Implementation of Federal Prize and Citizen Science Authority: Fiscal Years 2019–20

A Report by the

OFFICE OF SCIENCE & TECHNOLOGY POLICY

In Response to the Requirements of the

America COMPETES Reauthorization Act of 2010 *and the*

Crowdsourcing and Citizen Science Act

March 2022

About the Office of Science and Technology Policy

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About this Document

This document presents the seventh report on the use of prize competitions and challenges conducted by Federal agencies to spur innovation, engage citizen solvers, address tough problems, and advance their core missions. It also presents the second report on crowdsourcing and citizen science activities conducted by Federal agencies.

Copyright Information

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Abbreviations and Acronyms

AICA	American Innovation and Competitiveness Act
BLM	Bureau of Land Management
CCS	crowdsourcing and citizen science
CCS Act	Crowdsourcing and Citizen Science Act of 2017
CFTC	Commodity Futures Trading Commission
COMPETES Act	America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act of 2010
DHS	Department of Homeland Security
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOL	Department of Labor
DOS	Department of State
DOT	Department of Transportation
EPA	Environmental Protection Agency
FedCCS	Federal Crowdsourcing and Citizen Science Community of Practice
FFRDC	federally funded research and development center
FTE	full-time equivalent
FWS	Fish and Wildlife Service
GCD	Grand Challenge for Development
GSA	General Services Administration
HHS	Department of Health and Human Services
iCare-AD/ADRD	Improving Care for People with Alzheimer's Disease and Related Dementias Using Technology
LOC	Library of Congress
LTE	Long Term Evolution
NASA	National Aeronautics and Space Administration
NASEM	National Academies of Sciences, Engineering, and Medicine
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration

NPS	National Park Service
NSF	National Science Foundation
ODNI	Office of the Director of National Intelligence
OMB	Office of Management and Budget
OPM	Office of Personnel Management
OSTP	Office of Science and Technology Policy
OTA	Other Transaction Authority
PC&C	prize competition and challenge
PEO	Program Executive Office
PSCR	Public Safety Communications Research Division
QA	Quality Assurance
SBA	Small Business Administration
SBIR	Small Business Innovative Research
SI	Smithsonian Institution
SIDA	Swedish International Development Cooperation Agency
SSA	Social Security Administration
STEM	science, technology, engineering, and math
SWFF	Securing Water for Food Grand Challenge for Development
UAS	Unmanned Aircraft Systems
U.S.	United States
USAID	United States Agency for International Development
USA-NPN	USA National Phenology Network
USDA	United States Department of Agriculture
USGS	U.S. Geological Survey
WISE	Wide-field Infrared Survey Explorer

Executive Summary

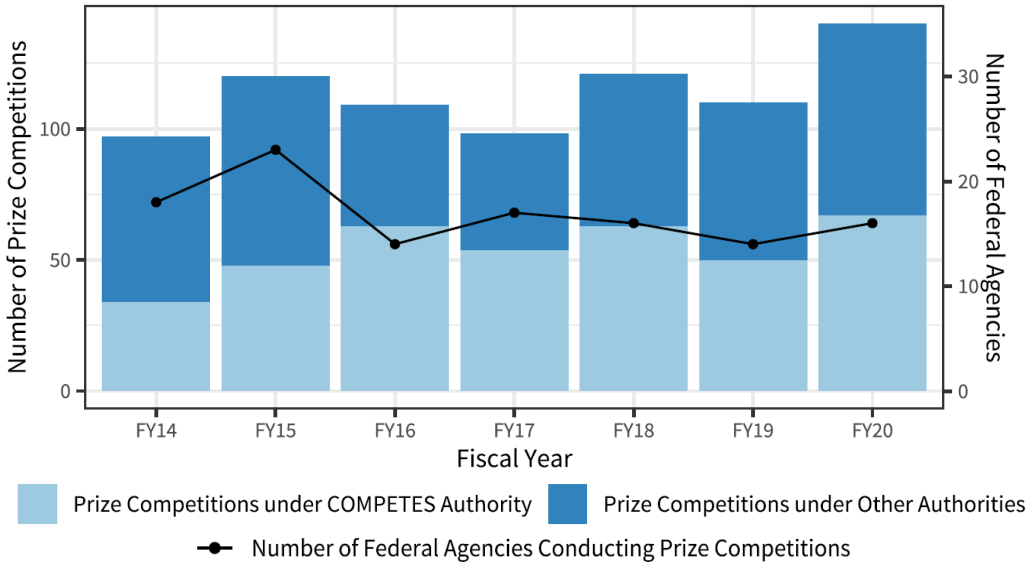
The America COMPETES Reauthorization Act of 2010 (COMPETES) amended Section 24 of the Stevenson-Wydler Technology Act of 1980 with a new provision on prize competitions that granted broad authority to all Federal agencies to conduct competitions to spur innovation and ingenuity by permitting incentives to invite fresh perspectives, novel approaches, and collective problem-solving. The American Innovation and Competitiveness Act (AICA) (Public Law 114-329), which became law in January 2017, contained the Crowdsourcing and Citizen Science (CCS) Act.[1] The CCS Act gave Federal agencies broad authority to use crowdsourcing—and specifically citizen science—to advance agency missions and facilitate broader public participation in the innovation process. The White House Office of Science and Technology Policy (OSTP) is legislatively required by these Acts to submit a biennial report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives on the activities carried out under these two authorities. This report compiles prize competition data as well as federally conducted CCS projects for FY19 and FY20.

Specifically, this report includes detailed descriptions of the 88 prize competitions and challenges (PC&C) that were active in FY19 and FY20 under the prize authority provided by COMPETES (as reported by Federal agencies to OSTP) and summarizes 84 PC&C activities conducted under other authorities and voluntarily reported by Federal agencies to OSTP (Figure ES-1).[2] These 172 PC&C—the most activities reported during any reporting period—were conducted by 16 Federal departments and independent agencies: the Commodity Futures Trading Commission (CFTC); Department of Commerce (DOC); Department of Defense (DOD); Department of Energy (DOE); Department of Health and Human Services (HHS); Department of Homeland Security (DHS); Department of Labor (DOL); Department of the Interior (DOI); Department of Transportation (DOT); Environmental Protection Agency (EPA); General Services Administration (GSA); National Aeronautics and Space Administration (NASA); National Science Foundation (NSF); Office of the Director of National Intelligence (ODNI); Small Business Administration (SBA); and the United States Agency for International Development (USAID).

[1] 15 U.S.C. § 3724

[2] PC&Cs were considered active in a given fiscal year if their status was launched, ongoing, or completed during that fiscal year.

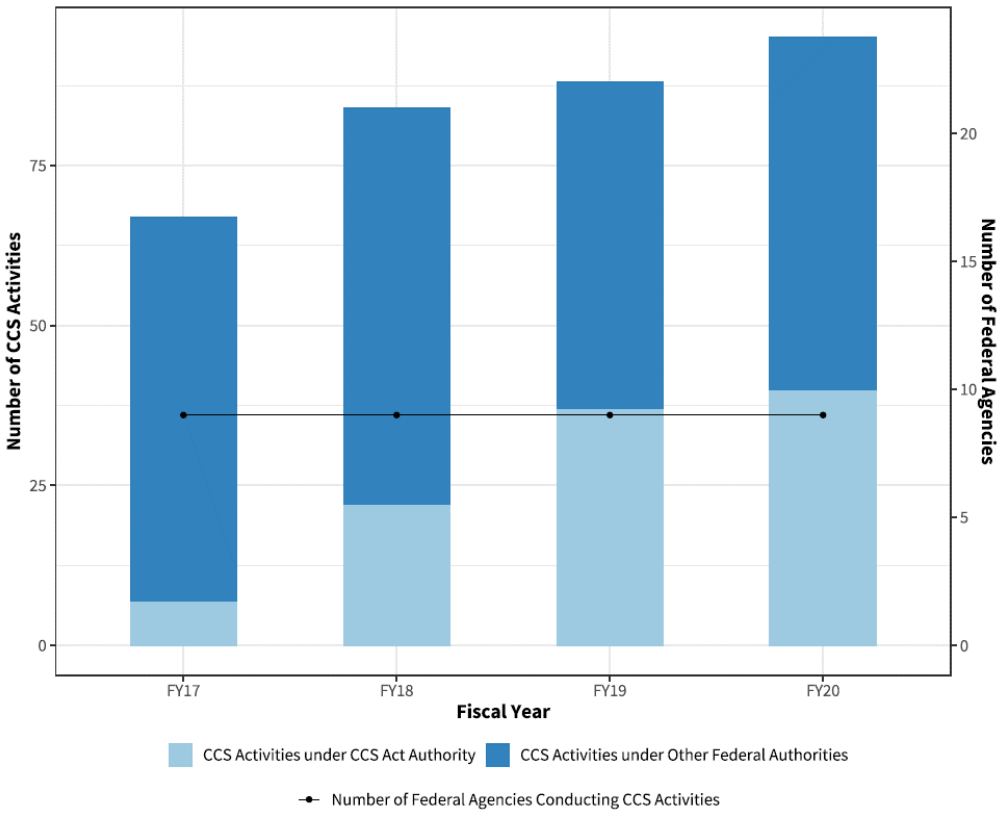
Figure ES-1. Number of Agencies Conducting PC&Cs and Number of PC&Cs Conducted by Authority since FY14.



This report also includes detailed descriptions of the 42 CCS activities that were active in FY19 and FY20 under the CCS Act (as reported by Federal agencies to OSTP) and summarizes 55 CCS activities conducted under other authorities and voluntarily reported by Federal agencies to OSTP (Figure ES-2).[3] These 97 activities—the most activities reported on since the AICA became law—were conducted and reported by 9 Federal departments and independent agencies: the United States Department of Agriculture (USDA); DOC; DOE; HHS; DHS; DOI; EPA; NASA, and the Smithsonian Institution (SI).

[3] CCS activities were considered active in a given fiscal year if their status was launched, ongoing, or completed during that given fiscal year.

Figure ES-2. Number of Agencies Conducting CCS Activities and Number of CCS Activities Conducted by Authority since FY17.



In addition, this report includes a brief discussion of how PC&Cs and CCS activities responded to the COVID-19 pandemic. Through partnerships with academia, industry, and other government organizations, Federal agencies effectively and rapidly scaled activities, leveraging open innovation to fight the spread of COVID-19 and addressing related issues.

New for FY19–20, this report collected data using an online survey with a mix of narrative and standardized response fields, which was a shift from previous reports that relied solely on narrative text to describe activities (refer to Appendix F for surveys). In addition to visualizations of the goals, objectives, participation, and partnerships of PC&C and CCS activities—as have been reported since FY13—the collection of quantitative variables (e.g., number of submissions) and categorical variables (e.g., types of partners) enabled new analyses for PC&C and CCS community members. The results indicate an expanded potential for using the report data to inform future efforts related to PC&Cs and CCS activities sponsored by Federal agencies, while also shining a descriptive light on the incredible activities taking place today.

Introduction

The White House Office of Science and Technology Policy (OSTP) is pleased to issue this report on the use of prize competitions and challenges (PC&C) as well as crowdsourcing and citizen science (CCS) by Federal agencies in fiscal years 2019 and 2020. In addition to fulfilling the mandates of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act (COMPETES Act) of 2010[4] and the Crowdsourcing and Citizen Science Act (CCS Act) of 2017,[5] which require OSTP to report to Congress on the use of the authorities provided by those laws on a regular basis, this report also provides an opportunity to highlight the creative and innovative ways that Federal agencies use prize competitions and citizen science to advance their missions and engage the American people.

The main body of this report provides an overview of the broad Federal landscape of both prize competitions and citizen science initiatives. Appendices B through E list all of the activities reported by Federal agencies, both those required by the COMPETES and CCS Acts as well as those implemented using other legal authorities that have been voluntarily contributed for inclusion by the sponsoring agencies.

This edition of the report reflects a fundamental change in how information on prize competitions and citizen science activities was collected from agencies. For all previous reports, data were reported in the form of narrative answers to long-form questions. Although the narrative answer approach provided a detailed description of each individual event, it limited the ability to collate data to understand broader patterns about the goals, objectives, partnerships, and participants involved in the activities.

For the FY19–20 PC&C and CCS report, the system for soliciting answers was built from the ground up using online surveys. In addition to reducing the effort required of submitters to provide information, the new approach allowed data to be gathered in a more systematic way. The result is a document that summarizes the landscape of Federal activities engaging the public through PC&Cs and CCS more comprehensively compared to past reports and makes more effective use of powerful data visualization techniques. The main body of this report focuses on the Federal landscape as a whole. In addition to these analyses, boxes are included throughout the report to highlight the variety of activities sponsored by Federal agencies in FY19 and FY20; each of these activities is fully documented in Appendices B–E. For those seeking a deeper dive into the analysis of the landscape of activities, Appendix A includes a variety of analyses focused on the various relationships between agency missions, activity goals, and the use of partnerships.

The use of both PC&Cs as well as CCS by Federal agencies has increased in number and scale from when information was first collected and reported systematically. In addition, both are supported by active and growing Federal communities of practice. This report captures a snapshot of the diversity and scope of these approaches to engage the American public in the work of Federal agencies and to harness the immense creative and innovative potential of the American people.

[4] The America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act of 2010 can be found at https://www.congress.gov/111/plaws/publ358/PLAW-111publ358.pdf.

[5] More information on the Crowdsourcing and Citizen Science Act can be found at https://www.govinfo.gov/content/pkg/USCODE-2016-title15/pdf/USCODE-2016-title15-chap63-sec3724.pdf.

Prize Competitions and Challenges

Introduction

PC&Cs have been used by the Federal Government as a means of finding creative solutions to challenging problems for many years. Agencies such as the National Aeronautics and Space Administration (NASA),[6] the Department of Defense (DOD),[7] and the Department of Energy (DOE)[8] have long possessed authorities to directly administer PC&Cs and to use appropriated funds for prize purses. However, 2010 brought the power of PC&Cs to the entire Federal Government, beginning with a memorandum from the Office of Management and Budget (OMB) on the use of prize competitions in March 2010, followed by the enactment of the COMPETES Act of 2010.[9] COMPETES expanded the authority of Federal agencies to fund PC&Cs through appropriations, gift funds from private entities, and as part of public-private partnerships in addition to previously existing authorities.

In January 2017, the American Innovation and Competitiveness Act (AICA)[10] was signed into law. Among other changes to the broad prize authority previously granted to Federal agencies under COMPETES, the AICA encourages agencies to eliminate unnecessary administrative burden and encouraged them to partner more broadly with the private sector and other government entities on incentive prize competitions, which could further expand their scope and sophistication.

Agencies use PC&Cs to tap into a knowledge base that exists outside of the Federal Government. Using PC&Cs, agencies can achieve a variety of goals, such as generating innovative ideas, developing or demonstrating technology, building or strengthening a community, and supporting outreach and information dissemination efforts. While PC&Cs are not the right tool for every problem, they can serve as a mechanism for spurring and sourcing innovation if and when they are aligned with a broader strategy and used systematically within an agency. Federal PC&Cs have catalyzed advances in areas such as autonomous transport and infectious disease forecasting, and stimulated research and investment in market sectors including solar energy and small business development.

Challenge and Prize Federal Community of Practice

All Federal agencies operating PC&Cs are supported and assisted by the General Services Administration (GSA). In 2010, GSA launched Challenge.gov to deliver tools and approaches to assist Federal agencies in advancing their core missions. Challenge.gov provides resources and collaborative opportunities to facilitate the use of PC&Cs government-wide. In 2016, OSTP and Challenge.gov crowdsourced the expertise of Federal prize practitioners to launch an online Challenges and Prizes Toolkit,[11] a comprehensive resource that provides a guide to planning and executing Federal PC&Cs.

The Challenge.gov program hosts a variety of resources and tools developed and administered by GSA to assist Federal agencies in developing and executing successful PC&Cs:

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[6] 42 U.S.C. § 20144

[7] 10 U.S.C. § 4065

[8] 42 U.S.C. § 16396

[9] Public Law 111-358 (Jan. 4, 2011)

[10] Public Law 114-329 (Jan. 6, 2017)

[11] More information about the Challenge.gov toolkit can be found at https://portal.challenge.gov/pdfs/prize_and_challenge_toolkit-0418d29477ba6c406f6b4e1adc115e99.pdf?vsn=d.

- **Challenge.gov Platform.** Since 2010, over 1,300 prize competitions have been hosted at no cost to Federal agencies on Challenge.gov. This platform provides a single location that allows citizen solvers—members of the public who participate in prize competitions and challenges by contributing their innovative ideas and solutions—the opportunity to view and engage with open (and archived) federally sponsored PC&Cs.
- **Resources for the Challenge and Prize Federal Community of Practice.** Working in close coordination with agency prize leads and prize practitioners across the Federal Government, the Challenge.gov program office develops trainings, holds office hours, and hosts spotlight chats and deep dive sessions to provide opportunities for knowledge sharing and experiential learning. In addition to the monthly newsletter, the program provides case studies and blogs, and continuously develops new toolkit content, templates, and resources for the Challenge and Prize Federal Community of Practice—a network and active community of more than 800 total individuals in the Federal Government that includes both current challenge managers and those who are considering managing challenges in the future.[12]
- **In-person Training for Federal Prize Practitioners.** The Challenge.gov program has offered in-person and remote training (e.g., live-streams, recorded webinars) to more than 2,000 people across the Federal Government via GSA's Digital.gov program.[13]
- **Tools and Services for Contracting.** GSA maintains the Multiple Award Schedule, 541613, Professional Services – Marketing and Public Relations, that provides agencies the ability to procure deeper technical expertise and dedicated services for their prize competitions.[14] Contractors on the schedule offer agencies options for technical assistance, prize platforms, and access to communities of individual solvers and teams interested in entering PC&Cs. GSA continues to assist agencies in taking advantage of the available services and to inform private sector vendors and agencies about the schedule and its benefits.

As the use of PC&Cs by Federal departments, independent agencies, and agencies within departments has increased, they have become increasingly ambitious, complex, and visionary.[15] Today, the Challenge.gov platform features more than 1,300 PC&Cs from over 100 Federal departments, independent agencies, and agencies within departments. Tens of thousands of solvers have participated in these PC&Cs on Challenge.gov, with additional entrants joining the PC&Cs through other means. In addition, several agencies have chosen to administer PC&Cs through third-party contractors and many have conducted prize competitions under authorities other than COMPETES.

Federal agencies have worked to expand their capacity and institutional abilities to conduct PC&Cs in a number of different ways (Table 1). In addition to internal support, many Federal agencies have also developed open innovation program offices and dedicated personnel to support the development and use of PC&Cs.

[12] More information about the Challenge and Prizes Federal Community of Practice can be found at https://digital.gov/communities/challenges-prizes/.

[13] More information about the Digital.gov program can be found at http://www.digital.gov.

[14] More information about the multiple award schedule can be found at https://www.gsaelibrary.gsa.gov/ElibMain/home.dohttp:/www.gsaelibrary.%20gsa.gov/ElibMain/sinDetails.do?scheduleNumber=MAS&specialItemNumber=541613.

[15] Throughout this report, "Federal agencies" refers to Federal departments, independent agencies, and agencies within departments.

Table 1. Federal Agency Practices to Support Prize Competitions and Challenges.

Agency Practice	Agencies Implementing
A dedicated central prize competition and challenge coordinator	DOD, DOI, EPA, GSA, HHS, NASA, USAID
A distributed network or community of prize competition and challenge managers and or points-of-contact (POCs) within the agency	DOC, DOD, DOE, EPA, HHS, NASA, USAID
A distributed network or community of project managers and/or resource people within the agency with expertise in prize competitions and challenges	DOC, DOD, DOE, DOI, EPA, GSA, HHS, NASA, NSF, ODNI, USAID
Carries out coordinated external communications or maintains a webpage for prize competitions and challenges	CFTC, DHS, DOC, DOD, DOE, DOI, DOT, EPA, HHS, NASA, ODNI, USAID
Centralized training and design support for staff conducting prize competitions and challenges	DOD, DOI, EPA, HHS, NASA, USAID
Contract vehicles to procure products and or services for prize competitions and challenges	DOC, DOD, DOE, DOI, EPA, HHS, NASA, NSF, ODNI, USAID
Developed or is in the process of developing centers for interagency challenges in specific topics related to prize competitions and challenges	EPA, USAID
Identified a prize competition and challenge POC not dedicated full-time to prize competitions and challenges	CFTC, DHS, DOC, DOD, DOE, DOI, DOT, EPA, GSA, HHS, ODNI, USAID
Internal communication tools to support prize competitions and challenges	DHS, DOC, DOD, DOE, DOI, DOL, DOT, EPA, GSA, HHS, NASA, NSF, SBA, USAID
Policy or guidance supporting the use of prize competitions and challenges	DHS, DOC, DOD, DOE, DOI, EPA, GSA, HHS, NASA, ODNI, USAID

This report discusses how Federal agencies have used PC&Cs, and highlights those conducted in FY19 and FY20 under both the COMPETES authority and other authorities. Although PC&Cs conducted under the authority of the COMPETES Act are required to be reported, activities carried out under other authorities are provided by their sponsoring agencies voluntarily. As a result, non-COMPETES activities included here represent only a sample of all the PC&Cs carried out by Federal agencies during the report period.

The Federal Landscape of Prize Competitions and Challenges in FY19 and FY20

The total number of active PC&C activities reported by Federal agencies in FY19 and FY20 was 172 under all authorities.[16] FY19 and FY20 PC&Cs were categorized based on their status (launched, ongoing, or completed) in each fiscal year. PC&Cs were considered active if their status was launched, ongoing, or completed for a given fiscal year.[17] Table 2 indicates the Federal agencies that reported active PC&Cs in FY19 and FY20 conducted under COMPETES and other authorities. Appendix B lists the 88 PC&Cs

[16] The percentages included in this report are based on the total number of PC&C activities unless otherwise noted. Some information is voluntarily reported and all information for PC&Cs conducted under authorities other than COMPETES is voluntarily reported.

[17] This method was not used for calculating aggregate prize purses and other monetary statistics as to avoid double counting.

conducted under the authority granted by COMPETES, and Appendix C lists 84 voluntarily reported activities conducted under other authorities.

Table 2. List of Federal Departments and Independent Agencies that Reported PC&Cs in FY19 and FY20 Conducted under COMPETES and Other Authorities. See Table 14 for a complete listing of Federal departments, independent agencies, and agencies within departments that reported PC&Cs under the COMPETES Act and other authorities in FY19 and FY20.

Sponsoring Agency	COMPETES FY19	Other FY19	COMPETES FY20	Other FY20
Commodity Futures Trading Commission (CFTC)			✓	
Department of Commerce (DOC)	✓		✓	✓
Department of Defense (DOD)	✓	✓	✓	✓
Department of Energy (DOE)	✓	✓	✓	✓
Department of Health and Human Services (HHS)	✓		✓	
Department of Homeland Security (DHS)		✓	✓	✓
Department of Labor (DOL)			✓	
Department of the Interior (DOI)	✓	✓	✓	✓
Department of Transportation (DOT)	✓		✓	
Environmental Protection Agency (EPA)	✓	✓	✓	✓
General Services Administration (GSA)	✓		✓	
National Aeronautics and Space Administration (NASA)	✓	✓	✓	✓
National Science Foundation (NSF)		✓		✓
Office of the Director of National Intelligence (ODNI)		✓		✓
Small Business Administration (SBA)	✓		✓	
U.S. Agency for International Development (USAID)		✓		✓

Agency Use of Prize Authorities

In FY19, 10 agencies offered PC&Cs enabled by COMPETES Act authority. Nine agencies administered PC&Cs using other authorities. Among these, five agencies conducted PC&Cs under both COMPETES and other authorities. In FY20, 13 agencies offered PC&Cs enabled by COMPETES Act authority and 10 agencies administered PC&Cs under other authorities (Table 2). Among these, seven conducted PC&Cs under both COMPETES and other authorities.

Box 1. NIST: Boosting Endurance for Search and Rescue

Each second counts during search and rescue operations, and it is critical that first responders communicate effectively. Often, search operations are in areas where broadband Long Term Evolution (LTE) communications are unavailable, making it difficult for those on the ground to communicate with one another. A possible solution to this issue uses drones, or Unmanned Aircraft Systems (UAS), to host wireless communication for public safety missions. Hosted by the National Institute of Standards and Technology (NIST) Communications Technology Laboratory, the First Responder UAS Endurance Challenge supported the development of efficient, cost-effective, and flexible UAS designs that optimize payload capacity, energy source, and flight times, allowing the UAS to be airborne for the longest time possible while the mission is being completed. Innovators competed in this 4-stage challenge for prize awards up to $552,000 in hopes of developing collaborations and partnerships, creating new technologies and products, and influencing industry competitiveness while driving down UAS production costs. Winners were announced in June 2021 following a live event and evaluation contest in spring 2021. The top three overall winners were awarded prizes of $100,000, $40,000, and $20,000, respectively, and winners in each of eight "Best-in-Class" categories were awarded $5,000. In the future, potential Public Safety Communications Research Division (PSCR) prize competitions may expand to cover other pressing issues regarding UAS operations and security, including public safety and cybersecurity.

https://www.challenge.gov/challenge/first-responder-uas-endurance-challenge/

Images: NIST PSCR

Agency Goals of PC&Cs

The goals of a PC&C activity refer to what an agency sought to accomplish through the event. Goal types were pre-defined in the online survey administered to Federal agencies and "Other" was provided as an option if additional relevant goals were not listed (Table 12). An event could have multiple goals—goal types were not mutually exclusive. Agencies reported that 70% of prize competitions active in FY19 and 69.3% of those active in FY20 had more than one goal. The mean number of goals reported per prize was three in both FY19 and FY20.

The most common PC&C goal reported for both FY19 and FY20 was *generate innovative ideas, designs, or concepts* (Figure 1). One other goal, *develop or demonstrate technology*, was reported by more than 50% of active PC&Cs in both FY19 and FY20. The least commonly reported goals were *launch or scale up the use of an enterprise or promote commercialization* and *improve a process, procedure, or service carried out by the sponsoring agency*.

For the FY19–20 report, goal types were revised from previous editions of this report to be more inclusive, specific, and informative, more accurately reflecting the variety of goals that agencies reported to achieve their aims through the use of PC&Cs (Table 3). This noteworthy change aligned with the transition to an entirely new system for soliciting answers using online surveys. As a result, direct comparisons between the most common goal types during FY19–20 and previous years are not possible. In the five fiscal years prior to FY19, *engage new people and communities* was the most commonly reported goal.

Figure 1. Percentage of PC&Cs Reporting Each Goal Type by Fiscal Year.

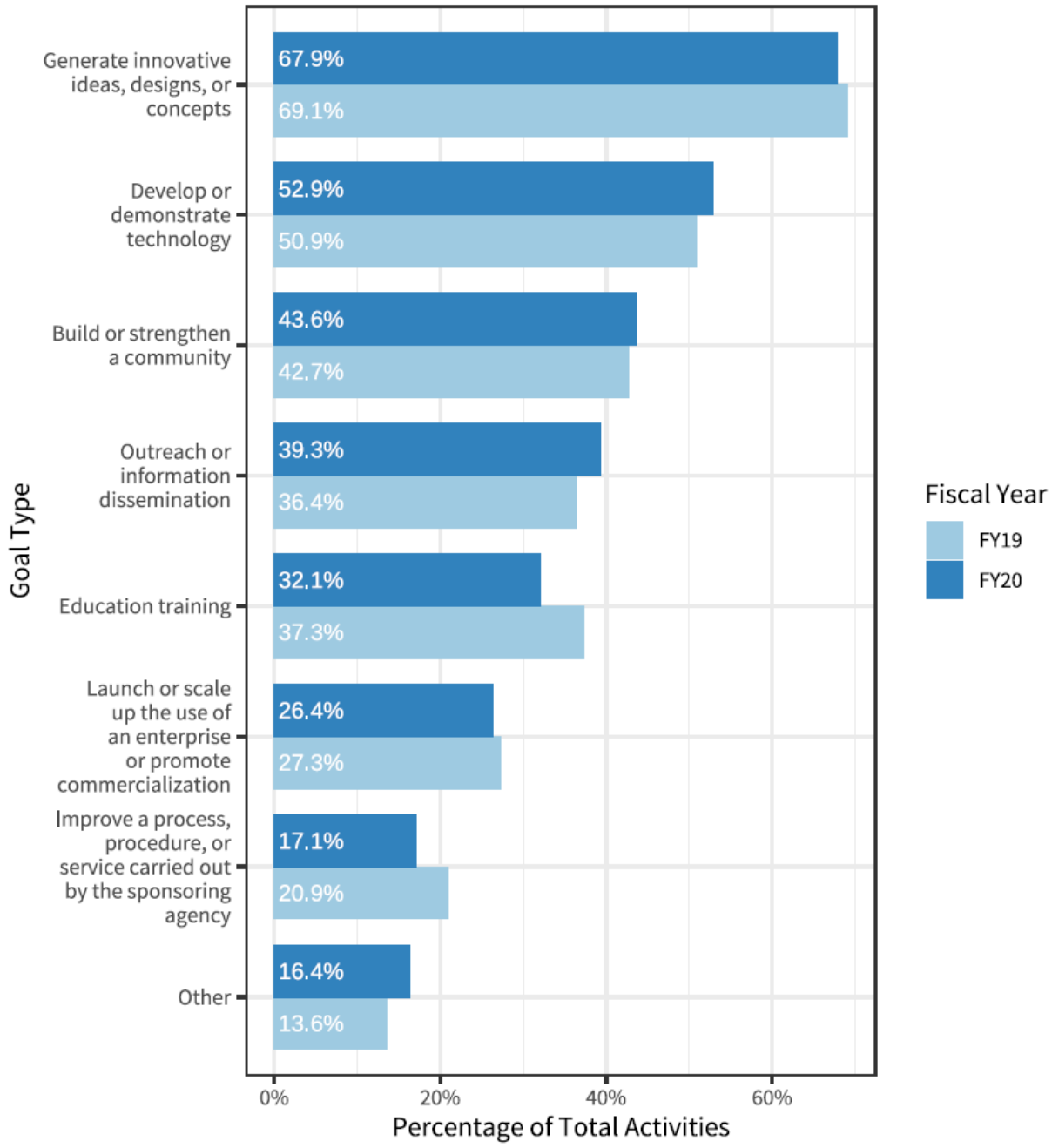


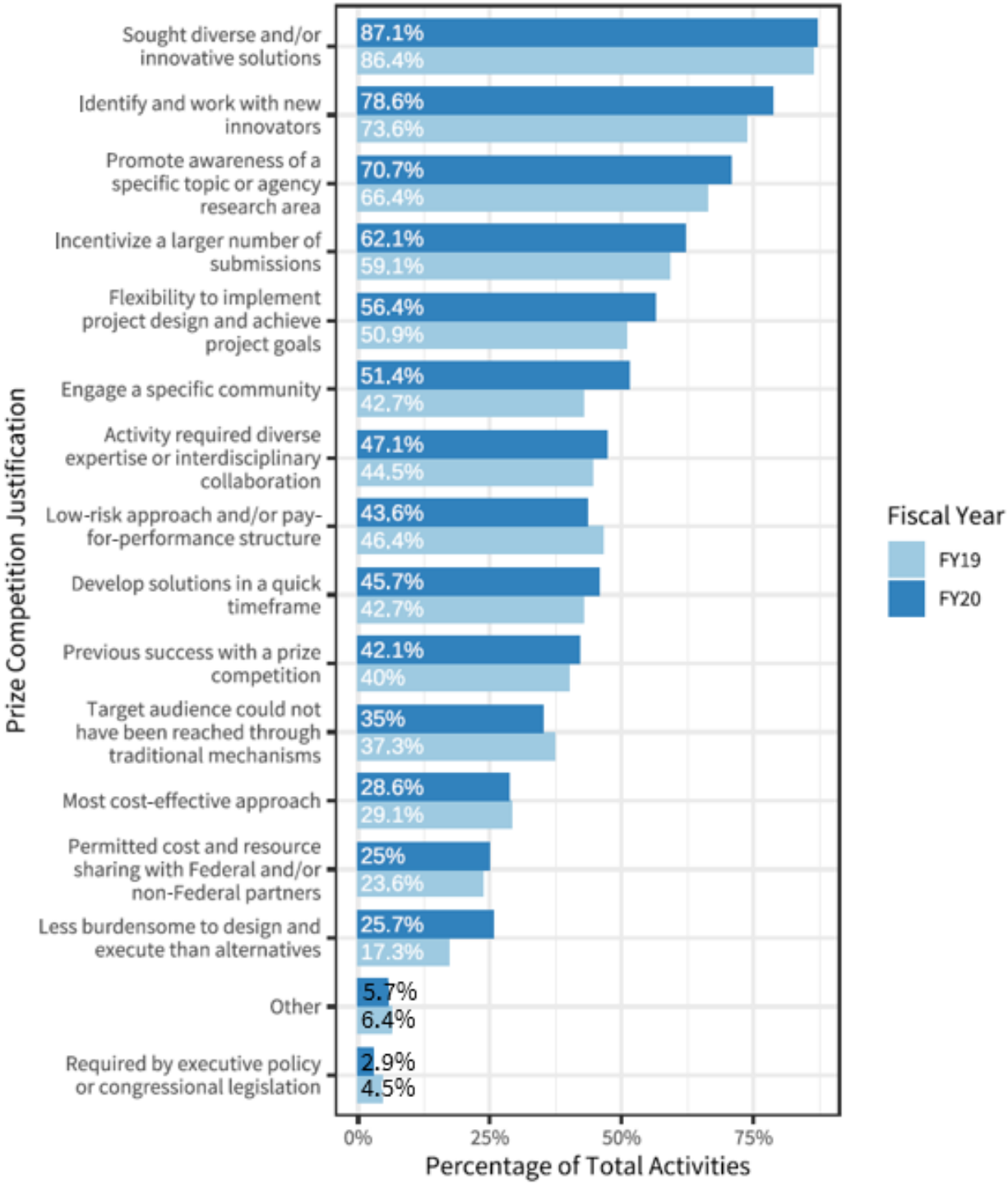
Table 3. Revised Goals versus Previous Fiscal Year Goals. Note that revised and previous goals are not strictly equivalent; previous goals are listed to provide context for revised goal types.

Revised Goals (FY19-20)	Goals Reported in Previous Fiscal Years
Build or strengthen a community: efforts to engage, establish, or strengthen a community.	Engage new people and communities
Develop or demonstrate technology: efforts to promote the development or demonstration of technology, such as hardware or software, to solve a problem or achieve an objective.	Advance scientific research; Develop technology; Solve a specific problem
Education or training: efforts related specifically to education or training.	Inform and educate the public
Generate innovative ideas, designs, or concepts: efforts to promote ideation, in which participants provide ideas in a variety of forms.	Find and highlight innovative ideas; Solve a specific problem
Improve a process, procedure, or service carried out by the sponsoring agency: efforts to improve processes or procedures of an agency, or to improve the delivery of services by an agency.	Improve government service delivery; Solve a specific problem
Launch or scale up the use of an enterprise or promote commercialization: efforts to support implementation, adoption, or commercialization, including technology transfer.	Build capacity; Stimulate a market
Outreach or information dissemination: efforts to engage or provide information to the public.	Inform and educate the public

Agency Justifications for Using PC&Cs

Justification refers to why an agency chose to achieve an objective by using a PC&C activity rather than an alternative mechanism such as a grant or contract. During the FY19 and FY20 reporting cycle, the most commonly reported justification for using PC&Cs was *sought diverse or innovative solutions* (reported by 86.4% of PC&Cs active in FY19 and 87.1% active in FY20); common justifications for using PC&Cs also included *identify and work with new innovators* and *promote awareness of a specific topic or agency research area* (Figure 2). Justifications were pre-defined in the online survey administered to Federal agencies and "Other" was provided as an option if additional relevant justifications were not listed; justifications are not mutually exclusive. The FY19 and FY20 reporting cycle was the first time that information on justifications for using PC&Cs was collected from agencies (for previous editions of this report, agencies provided a narrative description of justifications for carrying out prize competitions).

Figure 2. Percentage of Agencies Reporting Each Justification by Fiscal Year.



Box 2. NIH: Innovative Technologies to Tackle Dementia

As many as 5.6 million Americans age 65 and older are estimated to be living with Alzheimer's disease, in addition to many more under 65 who are also affected. Navigating the complex U.S. healthcare system can be challenging for people with dementia and their caregivers as they experience uncertain scenarios and interact with many different types of care providers and interventions. Effective dementia care management has been shown to improve outcomes by reducing the behavioral and psychological symptoms of dementia and lowering the cost of healthcare through a reduction in hospital visits. Despite the potential benefits, there are a variety of barriers to adopting these new methods, including workforce limitations, practice redesign costs, and limited uptake by insurers and health systems. Sponsored by the National Institutes of Health's (NIH's) National Institute on Aging, the Improving Care for People with Alzheimer's Disease and Related Dementias Using Technology (iCare-AD/ADRD) Challenge sought to stimulate innovation through the development of solutions for a technology-based application aimed at improving dementia care. The challenge enabled the National Institute on Aging to engage diverse participants—ranging from researchers to biotech firms to startups—to submit innovative mobile apps and software platforms. The winners shared $400,000 in prizes and provided software tools to assist with daily activities, help with the coordination of care, and facilitate engagement and information sharing with families of people with dementia.

https://www.nia.nih.gov/challenge-prize

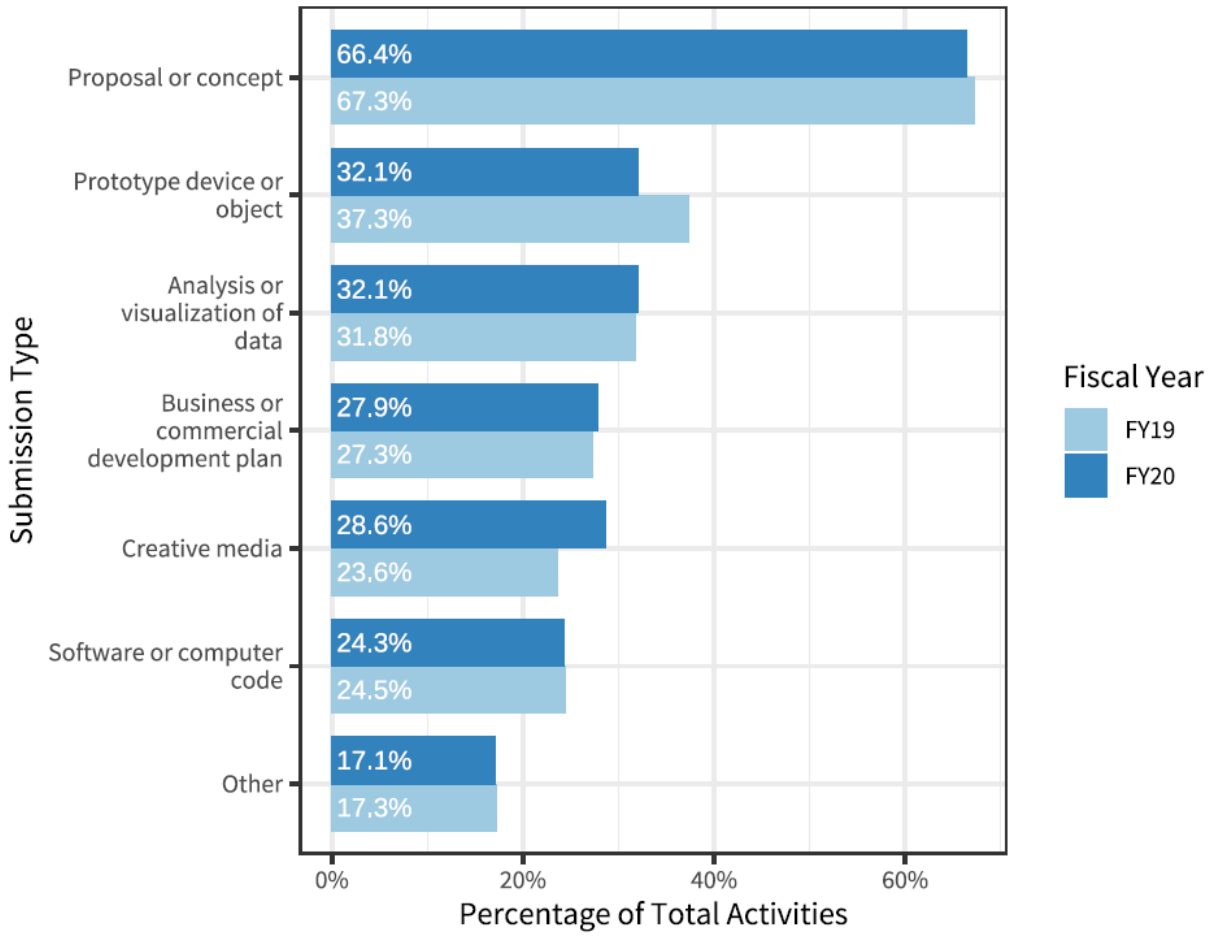
Types of Submissions Sought in PC&C Events

Submission type refers to what agencies requested PC&C participants to deliver. Types of submissions were pre-defined in the online survey administered to Federal agencies and "Other" was provided as an option if additional relevant submission types were not listed; types are not mutually exclusive. In FY19 and FY20, respectively, 52.7% and 58.6% of active PC&Cs reported seeking more than one submission type. The mean number of submission types reported per prize was 2.4 in both FY19 and FY20.[18]

The most common type of submission reported in FY19 and FY20 was a *proposal or concept* (Figure 3). Two additional submission types were sought by more than 30% of active PC&Cs in FY19 and FY20: *prototype device or object* and *analysis or visualization of data*. The least common submission types sought were *creative media* in FY19 and *software or computer code* in FY20.

[18] Number of submission types for each PC&C is based on the number of unique submission types across all reported phases of each prize (e.g., a PC&C with two phases seeking a *proposal or concept* is considered as having one submission type).

Figure 3. Percentage of PC&Cs Reporting Each Submission Type by Fiscal Year.[19]



For the FY19-20 report, "submission types" replaced the "solution types" used in previous reports. This change was made during the transition to an entirely new system for soliciting answers to improve clarity for submitting agencies and provide more accurate descriptions of submission types. However, the shift in definitions and terminology precludes direct comparisons with past years. Nevertheless, several of the previous and new categories overlap (Table 4) in ways that suggest continuity in the types of submissions sought by agencies: In the five fiscal years prior to FY19, except FY17, *ideas* was the most commonly reported solution type. In FY17, *software and apps* overtook ideas by a narrow margin (44.6% and 42.9%, respectively).

[19] Percentage of prizes reporting each submission type is based on the number of active PC&Cs in each fiscal year reporting a submission type during any phase of the PC&C.

Table 4. Submission Types in Current Report versus Solution Types in Previous Fiscal Years. New submission types are not strictly equivalent to previous solution types; solution types are listed to provide context for submission types.

Submission Types (FY19-20)	Previous Fiscal Year Solution Types
Analysis or visualization of data	Analytics, Visualizations, and Algorithms
Business or commercial development plan	Business Plans
Creative media (e.g., images, videos, podcasts, logos)	Creative
Proposal or concept	Ideas
Prototype device or object	Technology, Demonstration, and Hardware
Software or computer code	Software and Apps
Other	Nominations; Scientific

Box 3. DOE: Transforming Ocean Waves into Drinking Water

Water is a vital necessity for human health, economic growth, energy generation, and agricultural production. However, the threats to this critical resource are growing, and people and populations, especially those in remote coastal communities, can be left vulnerable when a disaster strikes. The Water Power Technologies Office at the Department of Energy (DOE) sought to utilize the collective expertise and creative spirit of innovators to design water desalination systems powered by ocean waves to help provide clean drinking water for these communities. The ultimate goal of this prize is to demonstrate the economic and energy promise of wave powered desalination. A part of the Water Security Grand Challenge, the Waves to Water prize offered up to $3. 3 million in cash to those that create small, modular, cost-competitive desalination systems that turn ocean water to clean water for disaster recovery and for remote and coastal communities. The 5 stages of the prize support design concepts through demonstration, with the final stage culminating in a 5-day, open water testing competition at Jennette's Pier in North Carolina in the spring of 2022. During the third stage, which closed in November 2020, winning teams documented detailed plans to create a prototype water desalination system and demonstrated technical capability. During the current stage, teams are providing evidence of a viable system that will be tested during the final stage.

https://americanmadechallenges.org/wavestowater/

Images: Coastal Studies Institute

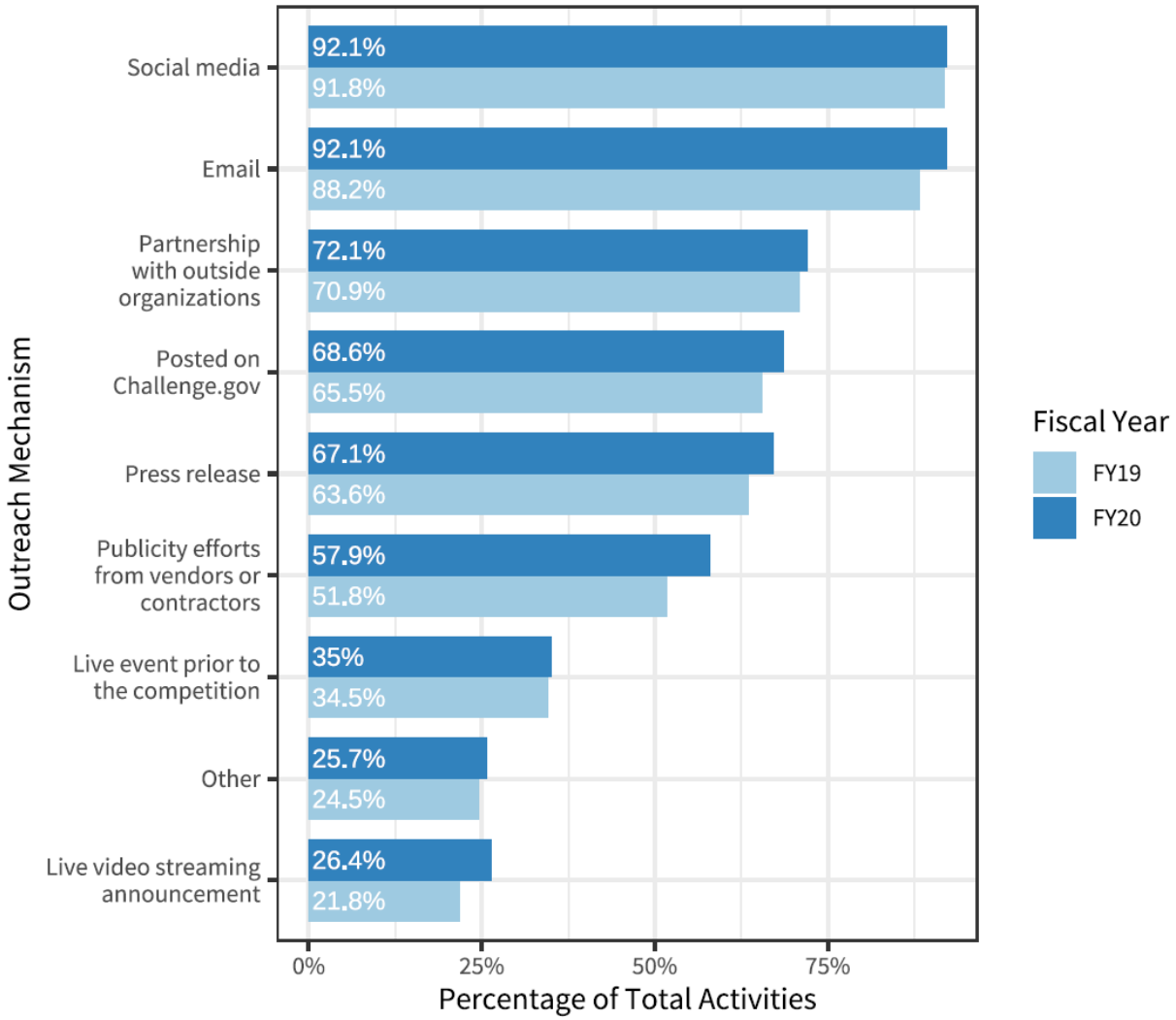
Outreach Mechanisms and Submissions

Federal agencies used a variety of mechanisms to publicize and solicit submissions for PC&Cs in FY19 and FY20. The most common mechanisms in both FY19 and FY20 were *social media* and *email* (Figure 4). Over 25% of PC&Cs active in FY20 reported holding a live video streaming announcement. These solicitation methods are aligned with the most commonly reported solicitation methods in FY17 and

FY18, the first reporting cycle that included questions about solicitation mechanisms. Posts on *Challenge.gov* and *publicity through partnerships with outside organizations* such as private companies, nonprofit organizations, and other Federal agencies were also common outreach methods. Many PC&Cs used more than one outreach mechanism.

The largest number of submissions received for a PC&C or phase of a PC&C was 6,000 for the DOD Space Security Challenge 2020: Hack-A-Sat, hosted by the U.S. Air Force, U.S. Space Force, and U.S. Defense Digital Service. The mean number of submissions received for a PC&C or phase of a PC&C, among those reporting number of submissions, was approximately 181. The median number of submissions received was 35. Overall, the number of submissions received for PC&Cs in FY19 and FY20 varied widely, depending on the nature of the competition, the desired pool of participants, and outreach mechanisms used, among other factors.

Figure 4. Percentage of PC&Cs Reporting Each Outreach Mechanism by Fiscal Year.



Total Prize Purse Offered

Total prize purses up to $19 million were awarded with a median of $23,000 in FY19 and $28,000 in FY20 under all authorities. During the FY19 and FY20 reporting periods, the largest total purse was for the Antimicrobial Resistance, Rapid, Point-of-Need Diagnostic Test Challenge, run by HHS. The competition concluded in FY20, awarding one winner $19 million for identifying and developing a novel, innovative point-of-need in vitro diagnostic tool that enables more rapid clinical decision making to combat the spread of antibiotic resistant bacteria and support public health efforts (see Appendix B.11.7 for more details). Although 8 monetary prize purses in FY19 and FY20 were less than $10,000, 23 events had totals of $1 million or more (typically awarded to multiple winners). In addition to monetary awards, agencies also offered non-monetary incentives to PC&C winners, such as mentoring or training, recognition in press or at events, networking opportunities, and support from partners to further refine ideas and proposals.

Approximately half of the reported PC&Cs in FY19 and FY20 with the largest total prize purse were conducted under COMPETES authority. Seventy-six percent of PC&Cs conducted under the authority of the COMPETES Act offered monetary prizes; 64.3% of PC&Cs conducted under other authorities offered monetary prizes.

Partnerships with Other Organizations

Fifty-nine percent of reported Federal PC&Cs were conducted by agencies in partnership with at least one other organization.[20] Approximately 47% of PC&Cs were conducted in partnership with at least one non-Federal organization, and approximately 27% were conducted with at least one Federal partner. Many PC&Cs had multiple Federal or non-Federal partners. Non-Federal partners included academic institutions, nonprofit organizations, State or local governments, private sector organizations, non-governmental organizations, and foreign governments. The most commonly reported partner type was *Federal Agency or Office* (Figure 6); State or local government and academic institutions were the least commonly reported partner types. Many agencies collaborated with a variety of partner types to conduct PC&Cs.

The Veterans' Employment Challenge,[21] launched jointly by DOL, DOD, and the Department of Veterans Affairs, is one example of how interagency partnerships were leveraged to conduct broadly beneficial PC&Cs. This challenge enabled innovators to develop a tool to help transitioning service members of the military in their job searches. The effort was part of the 2019 Workforce Grand Challenge, a government-wide prize competition initiative aimed at addressing the challenges of a 21st Century workforce associated with the growing need for computational skills and competencies across academic disciplines and careers.

Overall, partners contributed in a variety of ways to prize competitions—providing both monetary and non-monetary contributions—including solution acceleration, operations or administrative support, software development, and database development. Among all partners, the most commonly reported contribution type provided to sponsoring agencies and offices by partners was *publicity, advertising, outreach, and/or communications*; the least commonly reported partner contribution type was

[20] While 59% of PC&Cs were conducted by agencies in partnership with other organizations, agencies reported partnership information in narrative form for four of these PC&Cs to convey additional nuance, included in the appendices. The partners of these activities are not included in the percentages reported here.

[21] More information about the Veterans' Employment Challenge is available in appendix entry B.7.1 of this report and at https://www.dol.gov/newsroom/releases/vets/vets20200918.

purchase or rental of equipment (Figure 6). Approximately one in four partners also contributed *discovery or design support*. Among all PC&Cs, more than one-fifth received support from at least one partner for *publicity, outreach, and/or communications*.

Figure 5. Number of Partners of Each Type Reported by Sponsoring Agencies by Fiscal Year. "Other" types of partners included foreign government agencies, federally funded research and development centers (FFRDCs), interest groups, and other organizations that did not align with specified categories. If partners contributed to an activity in both fiscal years, it is included in the count for both.

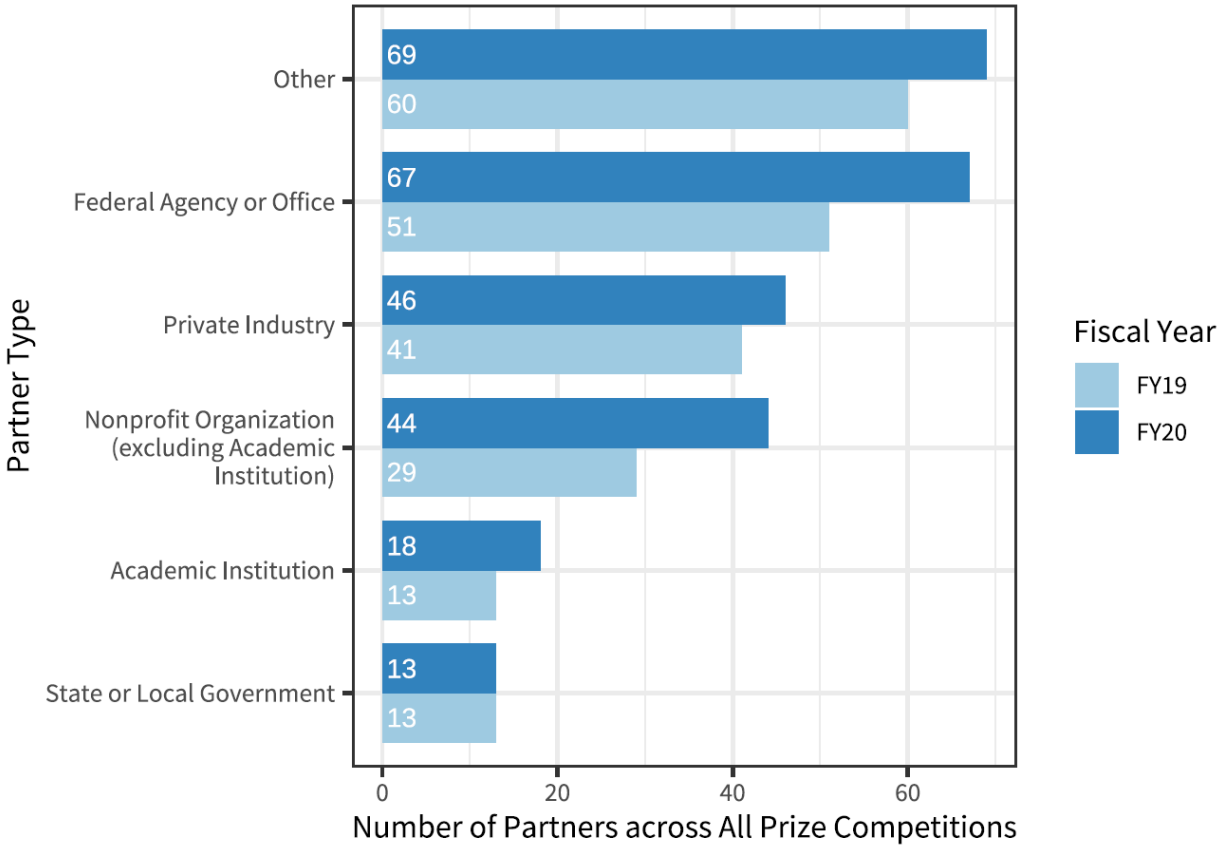
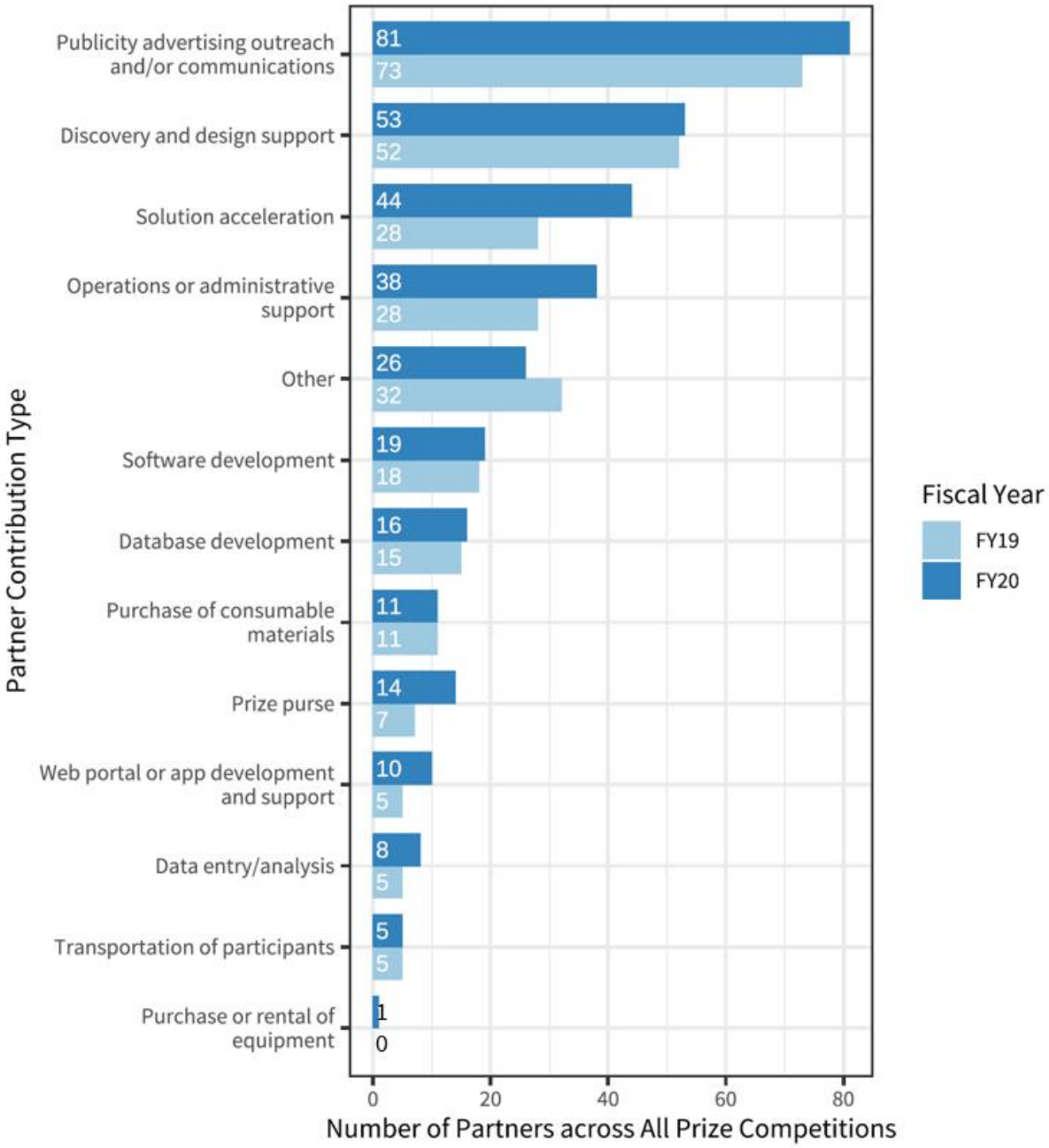


Figure 6. Number of Partners of Making Contributions of Each Type to PC&Cs by Fiscal Year.



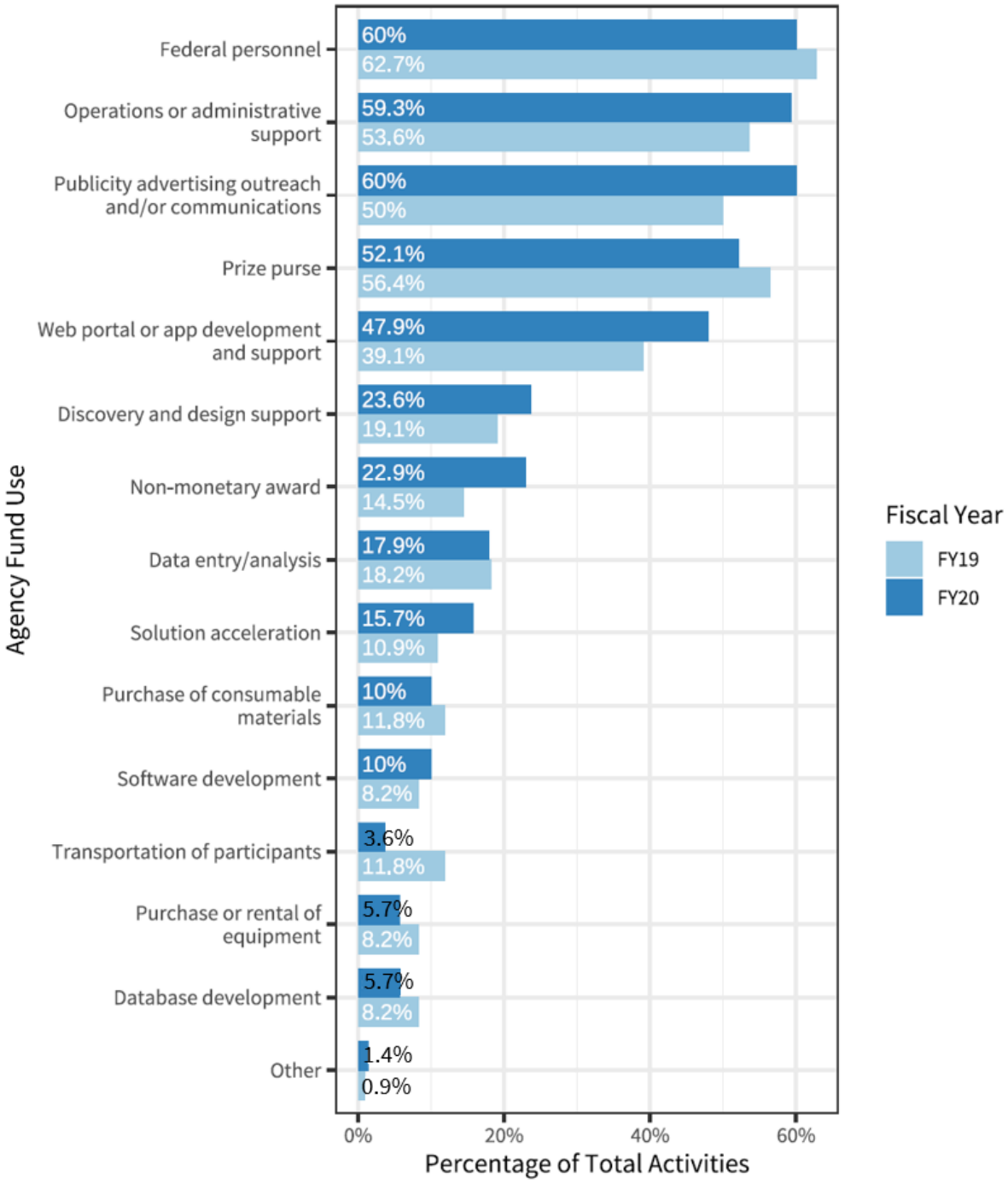
Use of Agency Funds to Support Prize Competitions and Challenges

Agency funds are used to support PC&Cs in a variety of ways (Figure 7). The most commonly reported use of agency funds during FY19 was *Federal personnel* (62.7%). The two most commonly reported uses of agency funds during FY20 were *Federal personnel* and *publicity, advertising, outreach, and/or communications* (both 60%). In FY19, the median reported full-time equivalent (FTE)[22] amount per

[22] Full-time equivalent (FTE) refers to the total amount of effort put forth by Federal agencies; one FTE represents the hours worked by one employee on a full-time basis over 1 year (2080 hours).

active prize competition was 0.5 FTE. In FY20, the median reported FTE amount per active prize competition was 0.3 FTE. Agency funds were also frequently reported as being used for *operations or administrative support* and *prize purse* in both FY19 and FY20.

Figure 7. Use of Federal Funds in PC&Cs by Fiscal Year.



Box 4. Army's xTech Program Prize to Contract Model

In 2018, the U.S. Army established the xTech Program, launching its first open topic competition known as xTechSearch, to attract transformative technology solutions from non-traditional businesses to help solve the Army's most critical challenges; the program has since expanded into various competitions with a range of topic areas. Within this program, business innovators have been awarded opportunities to receive monetary prizes, direct feedback and engagement from key Army and Department of Defense (DOD) stakeholders, diverse mentorship, educational programming, venture building consulting, and strategic exposure. With the expansion of the xTech Program, the U.S. Army has had to figure out alternative ways to bring the innovators, non-traditional small businesses, and academia directly to the Program Executive Offices (PEOs), program managers, and laboratories to begin further developing their technology solutions to meet the Army's needs and get the equipment in the hands of the warfighter.

xTech Innovation Combine Winners, Galley Power/UEC Electronics and Storagenergy Technologies, pictured with Christopher Lowman, senior official performing the duties of the Under Secretary, GEN Mike Murray, Army Futures Command, and Jeff Singleton, DASA R&T. Both Winners have been invited to submit a prototype proposal for an OTA contract of up to $500,000 each.

As a result, the xTech Program has developed the Prize to Contract Model, allowing business innovators to showcase technology solutions with the potential to receive a follow-on contract with the government organization hosting the competition. The prize competitions can be structured under the following authorities: 15 U.S.C. 3719 and/or 10 U.S.C. 2374a. The America Competes Act (15 U.S.C. 3719) is only available to small businesses and is limited to the United States, allowing a prize pool of up to $50M, but cannot be used alone to justify direct contract awards to the winners. xTechSearch open-topic competitions are typically executed under Title 15, awarding prize money for exceptional technical achievements of U.S.-based small businesses while providing them exposure and connections to develop relationships in the Army science and technology ecosystem.

Statutory authority at 10 U.S.C. 2374a, available only to DOD, is open to all business entities and can be expanded internationally with a prize pool of up to $1M and the flexibility to award follow-on contracts using the prize completion as the basis for competitive selection. The xTech|COVID-19 Ventilator Challenge, xTech|Innovation Combine, and the xTech|SBIR D2PhII are all competitions that had the flexibility to pursue follow-on contracts with winners of the competitions. For example, Innovation Combine winners FPH USA and TexPower received awards of $600,000 through an Other Transaction Authority (OTA) after being declared winners at the Innovation Combine pitch day hosted virtually in Austin, TX in July 2020. Similarly, over 20 small businesses were awarded Direct-to-Phase II Small Business Innovative Research (SBIR) contracts, worth up to $1.67M each, after selection as winners of the xTech|SBIR D2PhII contest in November 2021.

Several types of follow-on awards can be utilized with 10 U.S.C. 2374a and coupled with the xTech prizes, including: grants; contracts; cooperative agreements; OTAs; SBIR awards; and Small Business Technology Transfer awards. With the Prize to Contract Model, the xTech Program has been able to award more than $9.2M in prizes and $44.1M in follow-on contracts since the start of 2020.

Looking forward, the U.S. Army intends to continue expanding the xTech program, with plans to offer competitions that focus on artificial intelligence, advanced energy storage, additional SBIR topics, and collaborations with historically black colleges and universities (HBCUs) offering follow-on basic research grant opportunities.

Since its inception, the xTech Program continues to break down barriers to working with the Army and assists in growing the U.S. Army's Innovation Ecosystem by bringing in over 2,000 transformative technology solutions from non-traditional companies; conducting over 16,000 evaluations from across the Army and DOD; providing direct exposure to Army and commercial stakeholders; and accelerating technology development for Army and commercial success.

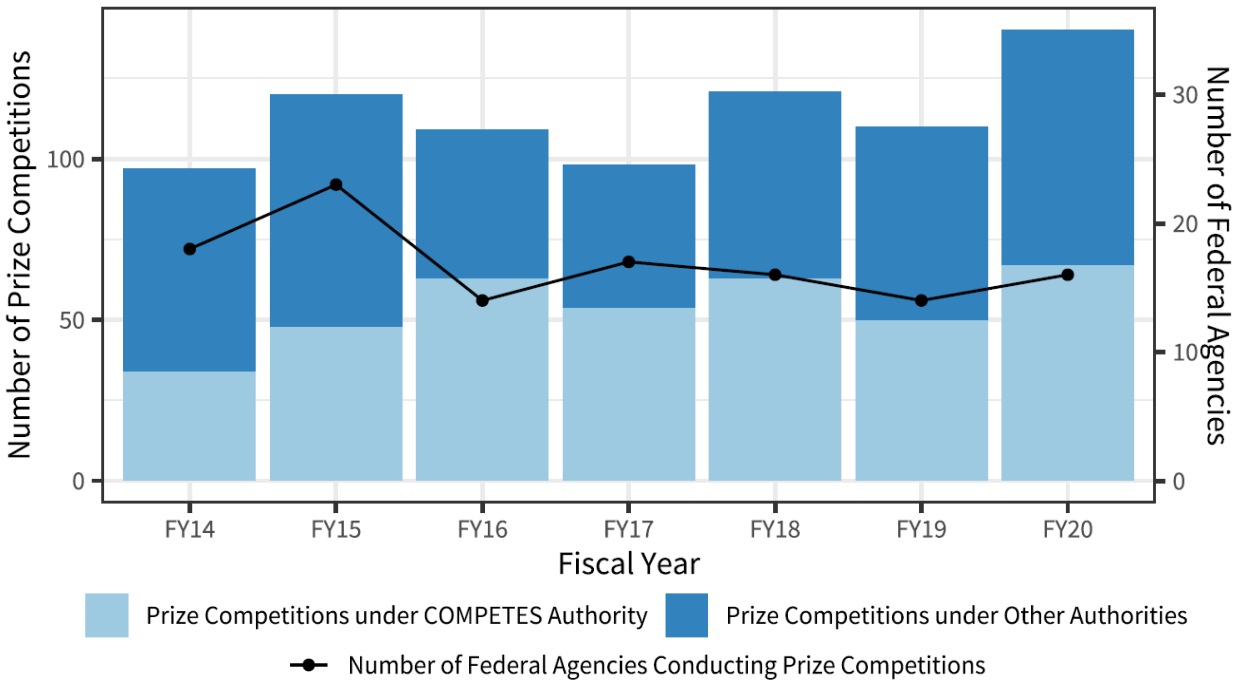
Trends in Federal Prize Competitions and Challenges from FY14 to FY20

Overall, the total number of active PC&Cs reported increased from 97 in FY14 to 140 in FY20, and the number of prizes conducted under the authority of the COMPETES Act increased from 34 in FY14 to 67 in FY20 (Figure 8; see Table 5 for breakdown by agency). Twelve agencies account for the bulk of events and prize money offered between FY14 and FY20: HHS and NASA have each funded over 100 PC&Cs since FY14, and DOC, DOD, DOE, DOI, DOS, EPA, NSF, ODNI, and USAID have each sponsored over 20. The proportion of PC&Cs conducted under the COMPETES authority has varied over time from a low of 35% in FY14 to a high of 58% in FY16. In recent fiscal years, approximately 50% of all PC&Cs reported have been conducted under the COMPETES authority.

To examine the use of PC&Cs by Federal agencies over time, the total number and magnitude of prize purses reported by Federal agencies under COMPETES and non-COMPETES authorities between FY14 and FY20 were tallied (Figure 9).[23]

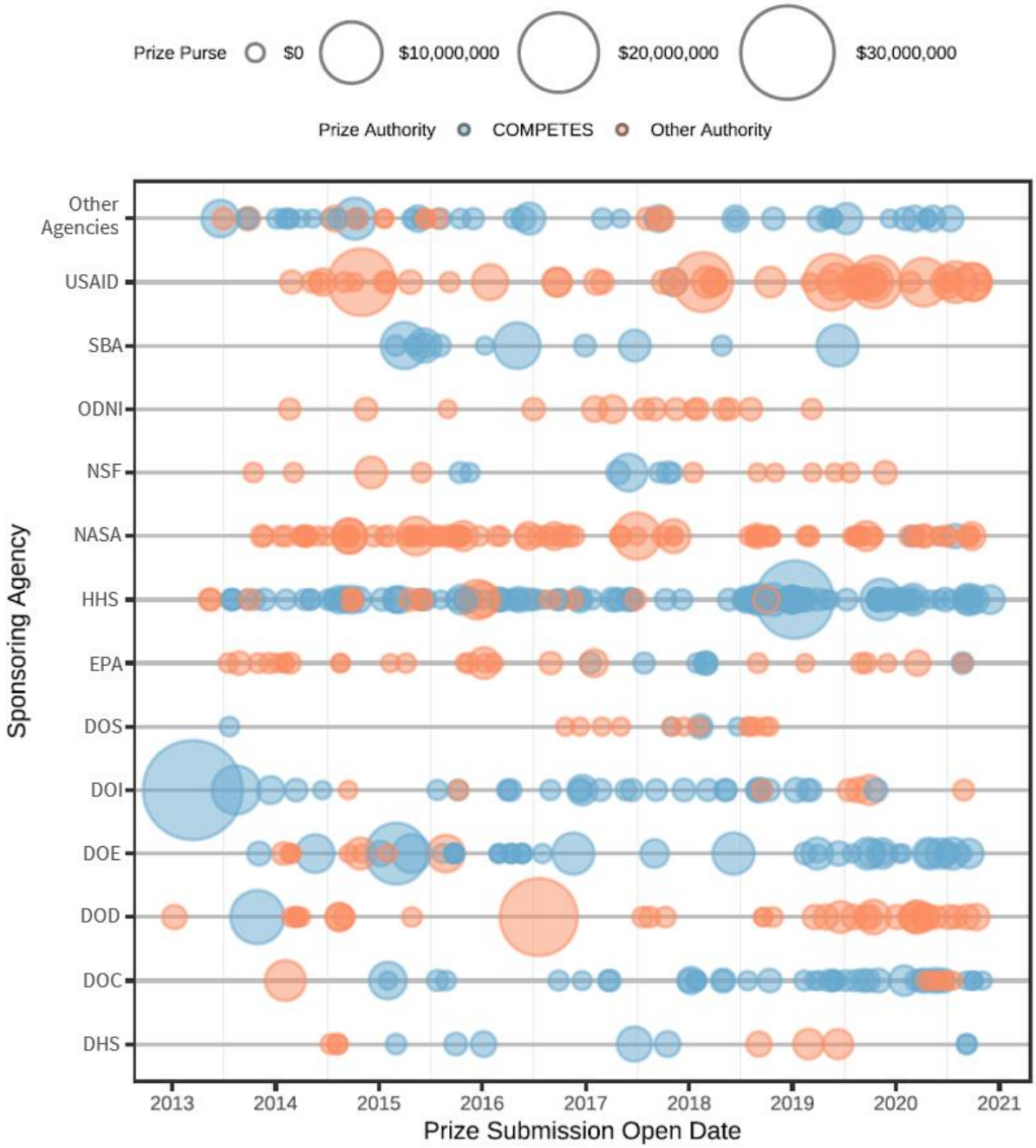
Numerous agencies have increasingly leveraged the COMPETES authority to execute PC&Cs in recent years, including DOE and HHS, while others, such as EPA and NASA, continue to primarily use non-COMPETES authorities, and some, such as ODNI, have never used COMPETES.

Figure 8. Number of Agencies Conducting PC&Cs and Number of PC&Cs Conducted by Authority since FY14.



[23] Trend analyses are limited to PC&Cs reported from FY14 to FY20. Data collected for PC&Cs prior to FY14 did not contain comparable information as those collected in later years.

Figure 9. Prize Amounts of PC&Cs Reported since FY13.[24] The position of each circle is based on the opening date of a PC&C or phase. For single-phase PC&Cs and PC&Cs reported in previous fiscal years, when information from specific phases was not collected, circle size corresponds to the size of the prize purse for the entire PC&C. For FY19-20 PC&Cs with multiple phases reported, circle size corresponds to the size of the prize purse for each phase.[25]



[24] Figure 9 shows agencies that have reported 10 or more prize competitions. Agencies that have conducted fewer than 10 total prize competitions between FY13 and FY20 are grouped together under "Other Agencies."

[25] Only prizes reporting a submission open date are included. Due to a difference in data collection, the total prize value in 2014 and 2015 may refer to the total prize allocated or awarded.

The total prize purse amount for all PC&Cs active in each fiscal year increased by 144% from $32 million in FY14 to $78 million in FY20, an increase of 13% from the $69 million total prize purse reported in FY18. Of the total prize purses offered in FY19 and FY20, five agencies (DOD, DOE, HHS, NASA, and USAID) held competitions with total prize purses equal to or greater than $5 million (Figure 9).

Table 5. **Number of PC&Cs Reported by Federal Agencies from FY14 through FY20.** Numbers in parentheses were conducted under the authority granted by the COMPETES Act.

Department/Agency	FY14	FY15	FY16	FY17	FY18	FY19	FY20
CFTC	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
CNCS	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
CPSC	2 (2)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
DHS	2 (0)	2 (1)	2 (2)	1 (1)	3 (2)	1 (0)	2 (1)
DOC	1 (0)	5 (4)	3 (2)	5 (5)	6 (6)	6 (6)	11 (9)
DOD	10 (1)	6 (1)	1 (1)	3 (0)	3 (0)	8 (3)	10 (3)
DOE	9 (4)	15 (8)	22 (18)	1 (1)	3 (3)	5 (4)	12 (11)
DOI	0 (0)	2 (1)	7 (5)	11 (11)	13 (13)	10 (7)	7 (2)
DOJ	5 (1)	5 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
DOL	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
DOS	1 (1)	0 (0)	0 (0)	6 (1)	20 (8)	0 (0)	0 (0)
DOT	1 (1)	1 (1)	0 (0)	0 (0)	1 (1)	1 (1)	2 (2)
EPA	12 (0)	3 (0)	7 (0)	6 (3)	6 (4)	6 (1)	7 (2)
FTC	1 (1)	2 (2)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)
GSA	2 (2)	1 (1)	2 (2)	1 (1)	1 (1)	2 (2)	1 (1)
HHS	22 (18)	25 (18)	29 (25)	25 (21)	21 (19)	24 (24)	31 (31)
HUD	2 (2)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NASA	17 (0)	24 (0)	23 (0)	13 (1)	16 (1)	19 (1)	27 (2)
NEA	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NSF	3 (0)	3 (0)	3 (2)	6 (5)	6 (4)	1 (0)	1 (0)
NSTC	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ODNI	1 (0)	2 (0)	0 (0)	6 (0)	12 (0)	2 (0)	1 (0)
OMB	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
SBA	0 (0)	5 (5)	3 (3)	2 (2)	1 (1)	1 (1)	1 (1)
TREAS	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)
USAID	5 (0)	8 (0)	4 (0)	6 (0)	6 (1)	24 (0)	25 (0)
USDA	0 (0)	1 (1)	2 (2)	2 (2)	0 (0)	0 (0)	0 (0)
VA	0 (0)	4 (0)	0 (0)	3 (0)	3 (0)	0 (0)	0 (0)
Total	97 (34)	120 (48)	109 (63)	98 (54)	121 (63)	110 (50)	140 (67)

The magnitude of the total Federal prize purse issued under the COMPETES authority has increased over time from $25 million in FY14 to $53.7 million in FY20 based on information reported by agencies. The median prize purse per competition conducted under the COMPETES authority increased from $82,000 in FY18 to $95,000 in FY19, a continuation of the increase from the median of $27,000 in FY14. However, in FY20, the median prize purse per competition conducted under the COMPETES authority fell to $65,000.

Box 5. USAID Grand Challenges for Development

Since 2011, the U.S. Agency for International Development (USAID) and its partners have launched 12 Grand Challenges for Development. Like prizes and challenges, Grand Challenges for Development (GCDs) incentivize solvers to develop and scale ideas that demonstrate impact. GCDs, however, operate at a much larger scale than typical prizes or challenges. Working at a regional or global level, these multi-year partnership platforms source new solutions to specific, well-defined development problems, test novel ideas, and scale what works. All GCDs offer challenge awards, but many also apply additional tools to identify and strengthen solutions, including prizes, hack-a-thons, and capacity-building technical assistance. Each GCD is designed to be fit-for-purpose, composed of complementary activities that are carefully selected to address the development problem at hand.

GCDs mobilize partners, including governments, foundations, and companies, to invest their funds and expertise in development problems, and focus attention and resources on seeking solutions. To date, Grand Challenge partners have jointly committed more than $500 million in grants and technical assistance, including nearly $140 million from USAID. Partners also help innovators attract both customers and investors in order to get the financing they need to grow—GCDs have catalyzed over $900 million in follow-on funding for solutions from external sources. Additionally, Grand Challenge partners collaborate to reduce market barriers and advocate for reforms that benefit innovators.

The GCD model has been applied across sectors. Through GCDs, solvers have developed innovations that improve early-grade reading skills, save the lives of mothers and newborns during pregnancy and childbirth, combat outbreaks of diseases like Ebola and Zika, and bring clean energy to farmers. Across the GCD portfolio, USAID Grand Challenge partners have received more than 16,000 applications and funded more than 700 innovations in over 80 countries to date.

The Securing Water for Food (SWFF) Grand Challenge for Development, a $35 million program that concluded in FY20, illustrates how GCDs work. To address the critical problem of water scarcity in agriculture, SWFF sourced, incubated, and accelerated high-potential solutions that enabled greater agricultural productivity with lower overall water demands than traditional solutions. Through SWFF, USAID partnered with the Swedish International Development Cooperation Agency (SIDA), the Foreign Ministry of the Netherlands, and the South African Department of Science and Technology to fund 40 promising innovators across four calls for innovation. To maximize commercial uptake and scaling opportunities for selected innovations, SWFF:

- Tied payments to clear, ambitious milestones, collaboratively identified by SWFF and the innovator.
- Complemented flagship awards with the Desal Prize, investment showcases, and peer-to-peer learning.
- Delivered multi-layered technical assistance to all selected innovators; support was tailored to each innovator's industry or business model and to country-specific market conditions.

Over 7 years, SWFF innovations have impacted more than 7 million farmers, catalyzed the production of nearly 7 million tons of food in over 35 countries, and reduced agricultural water consumption by 19 billion liters. The SWFF portfolio achieved a 41% return on investment on average, which compares favorably with private sector investment. Novel innovations sourced through SWFF include the Barsha Pump, a low-cost water-powered pump that allows farmers to irrigate their crops without using fuel or electricity (see image), and aquaculture ponds that produce fish for consumption and nutrient-rich water to support agriculture in arid climates.

More information about SWFF and other USAID Grand Challenges in FY19-20 is included in Appendix C.10.

Image: aQysta for the Securing Water for Food Grand Challenge

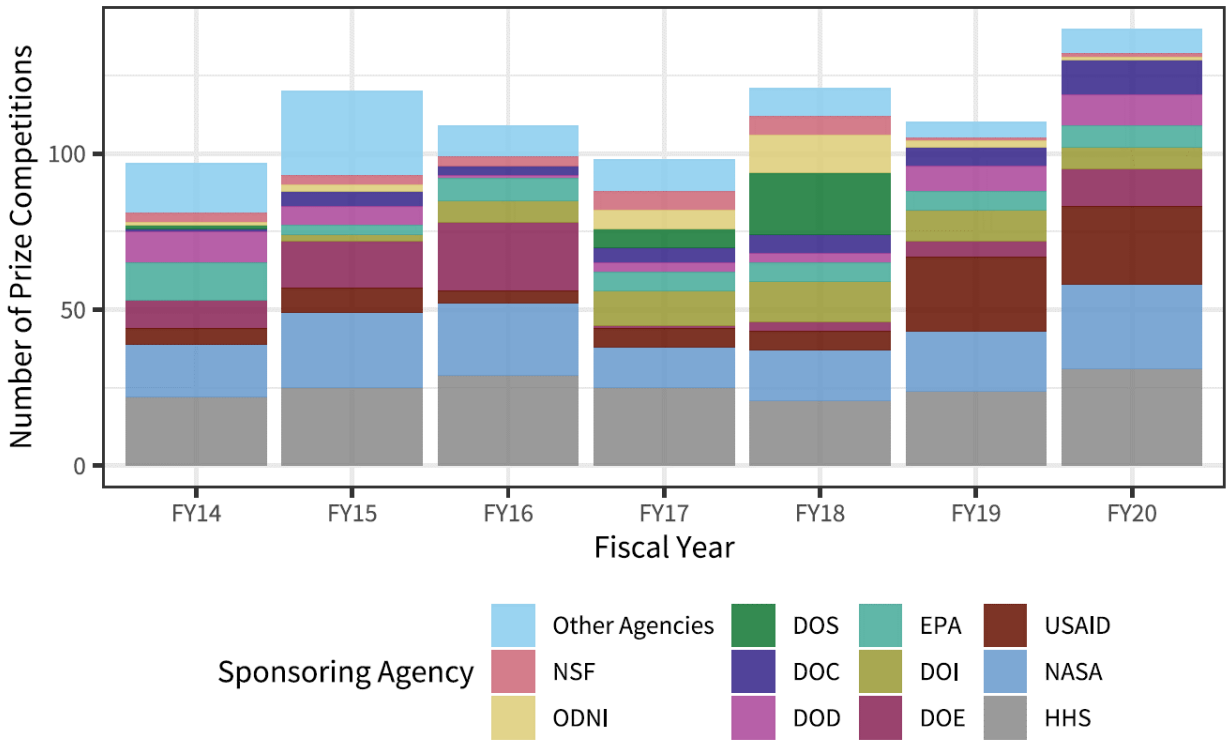
The Securing Water for Food Grand Challenge for Development Final Report can be found at https://securingwaterforfood.org/wp-content/uploads/2020/10/SWFF_FinalAnnualReport_Oct2014-March2020_4-15-2020-update.pdf.

Trends in Prize Competitions and Challenges for Select Agencies

DOE, HHS, NASA, and USAID accounted for 38% to 72% of active PC&Cs reported from FY14 to FY20, accounting for more than half of the total reported during this period. During the same years, DOE, HHS, NASA, and USAID accounted for 44% of the prize money offered by Federal agencies. However, the number, size, and authority used to fund PC&Cs changed substantially during these years (Table 5).

The number of PC&Cs offered by each Federal agency has also changed during the period from FY14 to FY20 (Figure 10). DOE has used the COMPETES authority for the majority of its reported prize competitions, while NASA and USAID rely primarily on other authorities. Of the prizes reported, HHS has reported the most PC&Cs of any Federal agency, ranging between 21 and 31 active PC&Cs in any year from FY14 to FY20. HHS used the COMPETES authority for the majority of its PC&Cs from FY14 to FY18 and for all PC&Cs active in FY19 and FY20.

Figure 10. Number of Prize Competitions Conducted by Each Agency since FY14.[26]



The median HHS prize purse increased steadily from $46,000 in FY14 to $130,000 in FY18, but has decreased to $100,000 in both FY19 and FY20. Of the prizes reported, the median USAID prize purse has increased steadily from $40,000 in FY14 to $700,000 in FY20, with the most significant increase in median prize purse occurring in FY16. The median prize purses offered by DOE and NASA have fluctuated over the period from FY14 to FY20.

[26] Agencies sponsoring fewer than 15 total prize competitions between FY14 and FY20 are grouped together under "Other Agencies."

Crowdsourcing and Citizen Science

Introduction

As part of the American Innovation and Competitiveness Act of 2017, Congress passed the Crowdsourcing and Citizen Science Act (CCS Act; 15 U.S.C. § 3724),[27] which grants Federal science agencies the direct, explicit authority to use CCS to stimulate and facilitate broader public participation in the advancement of Federal agency missions. The CCS Act defines citizen science as "a form of open collaboration in which individuals or organizations participate voluntarily in the scientific process in various ways, including: (A) enabling the formulation of research questions; (B) creating and refining project design; (C) conducting scientific experiments; (D) collecting and analyzing data; (E) interpreting the results of data; (F) developing technologies and applications; (G) making discoveries; and (H) solving problems." It defines crowdsourcing as "a method to obtain needed services, ideas, or content by soliciting voluntary contributions from a group of individuals or organizations, especially from an online community." Crowdsourcing engages participants in a wide range of activities and topics from digitizing archives to analyzing satellite images; citizen science is a form of crowdsourcing that allows participants to become involved in the scientific process through data collection, logistical support, and other direct contributions to research. The Federal Government supports them jointly because of their many shared elements, including mechanisms for organizing and engaging both online and on-the-ground communities.

While these practices were codified for Federal agencies by the CCS Act only recently, the Federal Government has a long history of engaging citizens in the scientific process. For example, Thomas Jefferson collected and shared weather observations and planned to establish a network of weather observers by providing a thermometer to one dependable deputy to collect twice-daily observations of temperature and wind direction in each county in Virginia. The Organic Act of 1890 created what is now the National Weather Service's Cooperative Observer Program,[28] which supports thousands of volunteers in the collection of observational meteorological data. The use of volunteer reports and observations by professionals continues to have an impact on research carried out by Federal agencies to advance their missions. For example, volunteer water quality monitoring has shaped the EPA's understanding of the environment, and reports from the public have improved the U.S. Geological Survey's (USGS's) detection and analysis of earthquakes.

In response to increasing public interest in recent years, Federal agencies have sought to facilitate community-based participation in their missions by preserving and improving access to scientific collections, data, and other research products. At the same time, technological advances have made it easier for both researchers and the public to gather and contribute valuable data and observations. With the dropping cost of sensors and greater access to the internet and smartphones, the collection and reporting of field-based measurements by both research specialists and citizen scientists has become increasingly streamlined. The past decade has also seen the emergence of online projects that involve participants in data and image analysis. Such projects offer new pathways for the public to participate in scientific research and can attract individuals outside the reach of more traditional models of scientific engagement. These trends help make CCS more efficient as a means for Federal agencies to carry out their missions and engage the public.

[27] More information on the CCS Act can be found at https://www.govinfo.gov/content/pkg/USCODE-2016-title15/pdf/USCODE-2016-title15-chap63-sec3724.pdf.

[28] More information about the Cooperative Observer Program can be found at https://www.weather.gov/coop/.

Federal Crowdsourcing and Citizen Science Community of Practice (FedCCS)

As implementation of CCS entered a period of rapid growth over the past decade, a nucleus of Federal officials who had been considering how to employ these methods came together. As early as 2012, Federal employees from various agencies began meeting as an informal discussion group, which led to the establishment in 2014 of the Federal Crowdsourcing and Citizen Science (FedCCS) Community of Practice.[29] These efforts are amplified by the work of the Crowdsourcing and Citizen Science Agency Coordinators, a group of Federal employees designated by their agency leaders as requested by the 2015 OSTP Memo on Addressing Societal and Scientific Challenges through Citizen Science and Crowdsourcing to be responsible for implementing tasks to advance CCS.[30] FedCCS works within and across Federal agencies to support Federal agencies in engaging the public directly and creatively as partners to enhance agencies' diverse missions. The FedCCS Community has grown rapidly from just 50 members in 2015 to over 445 members representing more than 70 Federal agencies in 2021.

Working together, the FedCCS Community increases efficiency, efficacy, and innovation across the Federal Government by sharing resources and expertise, methods and strategies, and identifying shared opportunities and needs. CitizenScience.gov is the Federal Government's central hub for CCS efforts. It provides essential resources, including:

- **The Federal Crowdsourcing and Citizen Science Catalog.** A vetted catalog of 475 projects at the Federal level that enables collaboration among Federal agencies and reveals opportunities for new high-impact projects.
- **The Federal Crowdsourcing and Citizen Science Toolkit.** A comprehensive toolkit to assist Federal CCS practitioners by providing how-to process steps, case studies, a resource library, and legal and policy resources to aid Federal agencies in setting up and managing their own projects.
- **The Federal Crowdsourcing and Citizen Science Community.** A resource to the FedCCS Community of Practice where practitioners share skills, resources, and experiences among themselves and with others to help expand and improve public participation across the government, as well as a list of the Crowdsourcing and Citizen Science Agency Coordinators.

This centralized online resource opens opportunities for the Federal Government to pursue and strengthen interagency partnerships as well as to collaborate with industry, academia, and other organizations on CCS initiatives. It also increases the ability of Federal practitioners to access resources for project development, gain top-level approval and support, and share lessons with fellow practitioners. By bringing together relevant resources and people in one place, CitizenScience.gov helps improve the FedCCS's impact while also fostering its practitioner-led organization.

[29] More information about the FedCCS Community can be found at https://digital.gov/communities/crowdsourcing-citizen-science/.

[30] The 2015 OSTP Memo can be found at https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/holdren_citizen_science_memo_092915_0.pdf.

Crowdsourcing and Citizen Science Act

The CCS Act grants Federal science agencies the direct, explicit authority to use crowdsourcing and citizen science. This authority supports efforts at the agency level to change perceptions about the validity of CCS contributions as well as create infrastructure to support implementation of these participatory techniques. As momentum increases, agencies such as NSF have funded work on the science of citizen science focused on identifying effective approaches and developing empirically supported best practices. The FedCCS Community continues to help agencies overcome concerns that might hinder implementation due to uncertainties around data quality, privacy, liability, and/or cybersecurity by engaging FedCCS members to work together to address policy challenges for the community. For example, many CCS projects involve a Federal agency collecting information directly from the public, a process that is regulated by the Paperwork Reduction Act (PRA).[31] The PRA requires agencies to develop an Information Collection Request (ICR) to obtain OMB approval. This process demands significant time and effort from multiple agency employees that can slow or prevent projects from getting started. However, agencies are finding ways to address this requirement while collecting data in a timely fashion. For example, EPA developed a generic ICR that covers CCS requests within the agency, dramatically shortening the time required to get projects approved to start collecting data from the public. This approach has been shared with the FedCCS Community and has been replicated by NASA.

As described in the CCS Act, unique benefits of CCS projects include "accelerating scientific research, increasing cost effectiveness to maximize the return on taxpayer dollars, addressing societal needs, providing hands-on learning in science, technology, engineering, and math (STEM), and connecting members of the public directly to Federal agency missions and to each other." CCS activities expand how government engages with the Nation, moving beyond working only with established entities (e.g., universities, private firms, non-governmental organizations) through contracts and grants to a collaborative approach involving broad public participation. Federal projects that use CCS do not solely benefit the U.S. Government; they also have positive impacts on the citizens who participate in them:

- **Enhancing scientific research and monitoring.** There are multiple paths by which CCS activities support scientific research and monitoring. In certain applications, volunteers are able to collect observations over geographic areas and/or time periods that would be impractical or impossible for Federal agencies, given personnel and resource constraints. In addition, volunteers can provide unique perspectives and local expertise for interpreting data.
- **Providing hands-on STEM learning and increasing STEM literacy**. CCS can help educate, engage, and empower students, educators, and the broader American public by applying their curiosity and contributing their talents to a wide range of real-world problems. Students have the opportunity to acquire lifelong enthusiasm for science, along with valuable skills in STEM. For students, working on real-world problems can make classroom learning experiences more engaging. For adults, working on CCS projects can help advance their knowledge and skills while contributing to a larger scientific enterprise. The 2018 study from the National Academies of Sciences, Engineering, and Medicine (NASEM) found that "citizen science supports learning outcomes related to scientific practices, content, identity, agency, data, and reasoning."[32]

[31] 44 U.S.C. 3501 et seq.

[32] *Learning Through Citizen Science: Enhancing Opportunities by Design* is available at https://www.nap.edu/catalog/25183/learning-through-citizen-science-enhancing-opportunities-by-design.

- **Addressing societal needs.** CCS can help address societal needs and Federal agency goals, ranging from enhancing the accuracy of prediction markets to tagging and transcribing national archive records. The ability to reach populations that may not previously have been engaged in scientific enterprises allows an influx of new ideas and insights. CCS can also provide unique exposure to government initiatives and the scientific process for the children and adults involved in those activities. The study from NASEM summarized these societal benefits: "citizen science can create opportunities for communities, especially communities who have been marginalized, neglected, or even exploited by scientists, to collaborate with scientists and the science community."

Federal agencies within the FedCCS have adopted a variety of practices to increase their capacity to effectively use CCS tools (Table 6).

Table 6. Federal Agency Practices to Support Crowdsourcing and Citizen Science Activities.

Agency Practice	Agencies Implementing
A dedicated full-time CCS coordinator	DHS, DOI, EPA, NASA
A distributed network or community of project managers and or resource people within the agency with expertise in CCS	DHS, DOC, DOI, EPA, HHS, NASA, SI, USDA
Agency leverages existing platforms or tools to conduct CCS activities	DHS, DOC, DOI, EPA, HHS, NASA, SI, USDA
Agency offers grant funding to support implementation of CCS	DOC, DOI, EPA, HHS, NASA, USDA
Agency provides centralized training and design support for staff conducting CCS activities	DOI, EPA, NASA
Articulated connections of how the use of CCS activities support the agency's mission	DOC, DOI, EPA, HHS, NASA, SI, USDA
CCS integrally or routinely used in agency science products	DOC, DOI, EPA, NASA, SI
CCS is included in agency-wide plans	DOC, EPA, HHS, NASA, USDA
Coordinated external communications or maintains a webpage for CCS	DOC, DOI, EPA, HHS, NASA, SI, USDA
Developed or is in the process of developing a generic information collection request (ICR) for CCS activities	DOI, EPA, NASA
Identified a CCS point of contact not dedicated full-time to CCS	DOC, DOI, EPA, HHS, NASA, SI, USDA
Internal communication tools to support CCS	DOC, DOI, EPA, HHS, NASA, USDA
Issued agency-wide policy or guidance on the use of CCS	DOC, DOI, EPA, NASA

Notable developments over the FY19–20 time period include:

- In January of 2020, the National Oceanic and Atmospheric Administration (NOAA) Research Council named citizen science one of six Science and Technology Focus Areas for the agency.
- The EPA Handbook for Citizen Science Quality Assurance (QA) and Documentation was released in March 2019 to help external groups understand how to prepare data quality plans

for their projects.[33] Other capacity building activities at EPA include a variety of community-scale equipment loan programs that provide access to low-cost air and water monitoring technology; a collaborative project with the Environmental Law Institute to characterize best practices for using citizen science in State, Tribal, and local environmental programs; and an assessment of Tribal use of citizen science that included suggestions for how EPA can better support Tribal citizen science.

- NASA invited proposals from employees and the public to develop CCS projects supporting NASA's mission. NASA also actively engaged NASA employees and partners through a series of citizen science webinars in 2020 and used a suite of web and social media tools to reach potential CCS project participants.
- USGS developed an active open innovation community of practice and began developing an agency-wide strategy and resource for how to implement crowdsourcing, citizen science, prize competitions, and other open science techniques.
- Among other awards, NSF funded a travel grant that focused on opportunities at the intersection of community-based environmental science and citizen science for both practitioners and scholars.
- FDA's Center for Drug Evaluation and Research continued to grow its crowdsourcing presence by hosting multiple internal staff engagements and planning for a future external-facing community.
- GSA organized a Federal Crowdsourcing Webinar Series to help with capacity building and knowledge sharing among Federal staff. The series launched with a look at Federal citizen science efforts and featured 14 episodes during FY19–20 that included presentations on how Federal agencies are using crowdsourcing to expand interactions with external and internal parties to leverage ideas and perspectives in targeted areas. Webinar topics were diverse, ranging from The Opportunity Project at the U.S. Census Bureau to NASA@Work, NASA's internal crowdsourcing platform. Organizations that shared their activities via this webinar series included: NASA, Census, Social Security Administration (SSA), U.S. Air Force, Library of Congress (LOC), HHS, NOAA, USGS, GSA, and Office of Personnel Management (OPM).

Beginning in 2019, four Federal land management agencies—the Bureau of Land Management (BLM), the Fish and Wildlife Service (FWS), the USDA Forest Service, and the National Park Service (NPS)—collaborated with external partners to develop a training to expand the capacity to conduct citizen science and address the shared needs, priorities, and vision of these agencies and partners to manage natural and cultural resources. Pilots of the training were conducted in 2020 and 2021. During the period covered by this report, the COVID-19 pandemic both disrupted CCS activities across government agencies and also offered opportunities. Social distancing requirements meant that some field-oriented citizen science projects were not able to collect data. While projects that required group contact decreased, opportunities for participation in projects that allowed data collection either in isolation or outdoors increased. It is difficult to determine whether the constraints caused by the pandemic led to new activities and larger participation for some types of projects. In response to COVID-19, a number of new projects were initiated that applied CCS to COVID issues. For instance, the Centers

[33] The EPA Handbook for Citizen Science Quality Assurance (QA) and Documentation is available at https://www.epa.gov/citizen-science/quality-assurance-handbook-and-guidance-documents-citizen-science-projects.

for Disease Control and Prevention (CDC) adapted its Epidemic Prediction Initiative to respond to the COVID-19 crisis to provide an open-source platform that holds data relevant to addressing the challenges of the pandemic. Participants from around the world can develop, submit, and share epidemiological models that use the data to predict the progression of the pandemic.

The Federal Landscape of Crowdsourcing and Citizen Science Activities in FY19 and FY20

A total of 97 CCS activities under any authority were reported as active by Federal agencies during the FY19–20 reporting period.[34] CCS activities were counted in a fiscal year if their activity status was reported as launched, ongoing, or completed. Consequently, some activities are counted in both years. This method was chosen in order to provide a complete snapshot of Federal CCS activity in each fiscal year. Appendix D lists the 42 CCS activities conducted under the authority granted by the CCS Act, and Appendix E lists 55 CCS activities conducted under other authorities that were voluntarily reported by agencies.

Agency Use of Crowdsourcing and Citizen Science Authorities

In both FY19 and FY20, nine independent agencies sponsored CCS activities (Table 7). In FY19, 7 agencies (defined as Federal departments, independent agencies, and agencies within departments) conducted CCS activities under CCS Act authority, while 22 sponsored CCS activities under another authority (Table 15). Five agencies sponsored CCS activities under both CCS Act authority and non-CCS Act authority in FY19. In FY20, 8 agencies sponsored CCS activities under the authority of the CCS Act and 22 agencies sponsored CCS activities under a non-CCS Act authority. Four agencies sponsored CCS activities under both CCS Act authority and at least one non-CCS Act authority in FY20.

Table 7. List of Federal Departments and Independent Agencies that Reported Crowdsourcing and Citizen-Science Activities in FY19 and FY20 Conducted under the Crowdsourcing and Citizen Science Act and Other Authorities. See Table 15 for a complete listing of Federal departments, independent agencies, and agencies within departments that reported activities under the CCS Act and under other authorities in FY19 and FY20.

Sponsoring Agency	CCS Act FY19	Other FY19	CCS Act FY20	Other FY20
Department of Agriculture (USDA)		✓		✓
Department of Commerce (DOC)	✓	✓	✓	✓
Department of Energy (DOE)	✓		✓	
Department of Health and Human Services (HHS)	✓	✓	✓	✓
Department of Homeland Security (DHS)		✓		✓
Department of the Interior (DOI)	✓	✓		✓
Environmental Protection Agency (EPA)	✓	✓	✓	✓
National Aeronautics and Space Administration (NASA)	✓	✓	✓	✓
Smithsonian Institution (SI)		✓		✓

[34] Percentages included in this report are based on the total number of activities unless otherwise noted. Some information for all activities was voluntarily reported; all information for CCS activities conducted under authorities other than the CCS Act was voluntarily reported.

Box 6. NASA: Discover a Rogue World in Your Backyard

Will you be the one to discover a large planet on the fringes of our solar system? With support from the Science Innovation Fund, the National Aeronautics and Space Administration (NASA) looked to citizen scientists to help to help answer this question using the Wide-field Infrared Survey Explorer (WISE) telescope. This telescope creates false-color images that combine two WISE bands that are invisible to the human eye, processes the images, and combines images over a time-lapse, creating negative images that can help the viewer identify patterns of celestial object movement. Computers have been searching these data sets for years, but have overlooked many important discoveries in the process. Citizen scientists were vital to this search because the human eye can more efficiently discern real celestial objects from optical blurs and instrument feedback. Citizen scientists helped NASA identify brown dwarfs and low-mass stars, and searched for the hypothesized Planet 9, which models suggest may exist within these images. Data from these activities led to research papers in peer-reviewed scientific journals, with many citizen scientists as co-authors on the publications.

backyardworlds.org

Image: William Pendrill/Backyard Worlds: Planet 9

Agency Goals of Crowdsourcing and Citizen Science Activities

The goals of a CCS activity refer to what the sponsoring agency intended to accomplish through the event (Table 13). Activities were not restricted to just one goal: for FY19, 89.8% of CCS activities reported more than one goal with a mean number of 3.3 goals reported per activity, while in FY20, 89.5% of CCS activities in FY20 reported more than one goal with a mean of 3.2.

The most common goal for CCS activities was *collection of data or observations* (Figure 11). *Public outreach or engagement* was also reported for more than three-quarters of all activities, with 77.3% and 76.8% of activities reporting this goal in FY19 and FY20, respectively.

CCS Act Objectives

In addition to agency goals, the CCS Act lists a series of objectives intended to be encouraged by the authority it provides (Figure 12). In both FY19 and FY20, 98.9% of reported activities addressed one or more CCS Act objectives. In FY19, 76.2% of CCS activities reported addressing more than one CCS Act objective, and in FY20, 76.8% of CCS activities reported more than one objective. The mean number of CCS Act objectives addressed per activity was 3.5 for both FY19 and FY20. Just as data collection was the most commonly reported informal goal, so too was *collect and analyze data* the most common reported CCS Act objective. No other CCS Act objective was reported for more than half of the CCS activities in either FY19 or FY20.

Figure 11. Percentage of CCS Activities Reporting Each Goal Type.

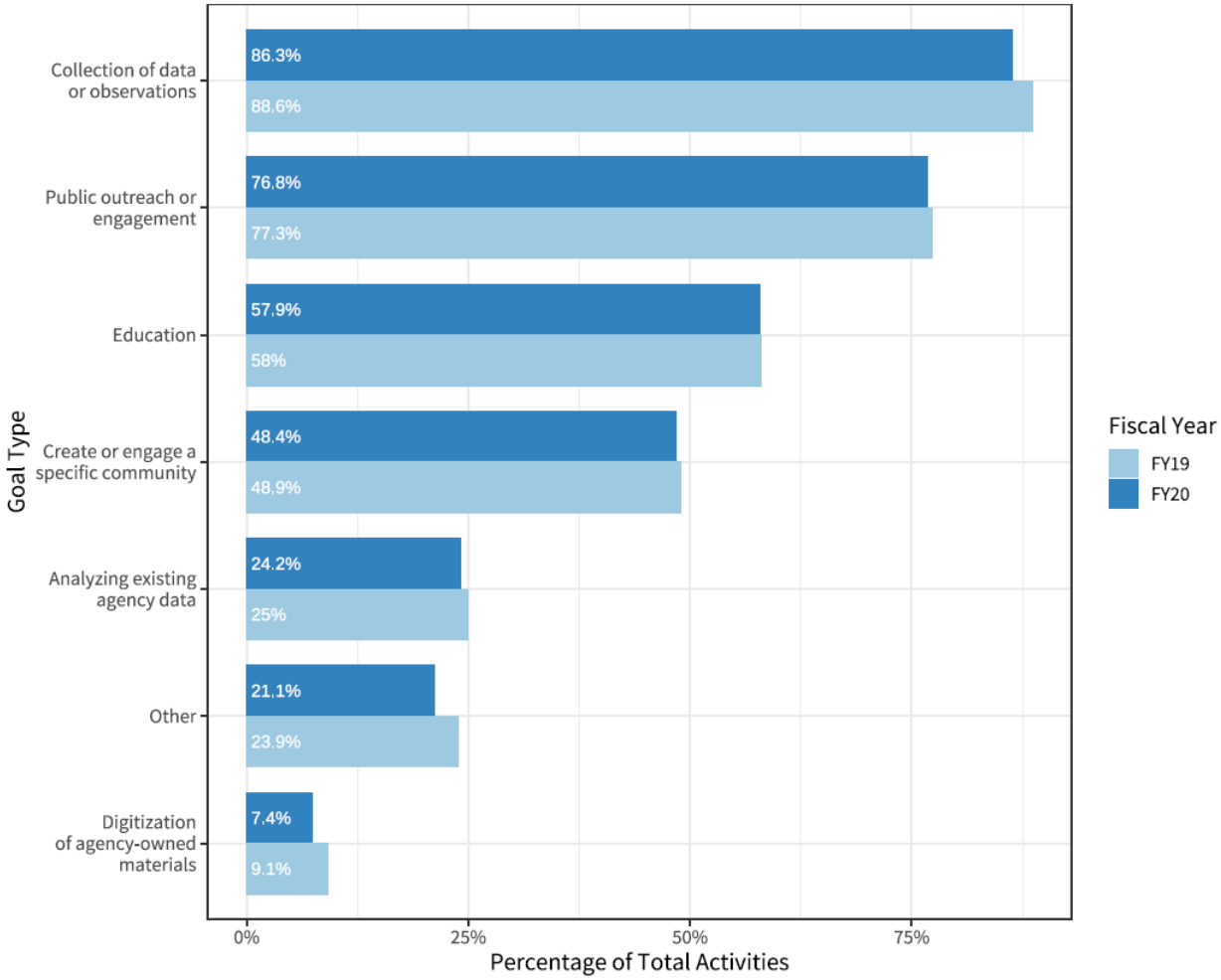
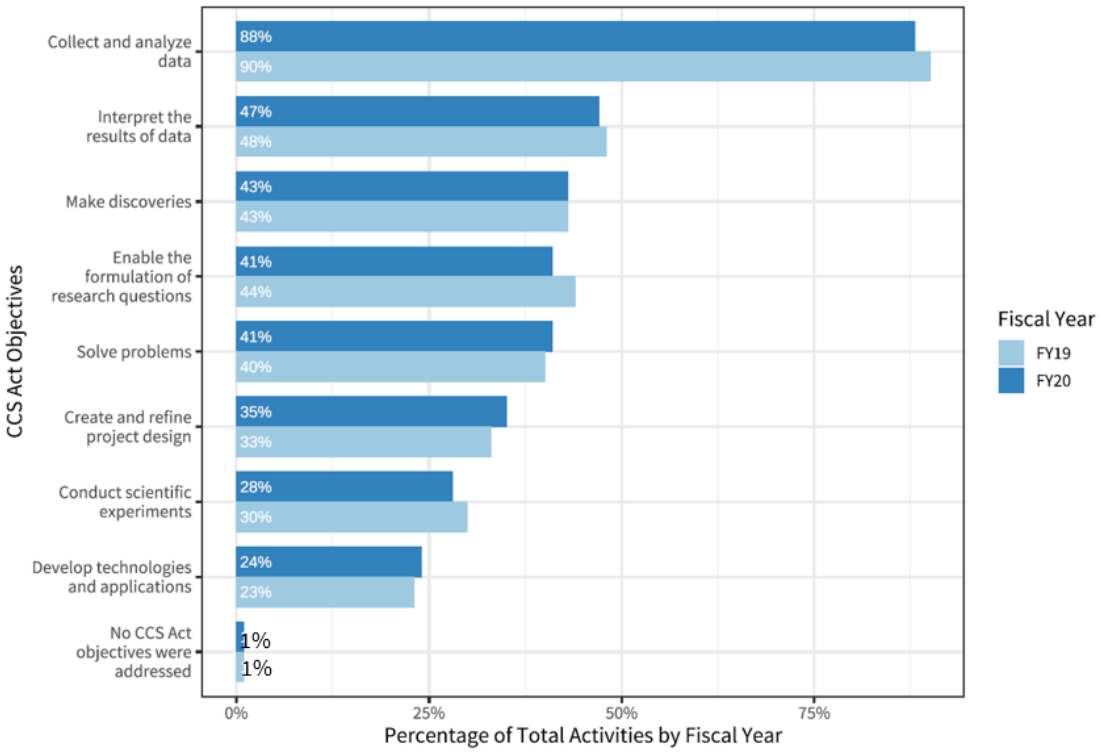


Figure 12. Percentage of CCS Activities Addressing Each CCS Act Objective.



Box 7. USDA: Uncovering the Mysteries of Oregonian Lampreys with eDNA

Not much is known about the population size and distribution of the native lampreys that exist in Oregon's coastal watersheds, but Environmental DNA (eDNA) may hold the answers. eDNA is organismal DNA found in the environment that originates from an organism's skin or waste, and can be an important method in monitoring or detecting rare or invasive species. Traditional monitoring methods, like electrofishing or redd (a gravel nest created by a spawning fish) counts, can be labor and time intensive. For the untrained eye, it may also be difficult to distinguish between the various kinds of lamprey larva. To help increase our knowledge base about lampreys and create population distribution maps, U.S. Department of Agriculture, Forest Service recruited citizen scientists to collect water samples containing eDNA at over 100 sites in various watersheds around Oregon. The project is establishing a network of citizen scientists and testing and refining techniques for obtaining eDNA samples at field sites. The project also served as an important step forward in fish conservation and provides critical data and information to those conducting restoration and protection activities within the watershed.

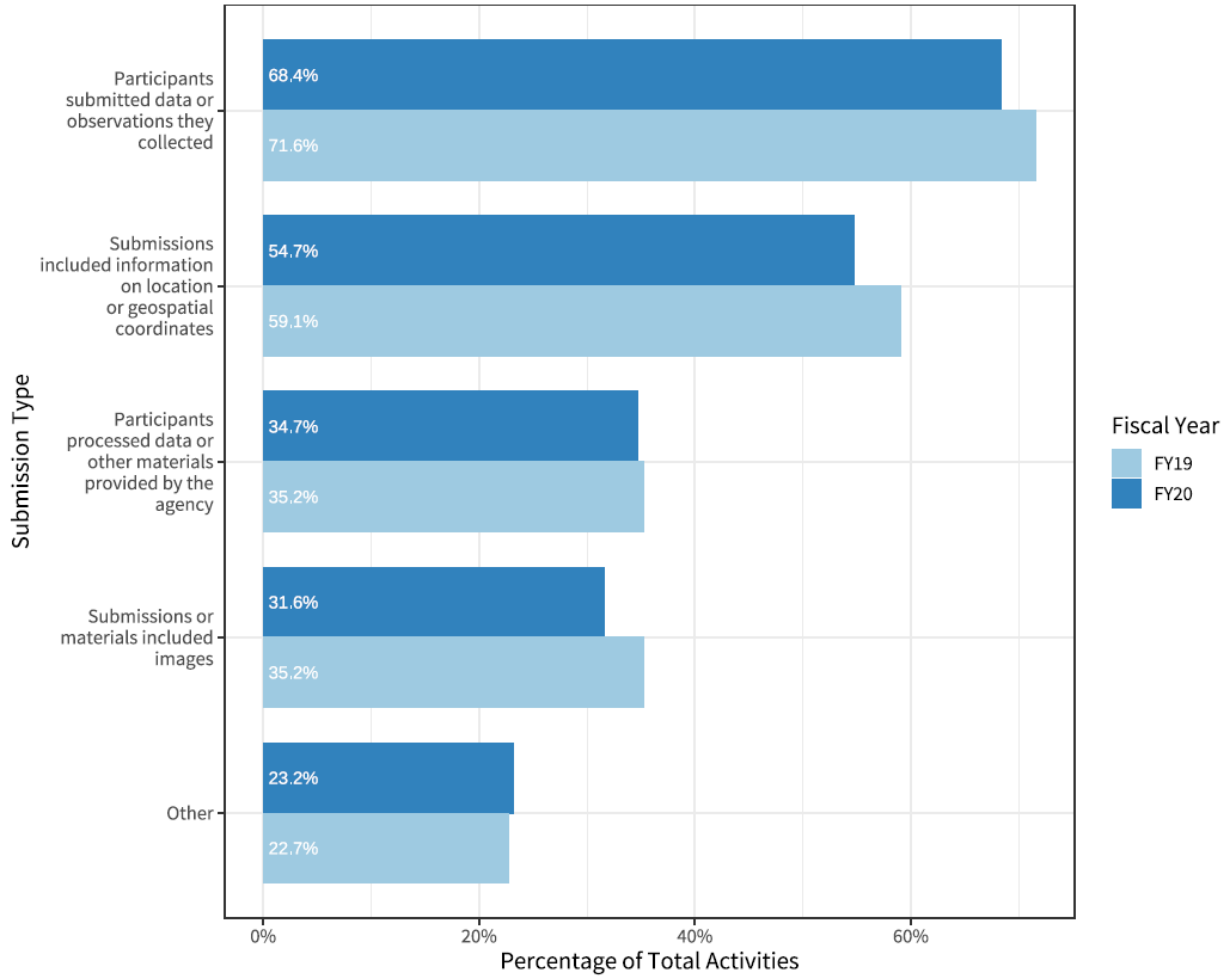
https://sloughvolunteers.wixsite.com/website/home

Image: USDA Forest Service

Types of Submissions Sought in Crowdsourcing and Citizen Science Activities

Submission type refers to what agencies requested that CCS activity participants deliver (if anything). In FY19, 83 of 88 (94.3%) CCS activities involved participants providing contributions or tangible deliverables; in FY20, 88 of 95 (92.6%) CCS activities involved participants providing contributions or tangible deliverables. Activities could involve multiple types of submissions: In FY19, 70.4% of activities accepted more than one submission type with a mean number of 2.2, and in FY20, 67.3% of activities reported more than one submission type with a mean of 2.1. The two most common types of submission in both FY19 and FY20, requested in more than 50% of reported activities, were *data or observations collected by participants* and *information on location or geospatial coordinates* (Figure 13).

Figure 13. Percentage of CCS Activities Reporting Each Submission Type by Fiscal Year.



Participation in Federal Crowdsourcing and Citizen Science Activities

CCS activities, by their nature, seek participation from members of the general public. For many CCS activities, the number of participants is difficult to count, but of the 88 activities that took place in FY19, 65 reported the number of participants,[35] with a median number of 150 and a maximum of 200,000. For

[35] Only activities that reported the number of individual participants were included for these and the FY20 analyses. This excluded a small group of activities that reported a range of participants, the number of teams that participated, or reported multiple kinds of participants in a way that could not be summed.

the 95 activities that occurred in FY20, 67 reported the number of participants; the median number was 200 and the maximum was also 200,000.

Some CCS activities require direct participation by the public at a specific location, others are carried out entirely via the internet, and some involve a hybrid of both on-the-ground and virtual participation. Activities that took place exclusively in one or more physical locations with no virtual component were the most common for both FY19 and FY20 (Table 8).

Table 8. Percentage of CCS Activities Reporting Each Location Type.

Location Type	FY19	FY20
Physical location(s)	43.2%	42.1%
Virtual activity	25.0%	28.4%
Combination of both physical locations and virtual activities	31.8%	29.5%

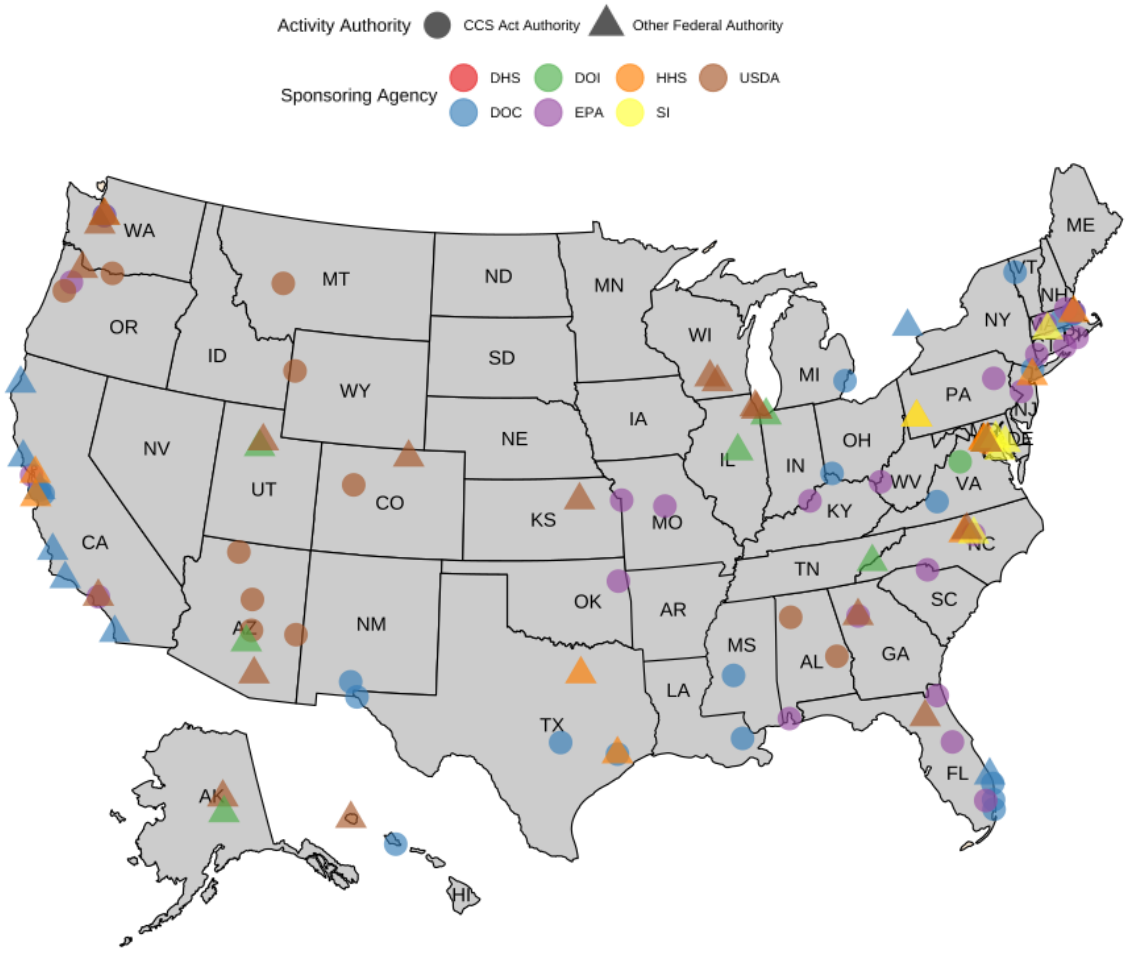
Although CCS activities that focused on particular physical locations were more numerous than virtual activities, virtual activities had a higher number of participants in both FY19 and FY20 (Table 9).

Table 9. Yearly Mean and Median Participants by Location Type.

Location Type	FY19 Maximum Participants	FY19 Median Participants	FY20 Maximum Participants	FY20 Median Participants
Physical location(s)	60,000	95	65,000	80
Virtual activity	60,000	806	70,000	762
Combination of both physical locations and virtual activities	200,000	170	200,000	150

CCS activities focusing on specific locations took place throughout the United States (Figure 14Figure). Different agencies had particularly strong presences in particular regions: USDA CCS activities made up the majority of those that took place in the Four Corners States, most EPA activities occurred in the eastern half of the country, and most NOAA activities took place in coastal regions.

Figure 14. Map of CCS Activity Locations. Some activities listed multiple locations, in which case all reported locations are marked on the map.



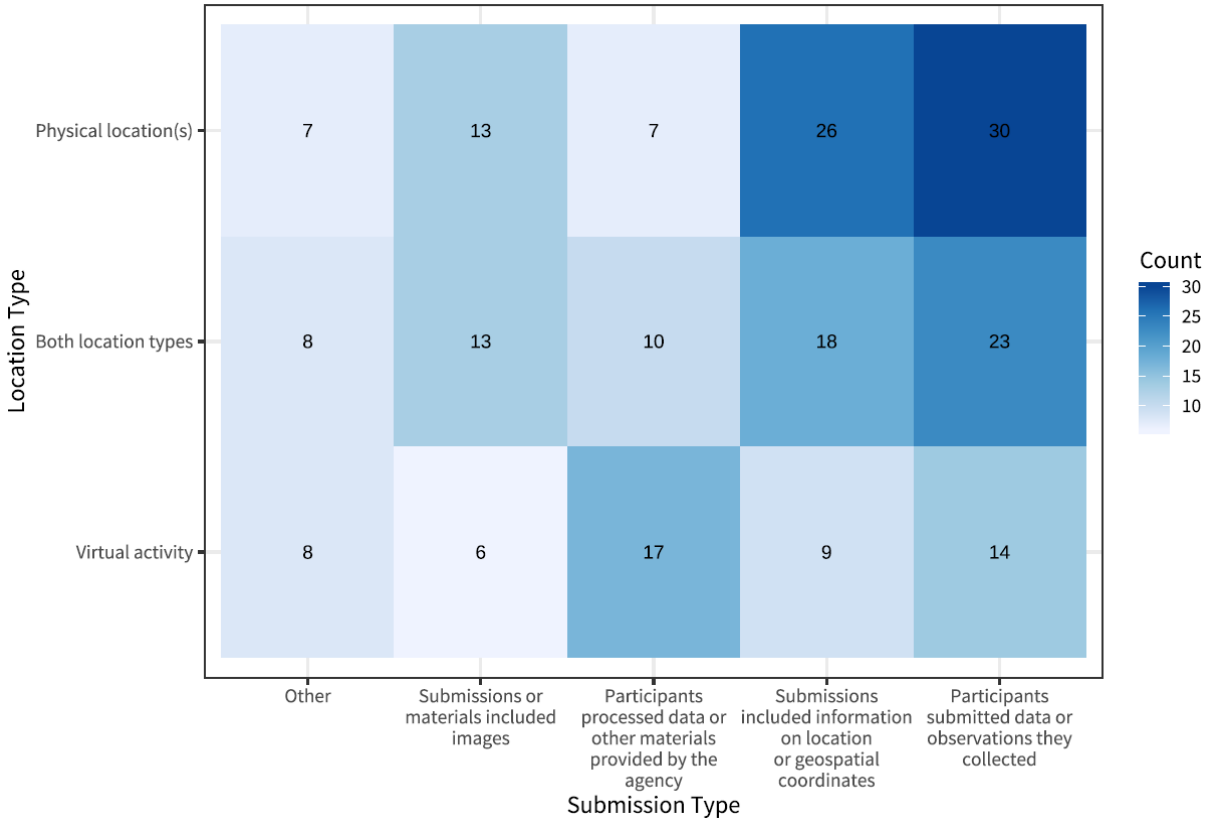
Different types of activity—on-the ground versus virtual—also differed in the types of submission sought (Figure 15).

Virtual activities tended to seek *participants processing data or other materials provided by the agency*, whereas activities occurring at or focusing on particular locations were more likely to seek *data or observations collected by participants*.

CCS activities involved many different kinds of participants in FY19 and FY20. Approximately half of all activities sought out participation by a specific group defined by age or educational level (Figure 16). Of those that did intend to reach a particular group, almost a third sought out participation from groups other than the categories listed in the survey used to gather information about CCS activities from agencies. All of those that intended to reach *other* groups also intended to reach at least one group listed in the survey.

Of the specific groups, *adults not affiliated with higher education*—or those who were not students or employees of college and universities—was the most common intended group in both years, accounting for 25.0% of activities in FY19 and 25.3% of activities in FY20.

Figure 15. CCS Activity Submission Type by Location Type.



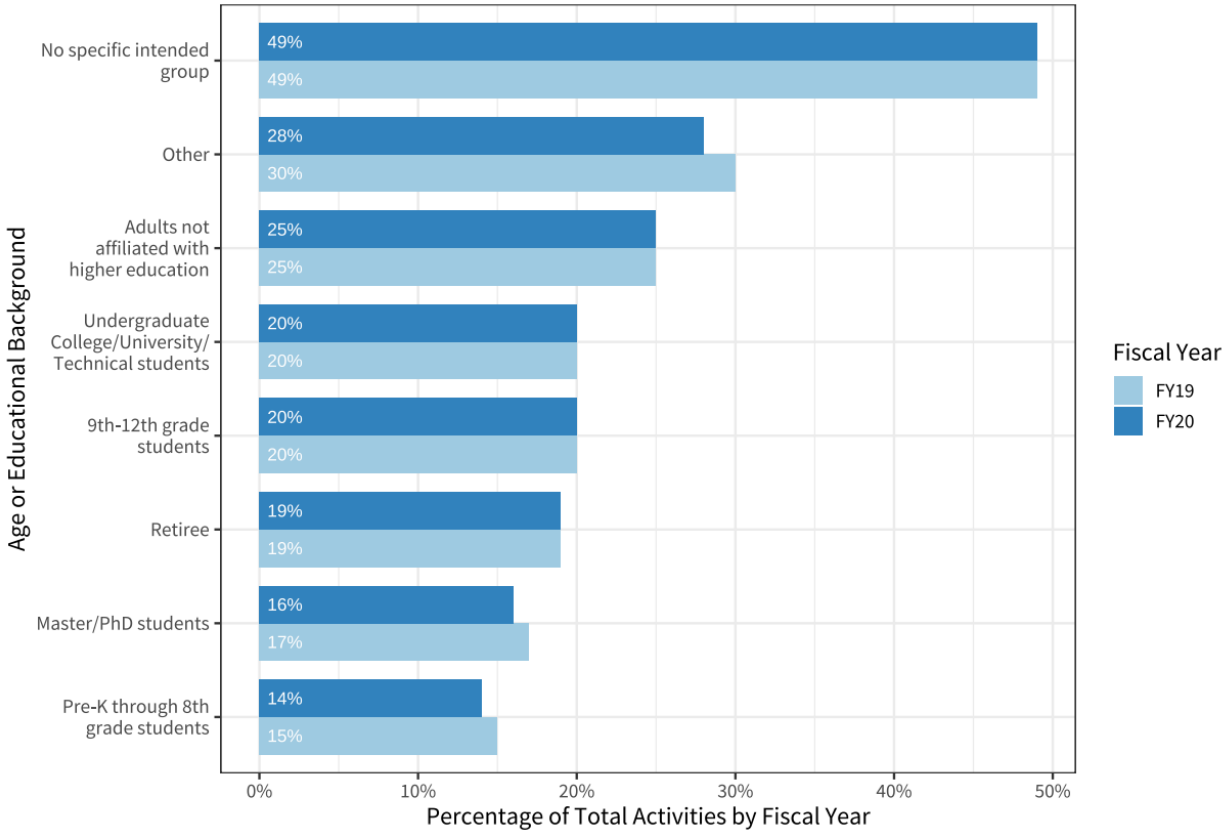
Box 8. DOC: Saving Turtles (and Others) From Nurdles

A water bottle. A lunch container. The ocean. All of these have something in common—nurdles. Nurdles are the small plastic pellets that serve as the building blocks for all of the plastics we use in our everyday lives. Nurdles caught the attention of researchers at the Mission-Aransas National Estuarine Research Reserve in 2018 when a large number of pellets washed up on the Mustang and North Padre Islands in Texas. Nurdles can be ingested by animals because they look like food, and may serve a double risk because they absorb chemicals from their surroundings. The Reserve now runs the Nurdle Patrol—a program that has involved over 2,300 citizen scientists in gathering information about where the nurdles are located and how to remove them, and advocating for policy changes that reduce the amount of plastic that reaches the ocean. By the end of 2020, over 6,600 Nurdle Patrol surveys had been completed at more than 3,000 sites across the United States. Ninety partner organizations have helped to organize volunteers to gather nurdle data on their coastlines, lakeshores, and river banks. Citizen scientists enter their nurdle data into a database that creates a color coded Nurdle Patrol map to describe nurdle occurrence and concentration. This data can help to guide cleanup efforts, inform future research about the impact of plastic on the environment, and create insights about possible sources of pollution.

www.NurdlePatrol.org

Image: Mission-Aransas National Estuarine Research Reserve

Figure16. Groups Defined by Age or Educational Background for CCS Activities.



In addition to information on age or educational background, information was sought on whether a CCS activity specifically sought urban or rural participants and whether the activity sought to engage economically disadvantaged participants (Figure 17). Just over half of all activities in both years that answered this question reported emphasizing rural populations, while just under half reported emphasizing urban populations.

Figure 18 shows the percentage of CCS activities in each year that reported targeting specific historically underrepresented populations. In FY19 and FY20, 65.9% and 67.4% of activities, respectively, reported no specific intended underrepresented populations as participants. In both years, *indigenous populations* were the most commonly targeted underrepresented population, accounting for 23.9% of CCS activities in FY19 and 23.2% in FY20.

Partnerships with Other Organizations

For many CCS activities, the sponsoring agency or office partnered with other Federal or non-Federal entities. In both FY19 and FY20, the median number of partners per CCS activity was 3, but some events had as many as 52. In both FY19 and FY20, about a quarter of reported CCS activities had at least one Federal partner, while just over half had at least one non-Federal partner (Figure 19). *Academic institution*, *nonprofit organization*, and *other* were the most commonly selected options for non-Federal partner types, while *private industry* partners were less common. *Other* partners most commonly included State, Tribal, or foreign government agencies.

Partners provided a wide variety of contributions and services (Figure 20), the most common of which was *personnel*.

Figure 17. Groups Defined by Economic Status and Urban/Rural Setting for CCS Activities.

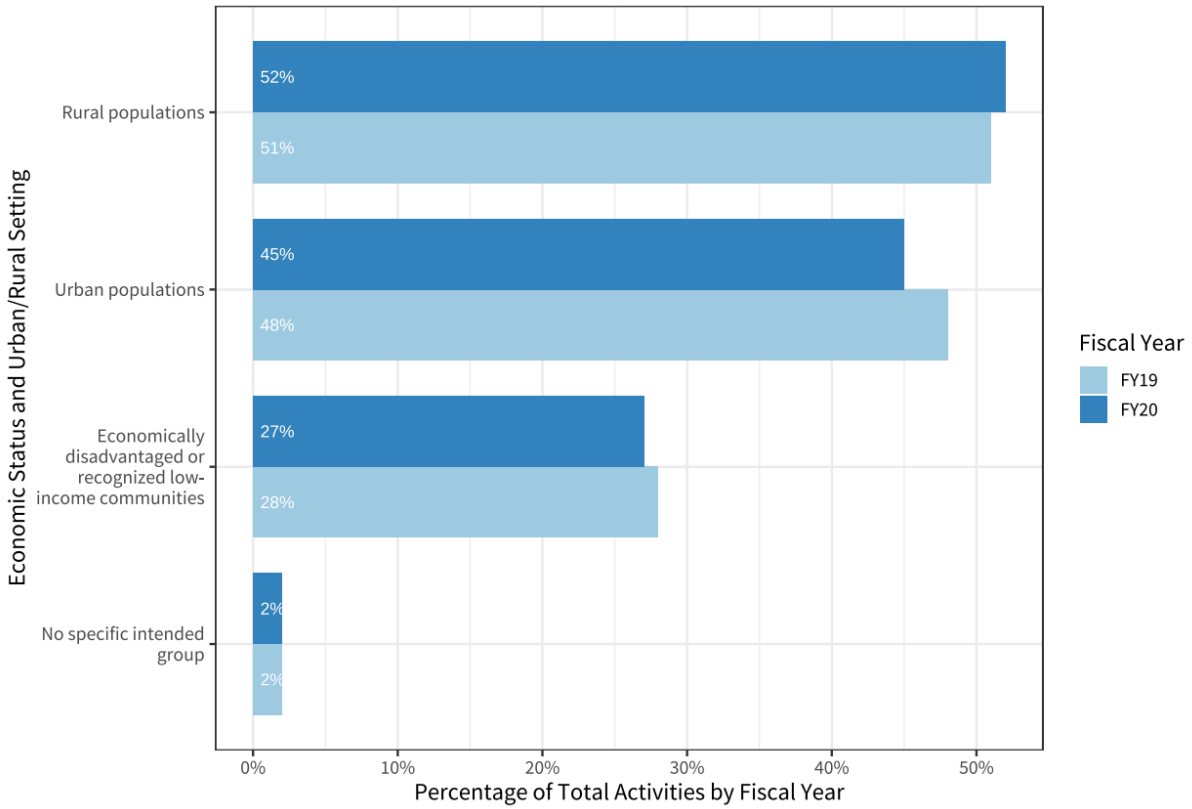
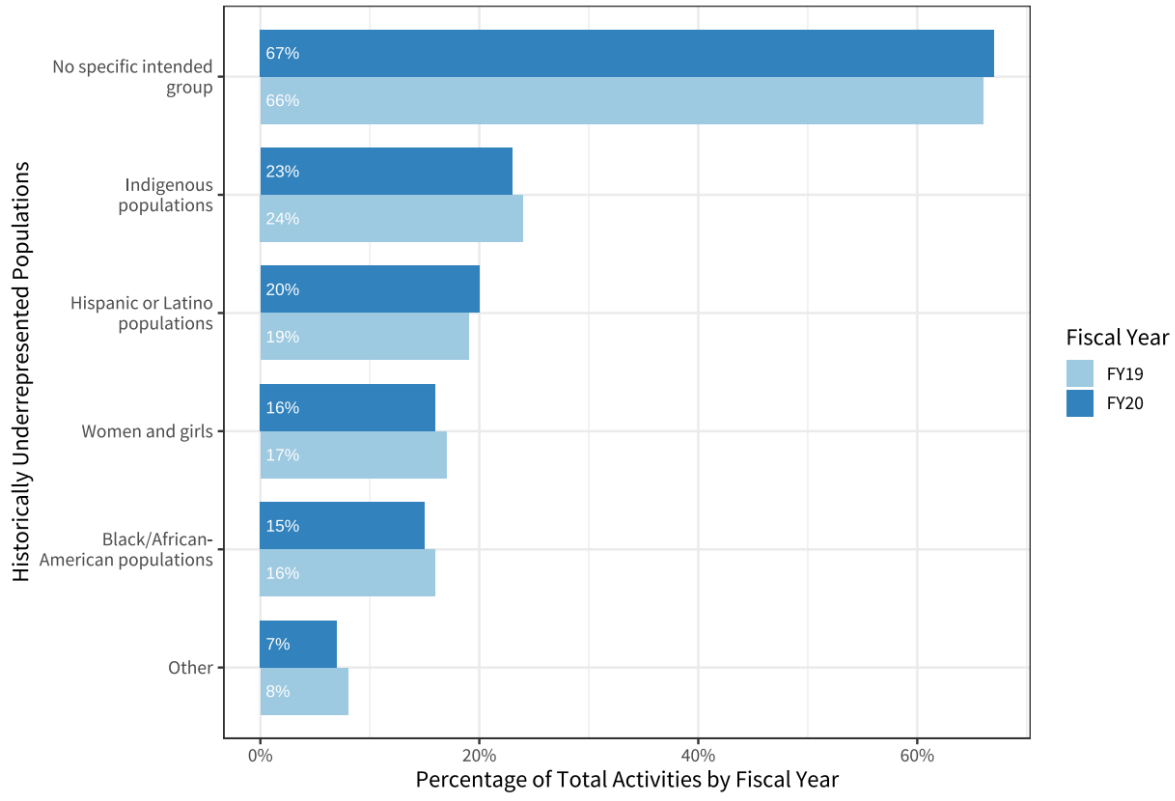


Figure 18. Historically Underrepresented Populations Targeted by CCS Activities.



Box 9. DOI: Lending a Hand with Aquatic Insect Monitoring in Grand Canyon

Aquatic insects are commonly used to gauge the health of streams and river ecosystems. Knowing the abundances and diversity of aquatic insects in a stretch of river is important to understanding river health and how rivers are affected by structures such as dams. Sampling aquatic insects on a larger river over long periods of time can be difficult with only a few people, especially on the 250 miles of the Colorado River flowing through Grand Canyon. However, this can be achieved by working with people who are on the river every day. Since 2012, the U.S. Geological Survey (USGS) has been collaborating with river guides, private boaters, and educational groups to collect adult aquatic insects. These citizen scientists have generated an impressive quantity of samples and data that have assisted USGS scientists in monitoring the Colorado River ecosystem and its response to flow management from dams, particularly Glen Canyon Dam. Results demonstrate that the abundance and diversity of aquatic insects in the Colorado River is constrained by hydropower production at Glen Canyon Dam. This project led to a change in flow management policies at Glen Canyon Dam starting in 2018. Specifically, during times when hydropower demands were lowest, flow releases were adjusted to try to enhance aquatic insect abundance and diversity - known as "bug flows" – that are meant to improve the health of the Colorado River ecosystem.

https://www.usgs.gov/centers/southwest-biological-science-center/science/bug-flows-improving-food-web-health-giving-bugs

Image: David Herasimtschuk/Freshwaters Illustrated/USGS

Figure 19. Percentage of CCS Activities with at Least One Partner of Given Type.

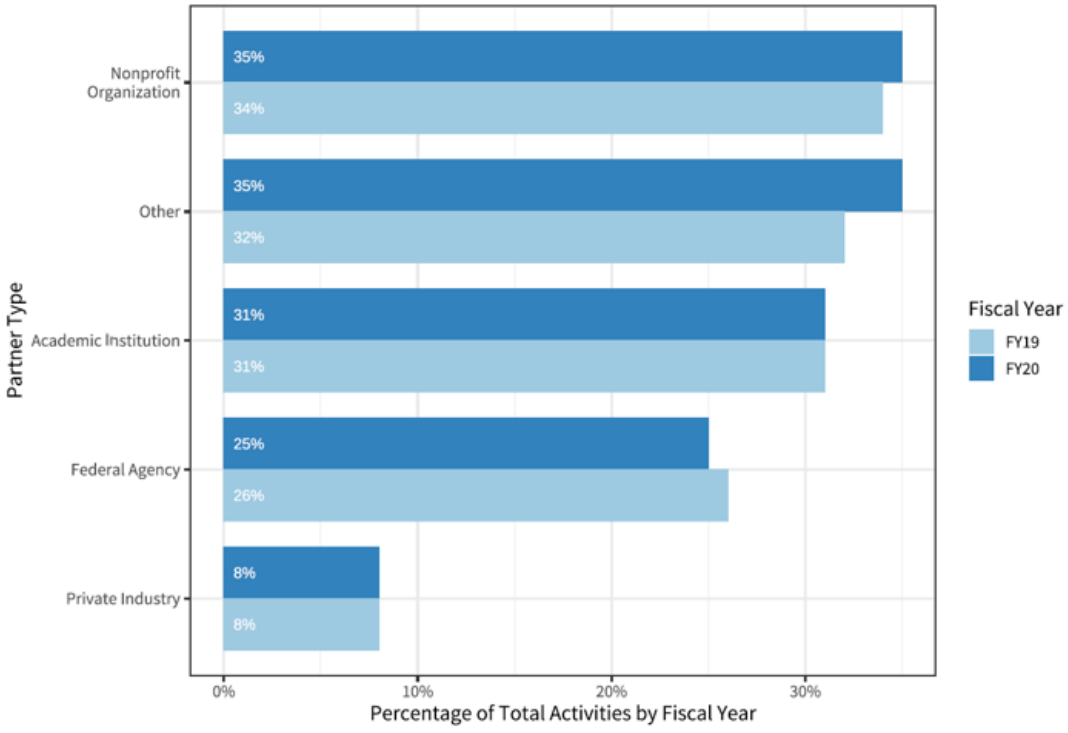
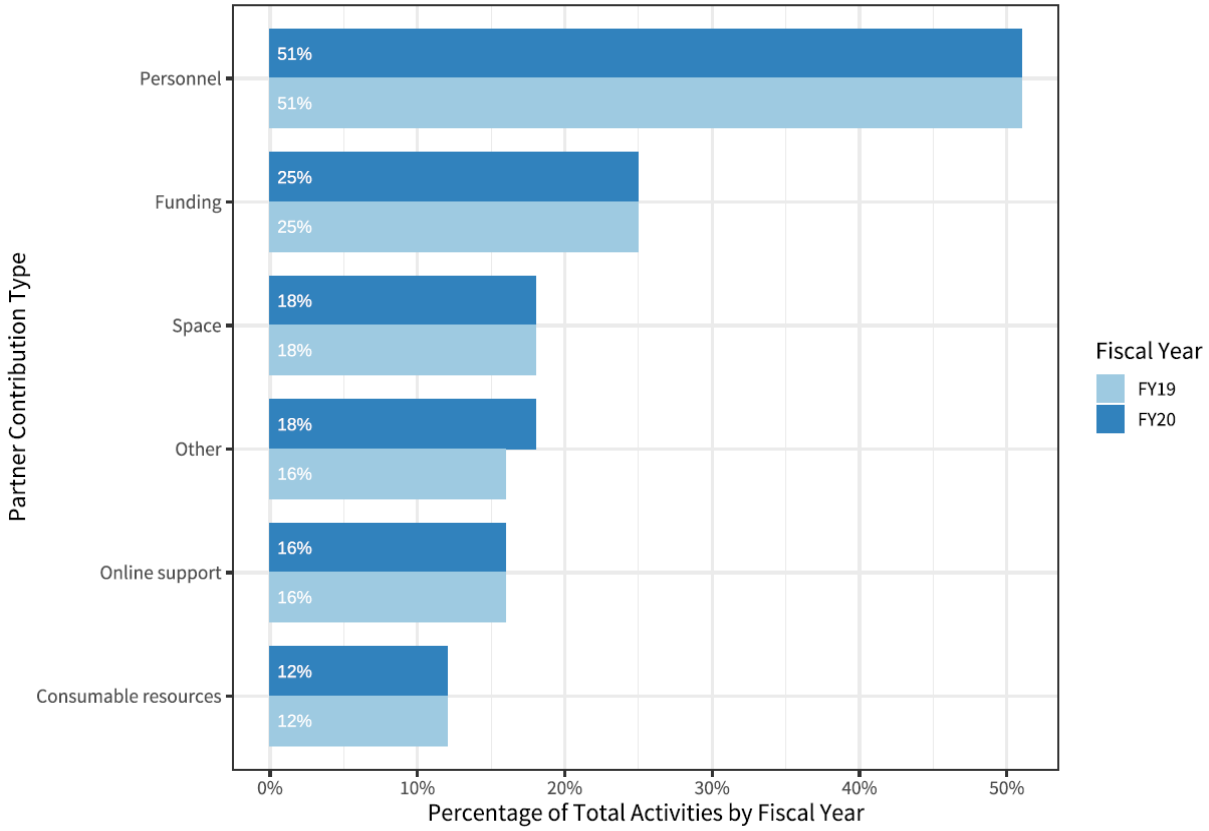


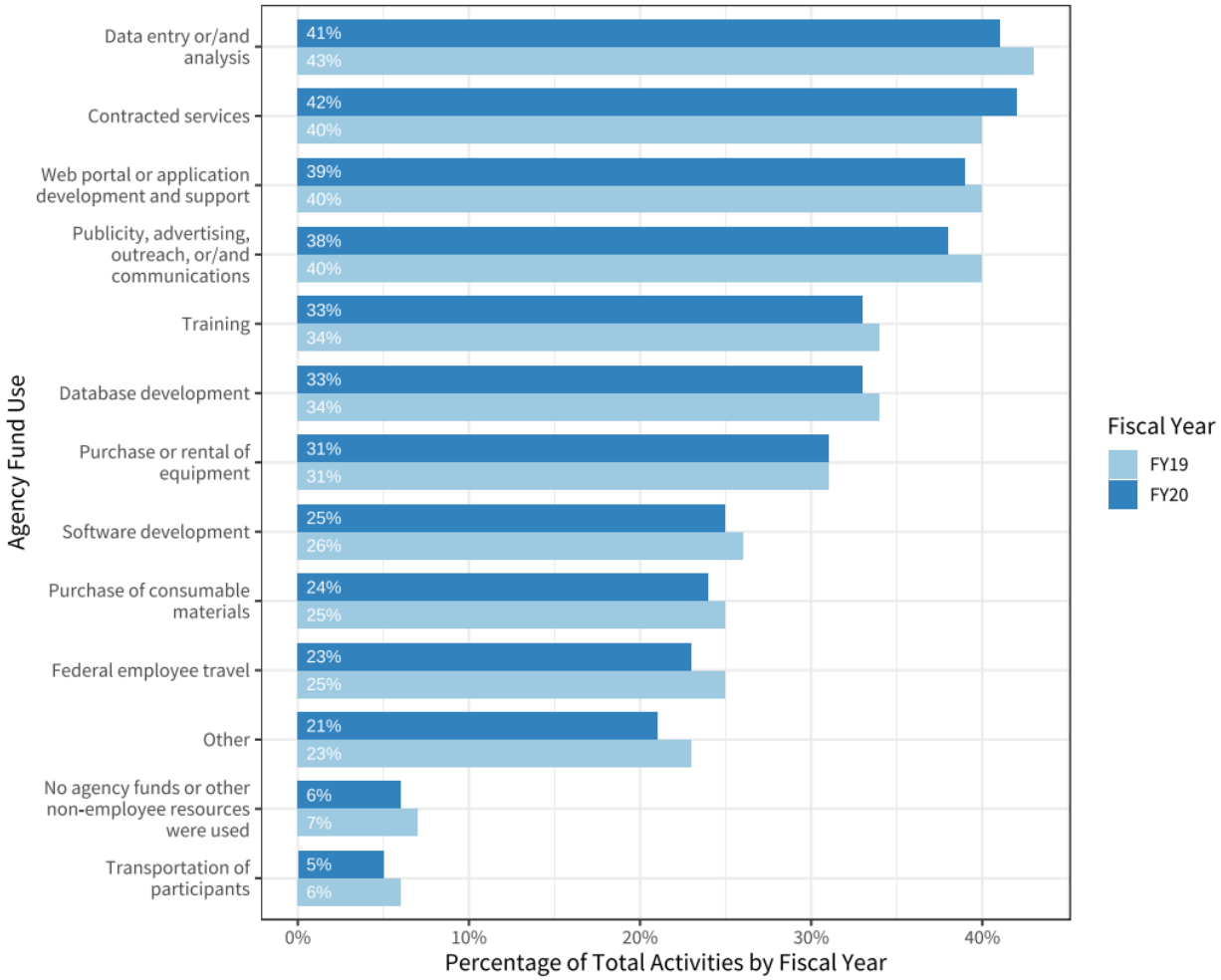
Figure 20. Percentage of CCS Activities with at Least One Partner Contribution of Given Type.



Use of Agency Funds to Support Crowdsourcing and Citizen Science Activities

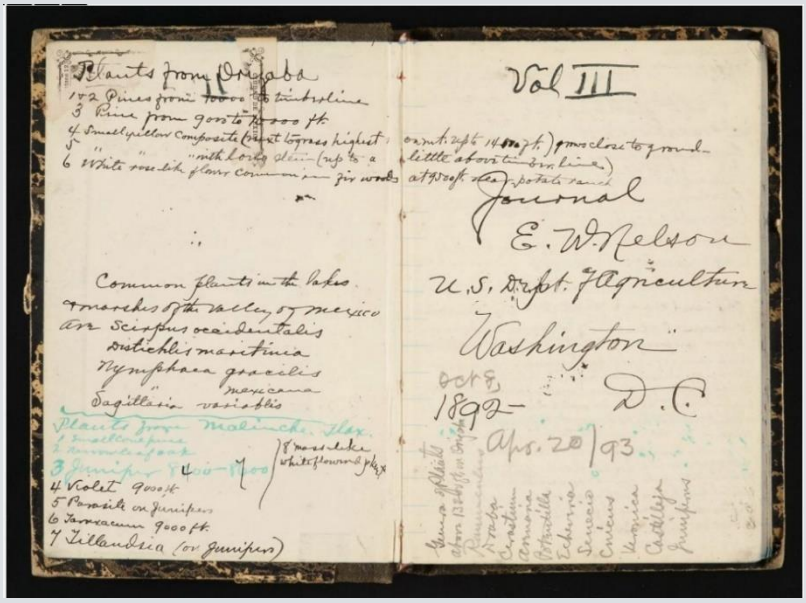
Agency funds are used to support CCS activities in a variety of ways (Figure 21). In FY19 and FY20, the two most common agency expenditures were *data entry or analysis* and *contracted services*. In addition, *web portal or application development and support* and *publicity, advertising, outreach, or/and communications* were also widely supported using agency funds.

Figure 21. Percentage of CCS Activities Reporting Use of Agency Funds of Different Types.



Box 10. SI: Traveling Back in Time with the Smithsonian

Since the conception of the Smithsonian's Transcription Center, thousands of Smithsonian Digital volunteers have transcribed more than 650,000 pages of field notes, diaries, manuscripts, biodiversity labels, and audio recordings related to the history of art, science, culture, race, gender, and more as far back as the 16th century. This information is sourced from collections at the Smithsonian Institution's National Museum of African American History and Culture, the Smithsonian Tropical Research Institute, the Smithsonian Institution Libraries and Archives, and more. Everyday citizens have the opportunity to transcribe records and learn about important historical occurrences—like the Tulsa Race Massacre from the perspective of one of the first Black attorneys in Oklahoma—experience the South American grasslands through the reports of USDA scientists in the 1920s, or listen to a first-hand account of those living in Washington, DC's Chinatown in the 1930s as the town faced challenges from major development projects. The Transcription Center was created to improve the quality of public engagement and participation in the digitized collections from around the Smithsonian while transcribing valuable historical documents for research purposes. With digital volunteers transcribing at an average rate of 400 pages per day, the stories and information locked away in these collections are being made more accessible for the public to enjoy and for researchers to study.



https://transcription.si.edu/

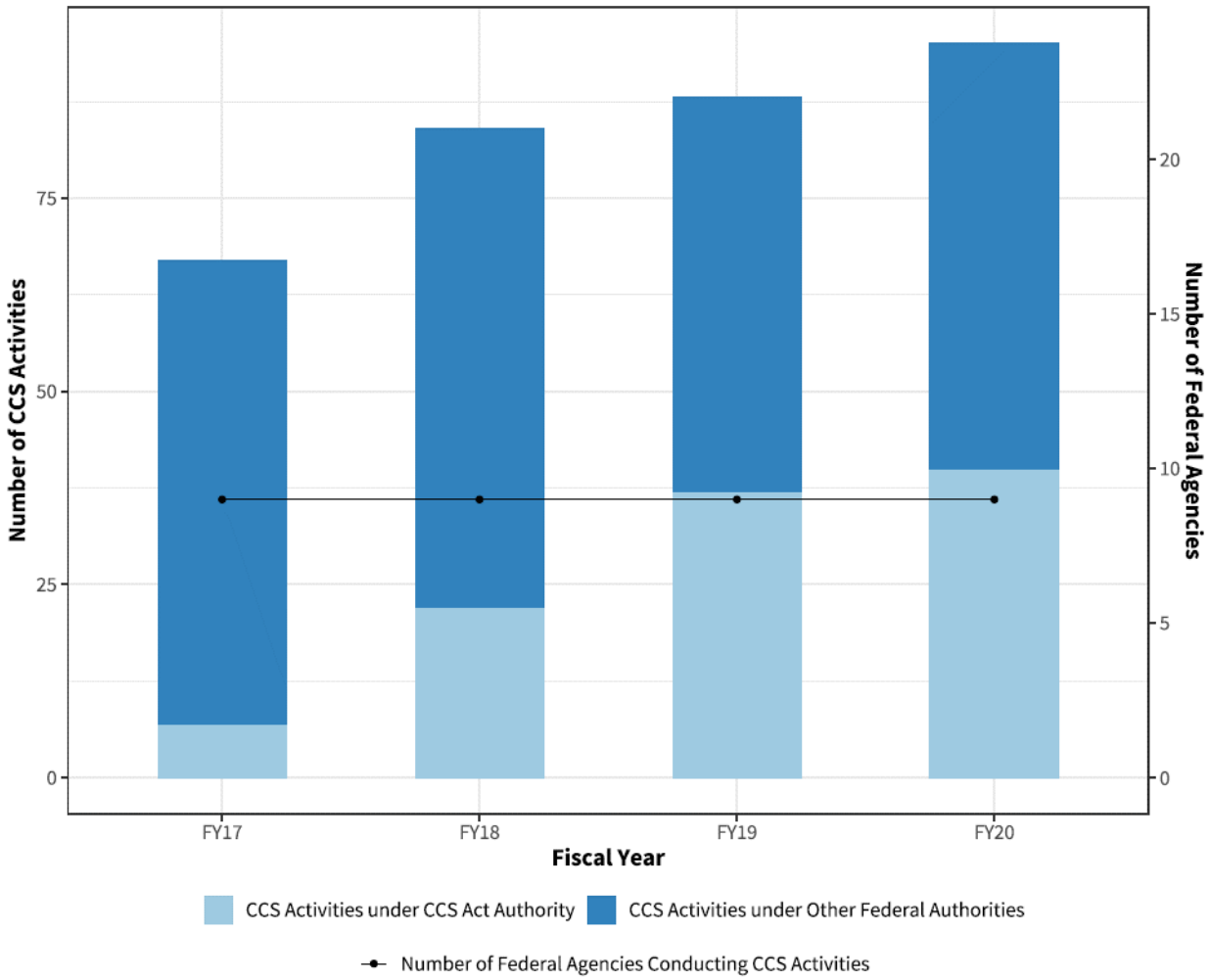
Image: Notebook of Edward William Nelson, Mexico, October 1892 – April 1893, SIA RU007364, Smithsonian Institution Archives, Smithsonian Institution.

Trends in Federal Crowdsourcing and Citizen Science Activities

Unlike PC&Cs, data on Federal CCS activities only goes back to 2017 (the previous edition of this report). With only 4 years of data, longer-term trends are hard to discern, but the observations presented here lay the groundwork for future analysis as the amount of information increases over time.

Figure 22 shows the number of agencies conducting CCS activities and the number of CCS activities conducted under CCS Act authority for each fiscal year since FY17. The total number of reported CCS activities increased from 67 in FY17 to 95 in FY20. The number of reported activities that occurred under CCS Act authority also increased steadily from 7 in FY17 (10.4% of reported activities) to 40 in FY20 (52.1% of reported activities), indicating greater adoption of the CCS Act as the designated authority for CCS efforts over time.

Figure 22. Number of Agencies Conducting Crowdsourcing and Citizen Science Activities and Number of Crowdsourcing and Citizen Science Activities Conducted by Authority since FY17.



The number of independent Federal agencies reporting CCS activities per fiscal year remained constant, with nine agencies reporting activities for each fiscal year from FY17 to FY20. Table 10 shows the number of CCS activities reported for each agency, by fiscal year and conducting authority. EPA reported the largest number of CCS activities for every fiscal year between FY17 and FY20, and shifted from 0% of their activities being conducted under the CCS Act authority in FY17 and FY18 to 100% in

FY19 and FY20. USDA was the only agency that saw a decrease in the number of its reported CCS activities conducted under the CCS Act authority in FY19 and FY20 (eight in both years), relative to either FY17 or FY18 (13 in FY18).

Table 10. Number of CCS Activities Reported by Federal Agencies from FY17 through FY20. Numbers in parentheses were conducted under the authority granted by the CCS Act.

Department/Agency	FY17	FY18	FY19	FY20
DHS	1 (1)	1 (1)	1 (0)	2 (0)
DOC	11 (1)	11 (1)	14 (2)	15 (2)
DOE	1 (0)	1 (0)	1 (1)	1 (1)
DOI	10 (0)	11 (1)	12 (1)	11 (0)
EPA	16 (0)	16 (0)	16 (16)	19 (19)
HHS	5 (0)	6 (0)	13 (3)	14 (3)
NASA	7 (5)	8 (6)	8 (6)	9 (7)
SI	13 (0)	14 (0)	9 (0)	9 (0)
USDA	3 (0)	16 (13)	14 (8)	15 (8)
Total	67 (7)	84 (22)	88 (37)	95 (40)

Federal Prize Competitions and Citizen Science Activities COVID-19 Response

Through partnerships with academia, industry, and other government organizations, Federal agencies have been able to effectively and rapidly scale PC&C and CCS activities, leveraging open innovation to fight the spread of COVID-19 and addressing related issues. Six PC&C activities and one CCS activity included in this report were specifically designed and implemented in response to COVID-19 (Table 11). These activities—sponsored by DOD, HHS, NASA, and DOC—addressed challenges related to the pandemic ranging from the shortage of resources at hospitals, including ventilators, to the effective sharing of public health information, to the mental health effects of social isolation when practicing physical distancing, to the real-time forecasting of the infectious disease.[36] Activities also involved citizen scientists and solvers to track and project the spread of the virus by using Earth observation and other open data, to develop exposure notification systems to limit the spread of the virus, and to better understand health outcomes related to infection by using synthetic health records and machine learning (ML).[37]

Box 11. HHS: A Community Approach to Predicting COVID-19

The largest scale real-time epidemic forecasting initiative to date runs on the power of crowdsourcing and citizen science. Since 2016, the Centers for Disease Control and Prevention's (CDC) Epidemic Prediction Initiative (EPI) has published influenza forecasts, data, and code contributed by participating groups. The EPI was then expanded to other potentially epidemic illnesses, including dengue fever, West Nile Virus, and, since March 2020, COVID-19. Now, the CDC is able to provide citizen scientists and academic research groups access to authoritative, up-to-date datasets of COVID-19 statistics. Researchers can then contribute their forecasting models, which are also usually made publicly accessible. Every week, the CDC aggregates models that have been submitted in the preceding week and publishes a single ensemble forecast that synthesizes predictions of COVID-19 cases, hospitalizations, and deaths. The EPI has limited duplicative efforts while enabling public health officials to make informed policy decisions by easily comparing forecasts and their underlying data within a single framework. The current COVID-19 Forecast Hub, the webpage used to provide public access to forecasting models, includes predictions provided by over 50 international research groups.
https://predict.cdc.gov/; https://covid19forecasthub.org/

[36] Please refer to the referenced appendix for additional details of these activities. Not all activities responding to the COVID-19 pandemic are included in this report. Only activities that were active during FY19 or FY20 and that were reported by Federal agencies are included in analyses and appendices; additional activities responding to the COVID-19 pandemic may have launched since the close of FY20 or may have been conducted under authorities other than COMPETES or the CCS Act, for which reporting was voluntary.

[37] More information about activities sponsored by DOD, HHS, VA, and NASA that aimed to address the pandemic can be found at https://www.challenge.gov/blog/july-22-2020-Federal-Crowdsourcing-Community-Responds-to-the-COVID-19-Emergency/.

Table 11. List of Prize Competitions and Crowdsourcing and Citizen Science Activities That Reported Responding to the COVID-19 Pandemic.

Sponsor	Activity	Authority	Appendix
Administration for Community Living (ACL), HHS	MENTAL Health Challenge	America COMPETES Reauthorization Act of 2010	B.11.27
Food and Drug Administration (FDA), HHS	Veterans' Health Administration (VHA) Innovation Ecosystem and precisionFDA COVID-19 Risk Factor Modeling Challenge	America COMPETES Reauthorization Act of 2010	B.11.42
National Institute of Standards and Technology (NIST), DOC	TC4TL	NIST Organic Act	C.2.1
National Institute of Standards and Technology (NIST), DOC	TREC-COVID	NIST Organic Act	C.2.2
U.S. Army, DOD	xTechCOVID19 Ventilator Challenge	Title 10 U.S.C. 2374a	C.3.7
Science Mission Directorate, NASA	International Space Apps COVID-19 Challenge	1 U.S.C. 20113(e)(NASA Space Act)	C.7.15
Centers for Disease Control and Prevention (CDC), HHS	Epidemic Prediction Initiative	Crowdsourcing and Citizen Science Act	D.6.1

Advancing Agency Missions and Looking Ahead

Federal agencies use PC&Cs and CCS in large part to advance their missions and engage the American people. These activities enable innovators to assist with data collection and analysis efforts, develop solutions to challenging problems, and contribute to the important work of agencies. Agencies reported many ways that PC&C and CCS activities contributed to the advancement of their missions during FY19–20 in narrative responses to the FY19–20 data call.[38] For example, DOE indicated that PC&Cs helped to spur the development of innovative energy solutions and products, including solar and water power technologies—helping DOE to meet its imperatives of environmental stewardship and energy generation aligned with the transition to a global clean energy economy. GSA reported that PC&Cs enable innovative public-private partnerships to form that transform service to citizens, and HHS described how PC&Cs help develop solutions to address pressing health issues, including improving the quality, accessibility, and affordability of health care. USAID indicated that its grand challenges contribute to the promotion of sustainable international development. Many agencies, including NASA and DOI, also reported that PC&Cs offered opportunities to educate and inform the public on the work and missions of their agencies. Overall, numerous activities were reported that engaged innovators to contribute to the work of Federal agencies.

Similarly, CCS activities were reported by agencies to have offered strong support to the advancement of agency missions. DOC, DOI, EPA, and USDA, among other agencies, indicated that engaging large groups of Americans to collect and analyze information enabled an understanding of issues that contributed to the development of solutions to high-priority problems, including those associated with the management of resources, protection of wildlife, changes in climate and environment, and the health of Americans. HHS reported that health information reported by U.S. citizens contributed to the advancement of its mission to enhance the health and well-being of all Americans by allowing changes to be monitored more effectively. NASA described how citizen scientists have been involved with observation and analysis that enables new discoveries. SI reported that CCS allowed for the collection and analysis of samples that improve our understanding of the natural world. Many agencies reported that CCS was also an effective way to educate the public and engage community members.

Looking ahead to future fiscal years, most agencies reporting PC&Cs during FY19–20 indicated that they will continue to leverage PC&Cs to spur innovation and to develop solutions to important problems. Several agencies intend to continue PC&Cs active during FY19–20 in future years with subsequent stages or phases, or by sponsoring particular PC&Cs on an annual basis, noting that future plans are dependent on funding. For example, the U.S. Army described plans to continue to sponsor prize competitions to address critical modernization challenges (see Box 4. Army's xTech Program Prize to Contract Model); DOE reported using PC&Cs as a means of funding research, development, and demonstration of renewable energy and desalination technologies; and DOI reported that it continues to identify topics for competitions to address infrastructure, water availability, and environmental challenges. Ultimately, Federal agencies will continue to leverage PC&Cs to stimulate innovation, develop solutions to challenging problems, and advance their core missions.

[38] For additional details and specific examples of how PC&Cs and CCS are advancing agency missions, please refer to entries for specific activities in Appendices B–E.

Supplementary Tables

Categorical Variables Used for Data Collection and Analysis

The following categorical variables were used for data collection for this report. The categories, or values, for each variable are listed; these were options in the survey used to collect information. Survey respondents had the option to specify "Other" in a text box if "Other" was selected.

Table 12. Prize Competitions and Challenges. Other than for the "Agency" variable, categories for variables are not mutually exclusive.

Variable	Categories (Values)
Agency	Name of sponsoring agency and office
Agency Practices to Support PC&C	Policy or guidance supporting the use of prize competitions and challenges; Contract vehicle(s) to procure products and/or services for prize competitions and challenges; Internal communication tools to support prize competitions and challenges; Coordinated external communications or webpage for prize competitions and challenges; Dedicated, central prize competition and challenge coordinator; Prize competition and challenge POC (not dedicated full-time to prize competitions and challenges); Distributed network or community of prize competition and challenge managers and/or POCs within the agency; Centralized training and design support for staff conducting prize competitions and challenges; Centers for interagency challenges in specific topics related to prize competitions and challenges; Distributed network or community of project managers and/or resource people within the agency with expertise in prize competitions and challenges; Other; None or Unknown
Goals of Activity	Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts (ideation); Develop/demonstrate technology (hardware or software); Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization (including technology transfer); Build or strengthen a community; Other
Age or Educational Background	No specific intended group; Pre-k through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses; Other
Justifications for Using PC&C	Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition; Required by executive policy or congressional legislation; Other
Outreach Mechanisms	Social media (e.g., Twitter, Facebook); Email (e.g., listservs); Press release; Live event(s) prior to the competition; Live video streaming announcement; Partnership with outside organizations (e.g., private companies, nonprofit organizations, other Federal agencies); Publicity efforts from vendors/contractors; Posted on challenge.gov; Other

Variable	Categories (Values)
Partner Contributions	Prize purse (monetary award); Non-monetary award(s); Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity/advertising/outreach/communications; Web portal/app development and support; Database development; Software development; Data entry/analysis; Discovery and design support; Operations or administrative support; Solution Acceleration; Other
Types of Partners	Federal agency of office; State or local government; Academic institution; Nonprofit organization (excluding academic institutions); Private industry; Other
Types of Submissions	Proposal or concept, Prototype device or object; Software or computer code; Business or commercial development plan; Creative media (e.g., images, videos, podcasts, logos); Analysis or visualization of data; Other
Use of Agency Funds	Prize purse (monetary award); Non-monetary awards; Federal personnel (FTE); Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity/advertising/outreach/communications; Web portal/app development and support; Database development; Software development; Data entry/analysis; Discovery and design support; Operations or administrative support; Solution Acceleration; Other

Table 13. Crowdsourcing and Citizen Science. Other than for the "Agency" variable, categories for variables are not mutually exclusive.

Variable	Categories (Values)
Agency	Name of sponsoring agency and office
Goal Type	Collection of data or observations; Public outreach or engagement; Education; Create or engage a specific community; Analyzing existing agency data; Digitization of agency-owned materials; Other
CCS Act Objectives	Collect and analyze data; Interpret the results of data; Make discoveries; Enable the formulation of research questions; Solve problems; Create and refine project design; Conduct scientific experiments; Develop technologies and applications; No CCS Act objectives were addressed
Submission Type	Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates; Participants processed data or other materials provided by the agency; Submissions or materials included images; Other
Location Type	Physical location(s); Virtual activity; Combination of both physical locations and virtual activities
Age or Educational Background	Pre-K through 8th grade students; 9th-12th grade students; Undergraduate college/university/technical students; Master/PhD students; Adults not affiliated with higher education; Retiree
Underrepresented Populations	Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls; No specific intended group; Other
Economic Status and Urban/Rural Setting	Rural populations; Urban population; Economically disadvantaged or recognized low-income communities
Agency Fund Uses	Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training; N/A: no agency funds or other non-employee resources were used; Other

Variable	Categories (Values)
Partner Type	Federal agency or office; State or local government; Academic institution; Nonprofit organization (excluding academic institutions); Private industry; Other
Partner Contribution Type	Funding; Personnel; Space; Consumable resources; Online support; Other
Agency Practices to Support CCS	Agency has issued agency-wide policy or guidance on the use of CCS; CCS is included in agency-wide plans; Agency has articulated connections of how the use of CCS activities support the agency's mission; CCS integrally or routinely used in agency science products; Agency leverages existing platforms or tools to conduct CCS activities; Agency uses internal communication tools to support CCS; Agency carries out coordinated external communications or maintains a webpage for CCS; Agency has a dedicated, full-time CCS coordinator; Agency has identified a CCS point of conduct (not dedicated full-time to CCS); Agency has a distributed network or community of project managers and/or resource people within the agency with expertise in CCS; Agency provides centralized training and design support for staff conducting CCS activities; Agency has developed or is in the process of developing a generic Information Collection Request (ICR) for CCS activities; Agency offers grant funding to support implementation of CCS; Not applicable (N/A) or unknown

Federal Departments, Independent Agencies, and Agencies within Departments That Reported Activities in FY19 and FY20

Table 14. List of Federal Departments, Independent Agencies, and Agencies within Departments (referred to as Sponsoring Agencies or Sponsoring Offices or Components, as appropriate) That Reported PC&Cs in FY19 and FY20 Conducted under COMPETES and Other Authorities.

Sponsoring Agency	Sponsoring Office or Component	COMPETES FY19	Other FY19	COMPETES FY20	Other FY20
Commodity Futures Trading Commission	LabCFTC			✓	
Department of Commerce	National Institute of Standards and Technology	✓		✓	✓
Department of Commerce	U.S. Patent and Trademark Office	✓			
Department of Defense	Air Force		✓		✓
Department of Defense	Army	✓	✓	✓	✓
Department of Defense	Defense Advanced Research Projects Agency		✓		✓
Department of Defense	National Geospatial-Intelligence Agency		✓		✓
Department of Defense	Under Secretary of Defense Research and Engineering		✓		✓
Department of Energy	Energy Efficiency and Renewable Energy	✓		✓	
Department of Energy	Energy Programs		✓		✓
Department of Energy	Office of Technology Transitions			✓	
Department of Energy	Solar Energy Technologies Office	✓		✓	
Department of Energy	Under Secretary for Energy	✓		✓	

Sponsoring Agency	Sponsoring Office or Component	COMPETES FY19	Other FY19	COMPETES FY20	Other FY20
Department of Energy	Water Power Technologies Office	✓		✓	
Department of Health and Human Services	Administration for Community Living			✓	
Department of Health and Human Services	Agency for Healthcare Research and Quality	✓		✓	
Department of Health and Human Services	Centers for Disease Control and Prevention	✓		✓	
Department of Health and Human Services	Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion			✓	
Department of Health and Human Services	Department of Health and Human Services, Office of the Chief Technology Officer	✓		✓	
Department of Health and Human Services	Food and Drug Administration	✓		✓	
Department of Health and Human Services	Health Resources and Services Administration	✓		✓	
Department of Health and Human Services	National Institutes of Health	✓		✓	
Department of Health and Human Services	Office of the Secretary	✓		✓	
Department of Homeland Security	Science and Technology Directorate		✓	✓	✓
Department of Labor	Veteran Employment and Training Service			✓	
Department of the Interior	Bureau of Ocean Energy Management		✓		✓
Department of the Interior	Bureau of Reclamation	✓	✓		✓
Department of the Interior	Office of the Secretary	✓		✓	
Department of the Interior	United States Fish and Wildlife Service	✓		✓	
Department of Transportation	Office of the Secretary	✓		✓	
Environmental Protection Agency	Office of Air and Radiation		✓		✓
Environmental Protection Agency	Office of Research and Development	✓	✓	✓	✓
Environmental Protection Agency	Office of Water		✓		✓
Environmental Protection Agency	Region 7 - Kansas City		✓		✓
General Services Administration	GSA IT	✓			
General Services Administration	Office of Government-wide Policy	✓		✓	

Sponsoring Agency	Sponsoring Office or Component	COMPETES FY19	Other FY19	COMPETES FY20	Other FY20
National Aeronautics and Space Administration	Aeronautics Research Mission Directorate		✓		✓
National Aeronautics and Space Administration	Centers and Facilities		✓		
National Aeronautics and Space Administration	Glenn Research Center		✓		✓
National Aeronautics and Space Administration	Headquarters				✓
National Aeronautics and Space Administration	Human Exploration and Operations Mission Directorate		✓		✓
National Aeronautics and Space Administration	Mission Support Directorate	✓	✓	✓	
National Aeronautics and Space Administration	Office of STEM Engagement		✓		✓
National Aeronautics and Space Administration	Science Mission Directorate		✓	✓	✓
National Aeronautics and Space Administration	Space Technology Mission Directorate		✓		✓
National Science Foundation	Office of Integrative Activities		✓		✓
Office of the Director of National Intelligence	Intelligence Advanced Research Projects Activity		✓		✓
Small Business Administration	Office of Investment and Innovation	✓		✓	
U.S. Agency for International Development	Overseas		✓		✓
U.S. Agency for International Development	Peru Environment and Sustainable Growth Office				✓
U.S. Agency for International Development	Washington		✓		✓

Table 15. List of Federal Departments, Independent Agencies, and Agencies within Departments (referred to as Sponsoring Agencies or Sponsoring Offices or Components, as appropriate) That Reported CCS Activities in FY19 and FY20 Conducted under the CCS Act and Other Authorities.

Sponsoring Agency	Sponsoring Office or Component	CCS Act FY19	Other FY19	CCS Act FY20	Other FY20
Department of Agriculture	Forest Service		✓		✓
Department of Agriculture	Marketing and Regulatory Programs		✓		✓
Department of Agriculture	Natural Resources and Conservation Service		✓		✓
Department of Agriculture	Research, Education, and Economics		✓		✓

Sponsoring Agency	Sponsoring Office or Component	CCS Act FY19	Other FY19	CCS Act FY20	Other FY20
Department of Commerce	National Oceanic and Atmospheric Administration	✓	✓	✓	✓
Department of Energy	Under Secretary for Science	✓		✓	
Department of Health and Human Services	Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases and the National Center for Immunization and Respiratory Diseases	✓		✓	
Department of Health and Human Services	Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health	✓		✓	
Department of Health and Human Services	Department of Health and Human Services, Office of the Chief Technology Officer	✓		✓	
Department of Health and Human Services	National Institutes of Health		✓		✓
Department of Homeland Security	Federal Emergency Management Agency		✓		✓
Department of the Interior	National Park Service		✓		✓
Department of the Interior	U.S. Geological Survey	✓	✓		✓
Environmental Protection Agency	Office of Land and Emergency Management		✓		✓
Environmental Protection Agency	Office of Research and Development	✓	✓	✓	✓
Environmental Protection Agency	Office of Water		✓		✓
Environmental Protection Agency	Region 1 - Boston		✓		✓
Environmental Protection Agency	Region 2 - New York		✓		✓
National Aeronautics and Space Administration	Human Exploration and Operations Mission Directorate		✓		✓
National Aeronautics and Space Administration	Science Mission Directorate	✓	✓	✓	✓
National Aeronautics and Space Administration	Space Technology Mission Directorate		✓	✓	✓
Smithsonian Institution	Conservation Biology Institute/National Zoo		✓		✓
Smithsonian Institution	National Museum of Natural History		✓		✓

Sponsoring Agency	Sponsoring Office or Component	CCS Act FY19	Other FY19	CCS Act FY20	Other FY20
Smithsonian Institution	National Zoological Park		✓		✓
Smithsonian Institution	Smithsonian Conservation Biology Institute		✓		✓
Smithsonian Institution	Smithsonian Environmental Research Center		✓		✓

Appendix A. Analysis of Federal Prize Competitions and Challenges and Crowdsourcing and Citizen Science Activities: Fiscal Years 2019-20

Table of Contents

Introduction

The FY19–20 report on Federal Prize Competitions and Challenges and Crowdsourcing and Citizen Science Activities reflects a significant shift from previous years in how information was gathered from sponsoring agencies. Since FY13, agencies responded to questions about the nature of their activities—goals and objectives, partnerships with other organizations, etc.—mostly in the form of narrative text. Because this approach allowed respondents to describe their activities in their own terms rather than standardized answers, it limited the ability to look for larger-scale trends and relationships over time among agencies and between activities. For the FY19–20 report, data were collected using an online survey that retained many of the narrative responses, which allowed agencies to describe activities in their own words, but also included numerous standardized responses for both quantitative variables (e.g., number of submissions) and categorical variables (e.g., types of partners).

The new approach enabled more effective visualization of the goals, objectives, participation, and partnerships of prize competition and challenge (PC&C) events and crowdsourcing and citizen science (CCS) activities as presented in the main body of this report. In addition, the new approach made it possible to visualize how agencies differed in their use of PC&C and CCS activities in FY19–20 and the role of external partners in the federally sponsored events. The purpose of this appendix is to provide an initial impression of such relationships. Due to the large volume of information collected, only selected relationships (focusing on differences among agencies and the roles of partners) are explored and presented. The results reported here are based only on the data collected as part of the PC&C and CCS report. On their own, they can only suggest possible relationships; however, they do provide a useful indicator to pursue more rigorous analyses of why agencies differ in their use of PC&C and CCS activities and how to engage partners effectively in such events.

Limitations to This Analysis

As part of the data collection framework for PC&C and CCS activities, respondents were asked to provide information on variables like activity goals, types of partners, and the nature of submissions (Tables A-1 and A-2) that were composed of multiple, non-exclusive categories (i.e., respondents could choose multiple goals, partners, and submissions types as appropriate for a given activity). The immediate aim of collecting these data was to characterize the nature of PC&C and CCS activities across the Federal Government. However, the same data also provide the opportunity to answer questions about how the different aspects of PC&C and CCS activities interact with each other. For example, do PC&C activity goals differ among agencies? Do the types of partners and their contributions differ for PC&C projects with different goals? Is the identity of participants in CCS activities related to the goals of the activities?

Table A-1. Categorical Variables Used to Characterize PC&C Activities

Agency
Goals of Activity
Agency Practices to Support PC&C
Justifications for Using PC&C
Types of Submissions
Types of Partners
Partner Contributions
Outreach Mechanisms
Intended Participants
Use of Agency Funds

Table A-2. Categorical Variables Used to Characterize CCS Activities

Agency
Goals of Activity
CCS Act Objectives
Nature of Submissions
Intended Participants
Emphasized Demographic Groups
Engagement of Underrepresented Groups
Types of Partners
Partner Contributions

To explore for potentially interesting relationships, categorical variables were analyzed based on their intersection (Table A-3) that record the number of activities that share particular traits (e.g., frequency of occurrence). These intersection tables provide a means of identifying the most and least frequent coincident categories of the two variables being compared. For example, Table A-3 shows that 69 (of 172) PC&C activities reported in FY19–20 had a goal to *Generate innovative ideas, designs, or concepts* and also had a *Federal agency or office* as a partner.

Table A-3. Example of a Two-way Contingency Table Relating PC&C Activity Goals (Rows) and Types of Partnering Organizations (Columns).

	State or Local Government	Academic Institution	Private Industry	Nonprofit Organization (non-Academic)	Federal Agency or Office	Other (none of the above)
Generate innovative ideas, designs, or concepts	6	13	27	30	69	30
Develop or demonstrate technology	5	10	30	22	60	26
Build or strengthen a community	4	10	11	28	50	33
Outreach or information dissemination	2	8	10	20	33	17
Education or training	0	9	14	15	28	22
Launch or scale up the use of an enterprise/promote commercialization	0	6	6	17	12	39
Improve a process, procedure, or service carried out by the sponsoring agency	3	5	5	3	29	9
Other (none of the above)	9	6	17	11	12	17

High (or low) values in the intersection tables are informative regarding which properties most commonly (or most rarely) coincide. For example, the intersection of *generate innovative ideas, designs, or concepts* and *Federal agency or office* (69 reported PC&C activities) indicates that activity sponsors work with Federal partners in activities intended to generate novel ideas.

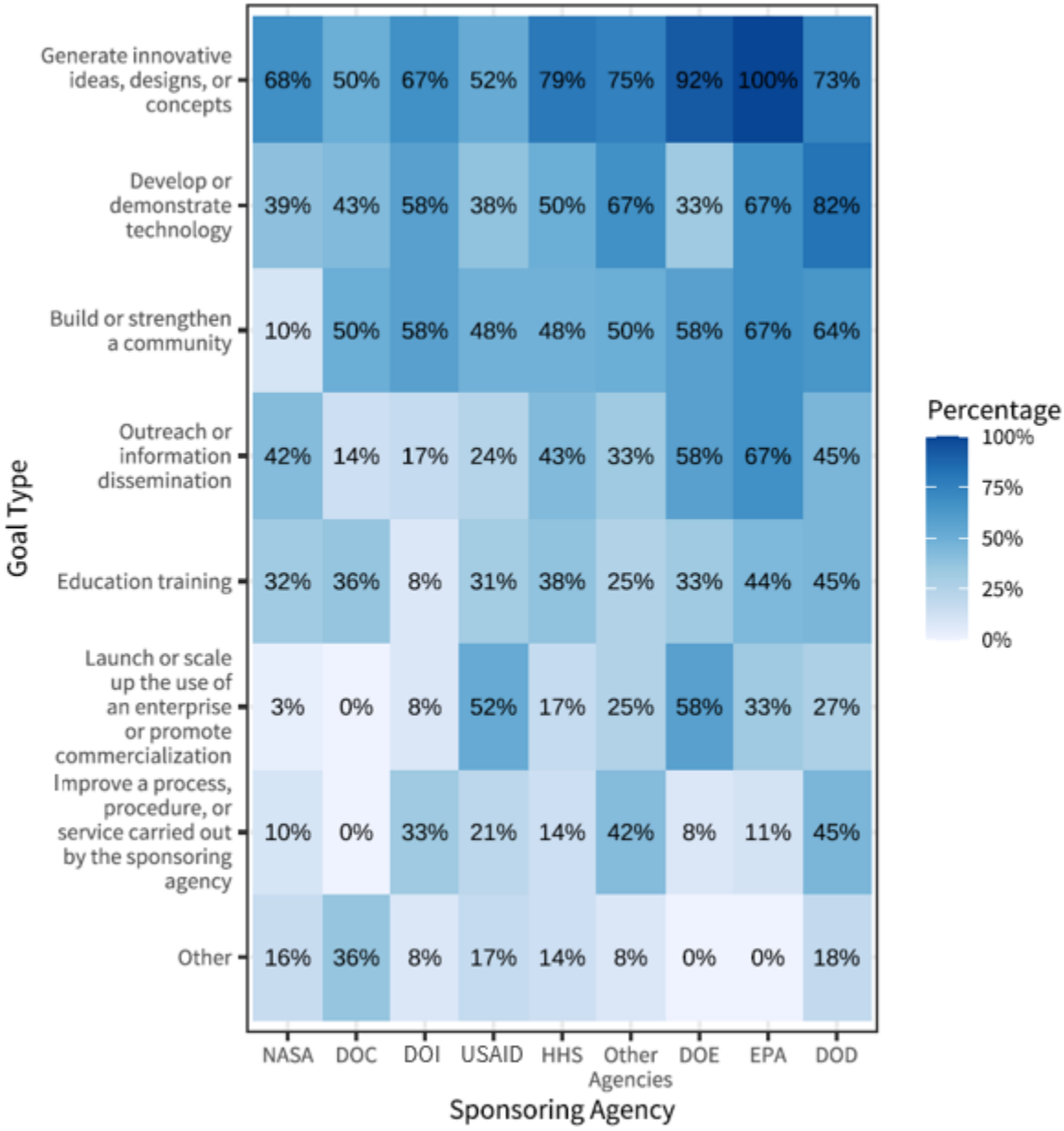
Prize Competitions and Challenges

Analysis by Federal Agency

Agencies and Goals of Prize Competitions and Challenges

Differences among the missions and authorities of Federal agencies may be reflected in their goals for PC&Cs. The most common goal for PC&Cs in FY19–20 across all agencies was to *generate innovative ideas, designs, or concepts*, followed closely by *develop or demonstrate technology* and *build or strengthen a community* (Figure A-1).

Figure A-1. FY19 and FY20 Prize Competition Goal Types Reported by Sponsoring Agencies. [39,40]



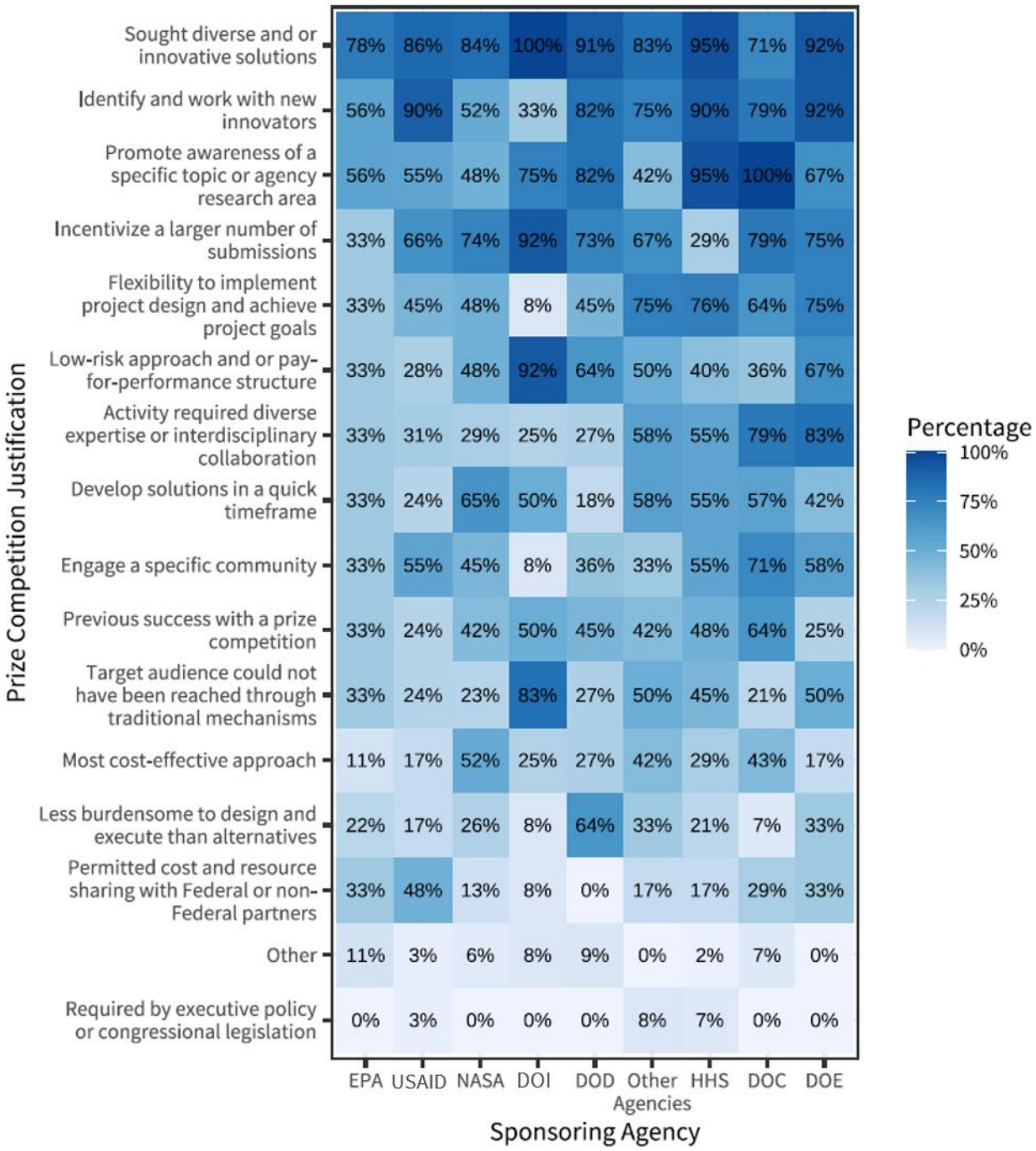
[39] "Other Agencies" in this and all other tables referring to PC&C activities include those departments and agencies reporting fewer than five total activities during FY19 and FY20. These are CFTC, DHS, DOL, DOT, GSA, NSF, ODNI, and SBA.

[40] All intersection tables are presented with row totals increasing from bottom to top and column totals increasing from left to right in order to highlight the relative frequency of relationships between the values of the depicted categorical variables.

Agencies and COMPETES Act Justifications for Using a Prize Competition or Challenge

The America COMPETES Act of 2010 lists a number of justifications for Federal agencies to use PC&Cs to advance their missions (Figure A-2). The most commonly reported justifications for using PC&Cs reported overall in FY19–20 were *sought diverse or innovative solutions*, followed by *identify and work with new innovators* and *promote awareness of a specific topic or agency research area*.

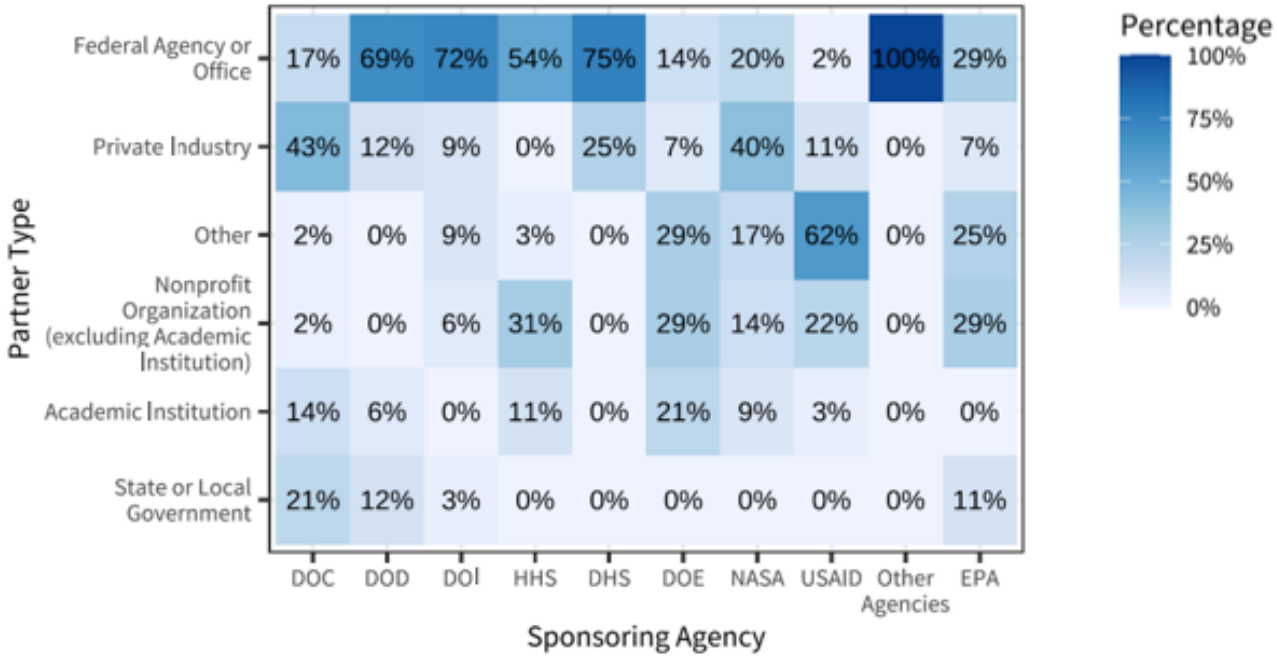
Figure A-2. Justification for Using Prize Competitions in FY19 and FY20 Reported by Sponsoring Agencies.



Agencies versus Partner Types

More than half of all PC&C activities reported in FY19–20 were carried out in conjunction with at least one partner, and the variety of partnering organizations was quite diverse (Figure A-3).

Figure A-3. FY19 and FY19 Partner Types Reported by Sponsoring Agencies.

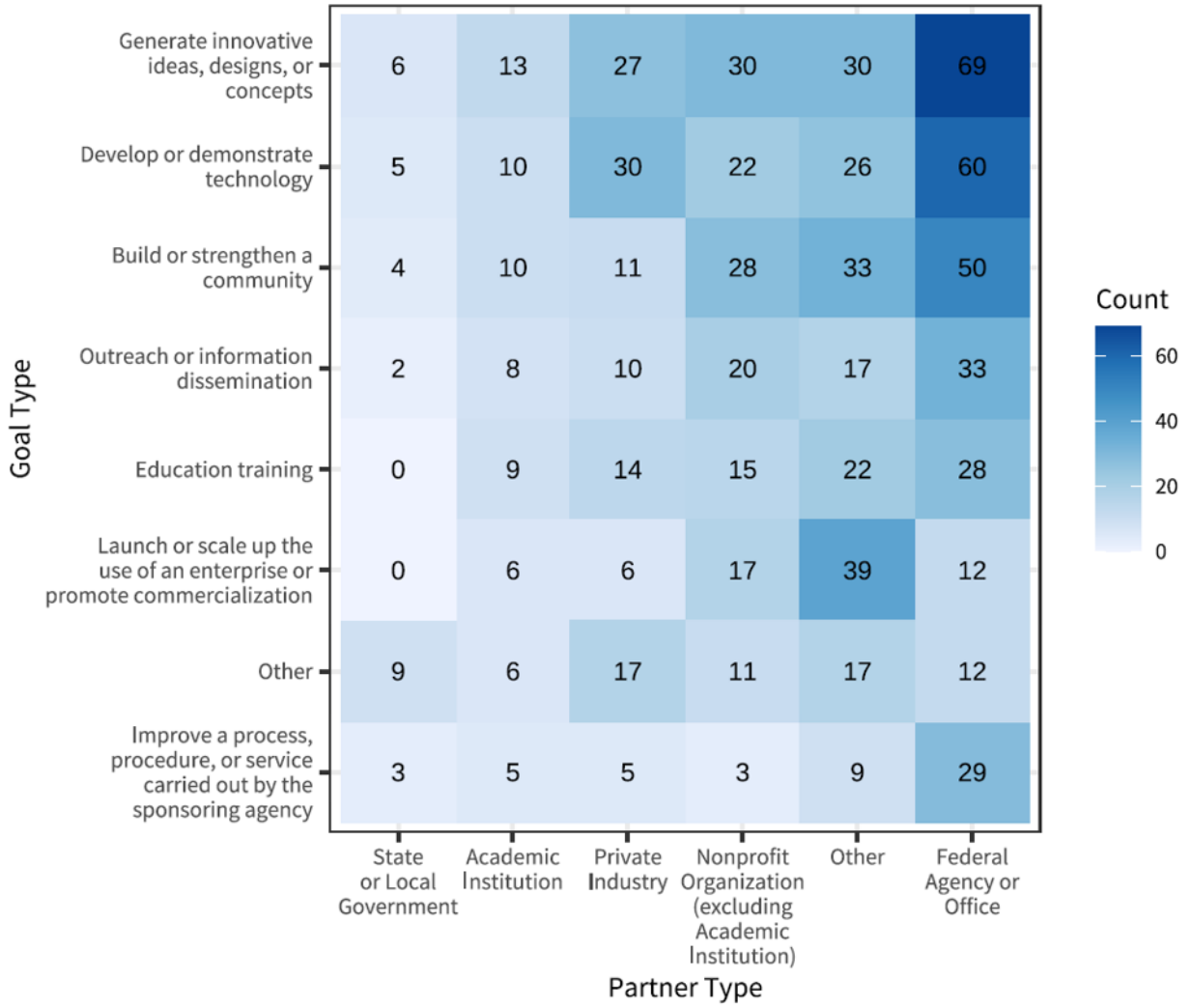


Analysis of Partnerships

Partner Types versus Goals

Federal agency or office is the most common partner type (Figure A-4). This lower level of Federal partnership in activities seeking commercialization as a goal may reflect restrictions on the ability of U.S. Government entities to invest in commercial enterprises.

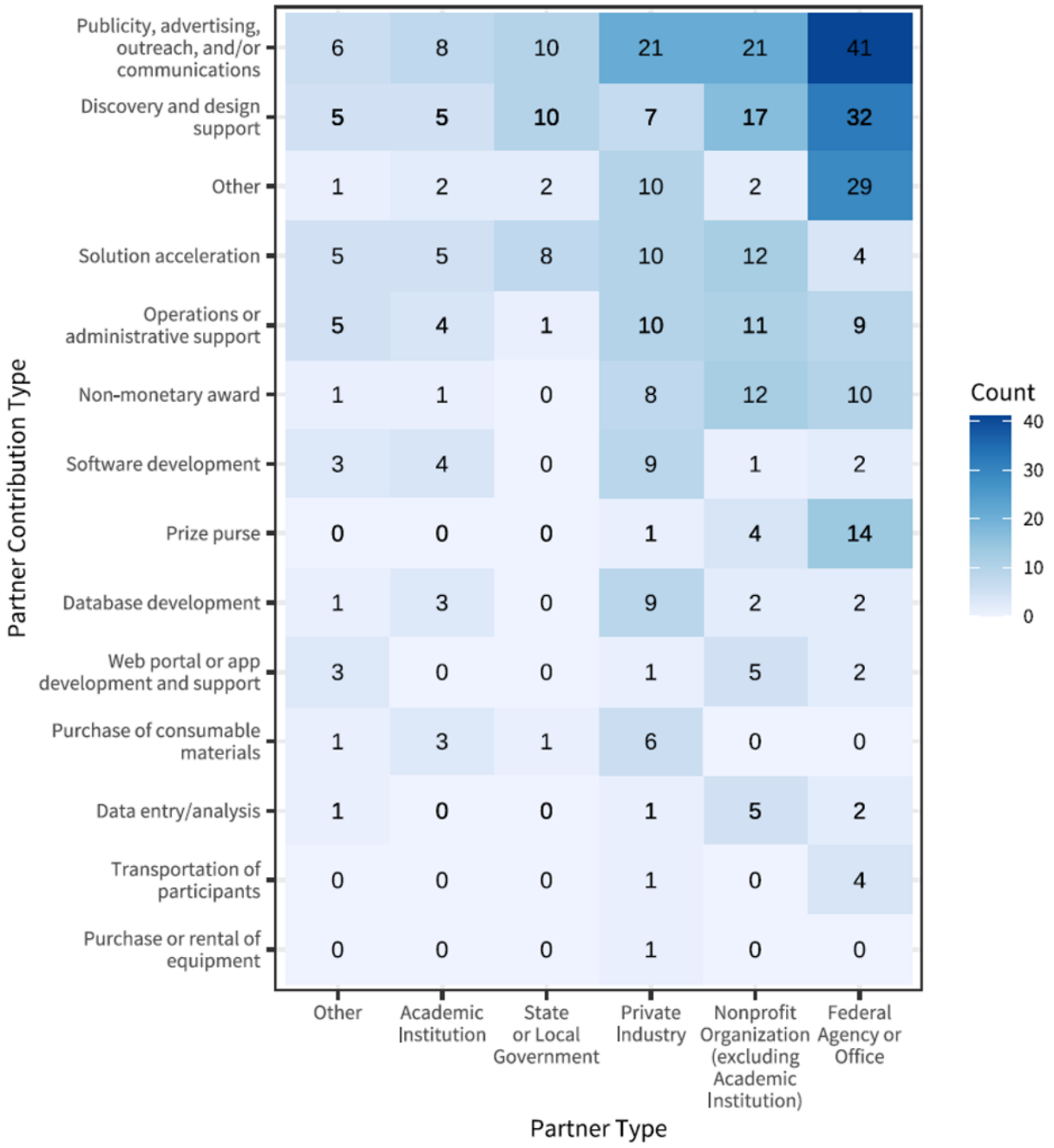
Figure A-4. FY19 and FY20 Goal Types by Partner Type.



Partner Types versus Partner Contribution

Agencies turn to partners to contribute a variety of resources and services when carrying out PC&C activities (Figure A-5); identifying what kinds of partners make what kinds of contributions may help Federal sponsors optimize external collaborations. The two most common partner contributions overall are *publicity, advertising, outreach, and/or communications* and *Discovery and design support*.

Figure A-5. FY19 and FY20 Partner Contributions by Partner Type.



Summary of Relationships in Prize Competitions and Challenges

Overall, dissection of the available information on Federally-sponsored PC&C activities in FY19–20 indicates that most agencies use them for a similar array of purposes and work with a similar variety of partners. However, exceptions to the general relative patterns above may suggest how agencies' missions influence the ways in which they use PC&Cs and with whom they partner.

With respect to agency-specific goals and justifications for using PC&Cs, most of the deviations were due to particular agencies avoiding certain categories rather than favoring a select few. For example, HHS did not use PC&C approaches to increase submissions, and DOI did not use them to provide flexibility. These results do not mean that PC&C activities did not provide these benefits for these agencies, but rather that these were not the reasons reported by agencies for choosing the PC&C approach.

Similarly, the intersection between partner type and partner contribution provided more insight on negative relationships than strong positive relationships—i.e., where Federal agencies do *not* turn for particular needs rather than identifying particular types of partnering organization that deliver specific types of help. For example, an interpretation of the FY19–20 data suggests it is more common for an activity sponsor seeking support for discovery and design to partner with another Federal agency rather than another partner type such as private industry or an academic institution. There was also a high frequency of unspecified "other" contributions, suggesting that a significant number of partnerships serve to provide very specific contributions that were not captured in the survey used to collect the data, which was designed to be broadly applicable.

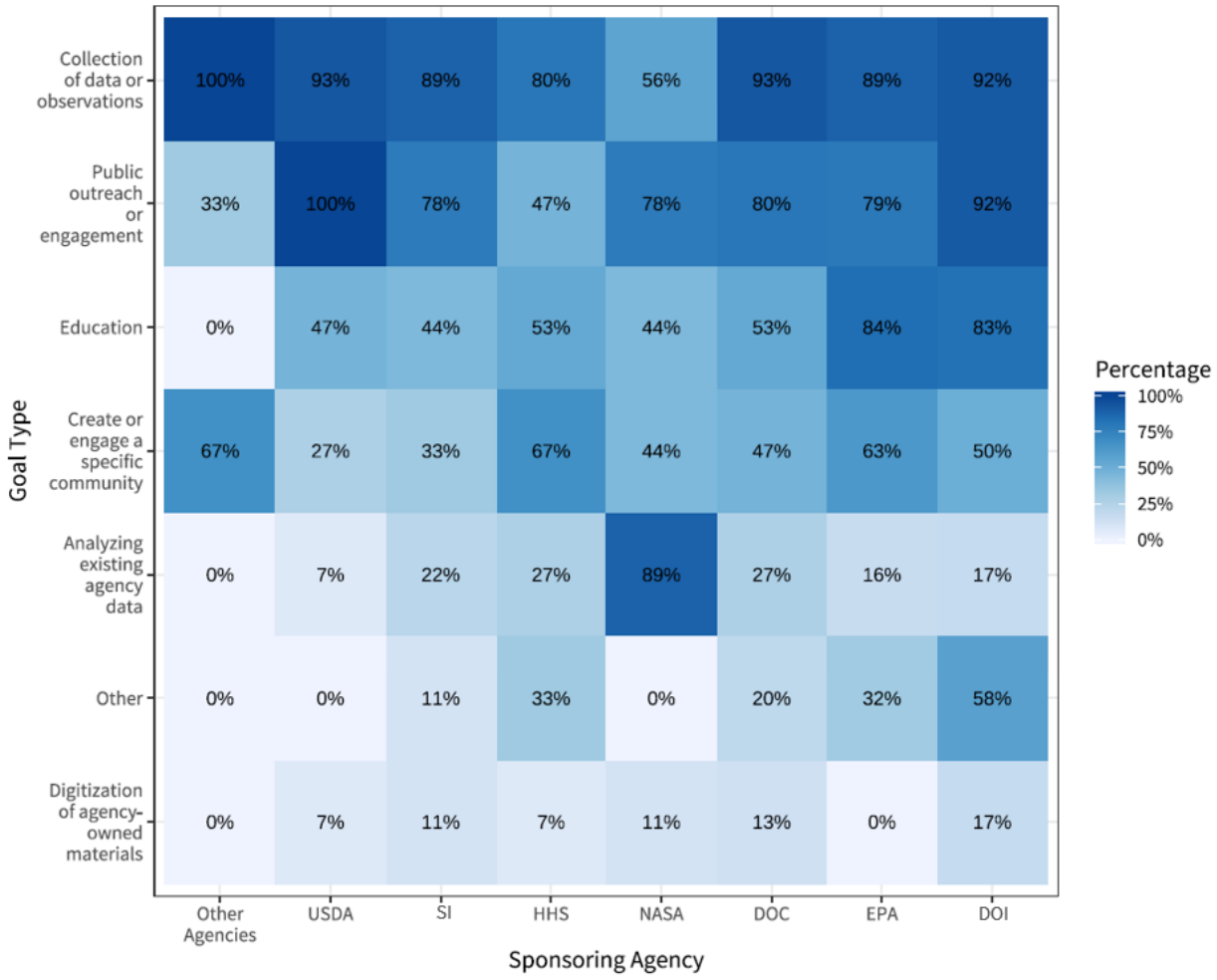
Crowdsourcing and Citizen Science

Analysis by Federal Agency

Agencies and Goals of Crowdsourcing and Citizen Science Activities

As was the case for PC&C activities, Federal agencies can have different goals for CCS activities (Figure A-6). The single most commonly reported goal in the FY19–20 period was the *Collection of data or observations*, closely followed by *Public outreach or engagement*, *Education*, and *Create or engage a specific community*.

Figure A-6. CCS Activity Goal Types by Sponsoring Agency.[41]

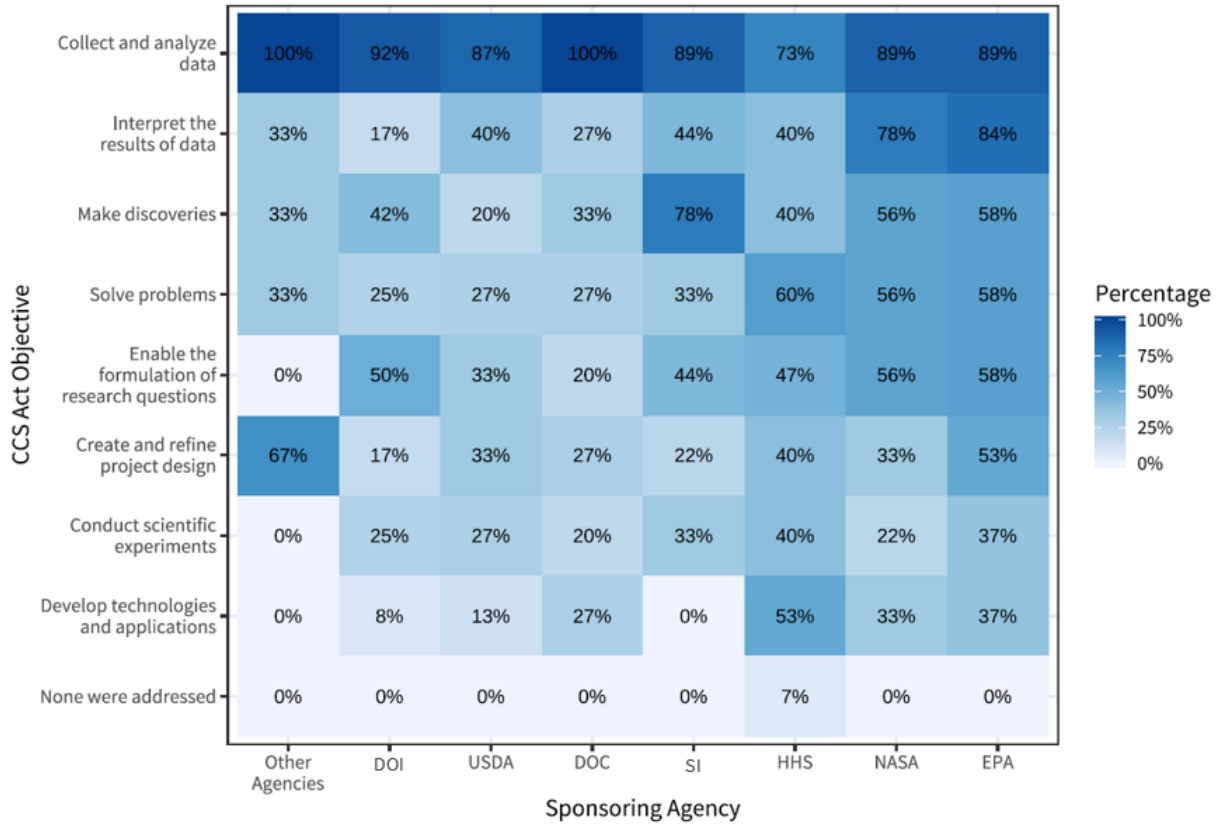


[41] "Other Agencies" in this and all other tables referring to CCS include those departments and agencies reporting fewer than five total activities during FY19 and FY20. These are DOE and DHS.

Agencies and CCS Act Objectives of Crowdsourcing and Citizen Science Activities

The CCS Act of 2017 lists a number of objectives for CCS activities that can benefit the sponsoring agencies (Figure A-7). The most commonly reported objective in FY19–20 was *Collect and analyze data*, followed by *Interpret the results of data*. Several agencies appear to favor additional objectives, including the Smithsonian Institution (*Make discoveries*), DOI (*Enable the formulation of research questions*), and HHS (*Develop technologies and applications*).

Figure A-7. CCS Act Objectives by Sponsoring Agency.



Agencies and Participation by Different Populations

For the FY19–20 report, Federal agencies were asked whether the CCS activities they sponsored were aimed at historically underrepresented groups (Figure A-8), groups defined by age or educational background (Figure A-9), and groups defined by economic status and urban/rural setting (Figure A-10).

Overall, all Federal agencies carrying out CCS activities in the FY19–20 reporting period worked to attract a diversity of participants, with some activities aimed at particular populations based on age or education (e.g., events specifically aimed at university undergraduates or high school students). Responses to demographic questions were voluntary, so a result the sample size of activities reporting this information was small.

Figure A-8. Historically Underrepresented Groups Targeted by CCS Activities versus Sponsoring Agency.

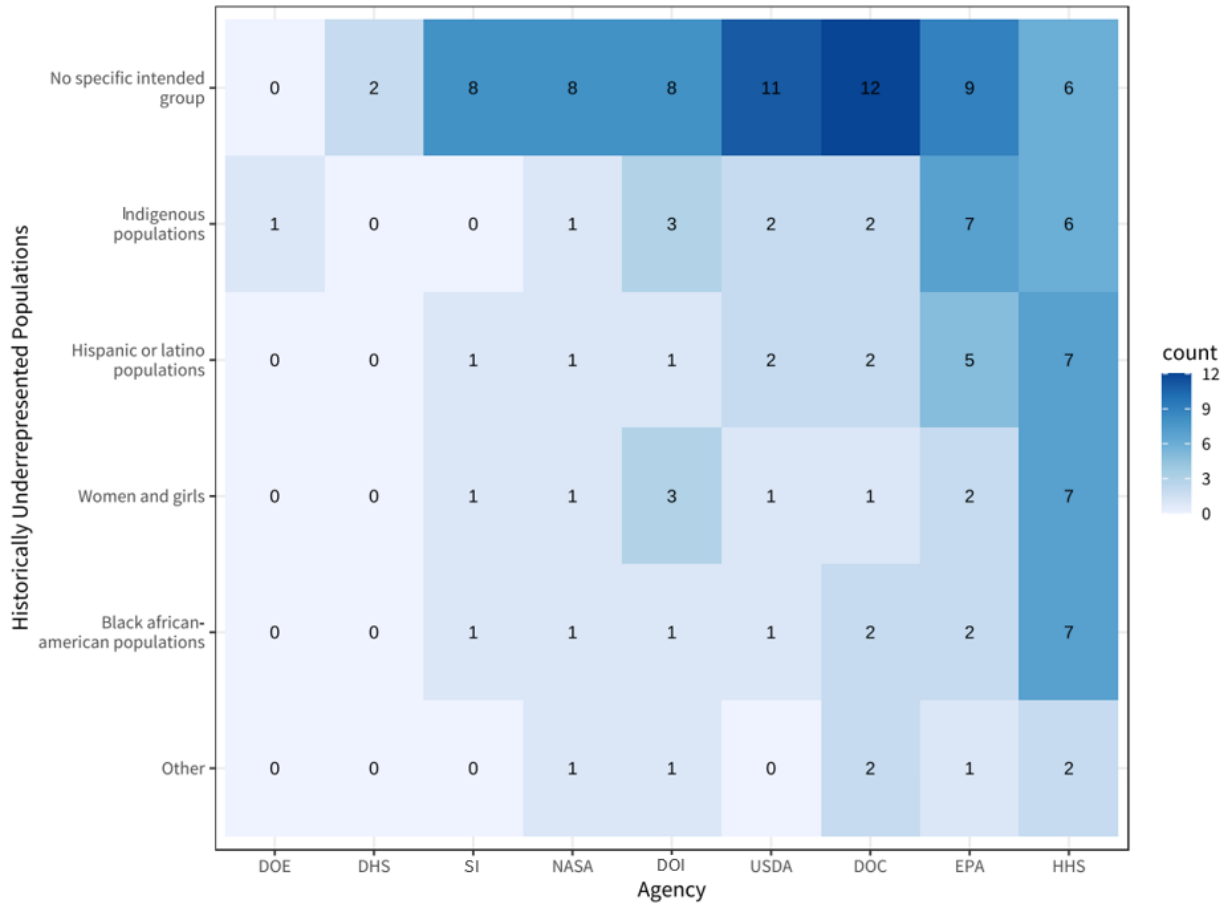


Figure A-9. Groups Defined by Age or Educational Background versus Sponsoring Agency.

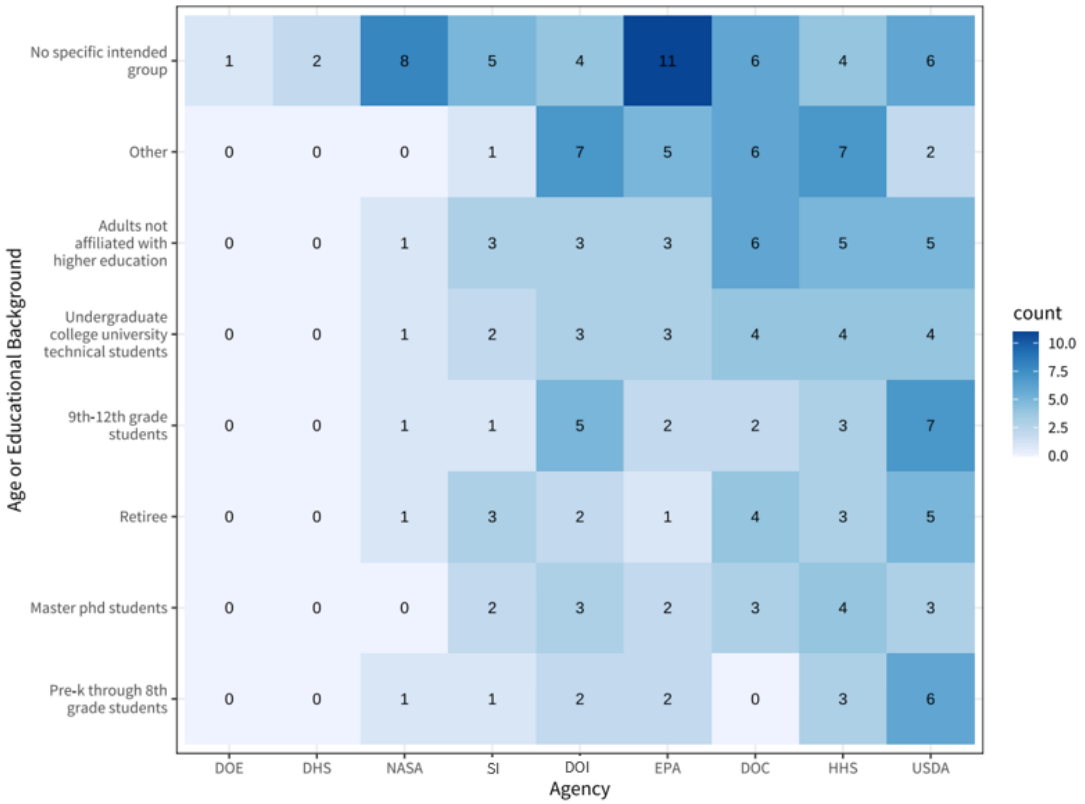
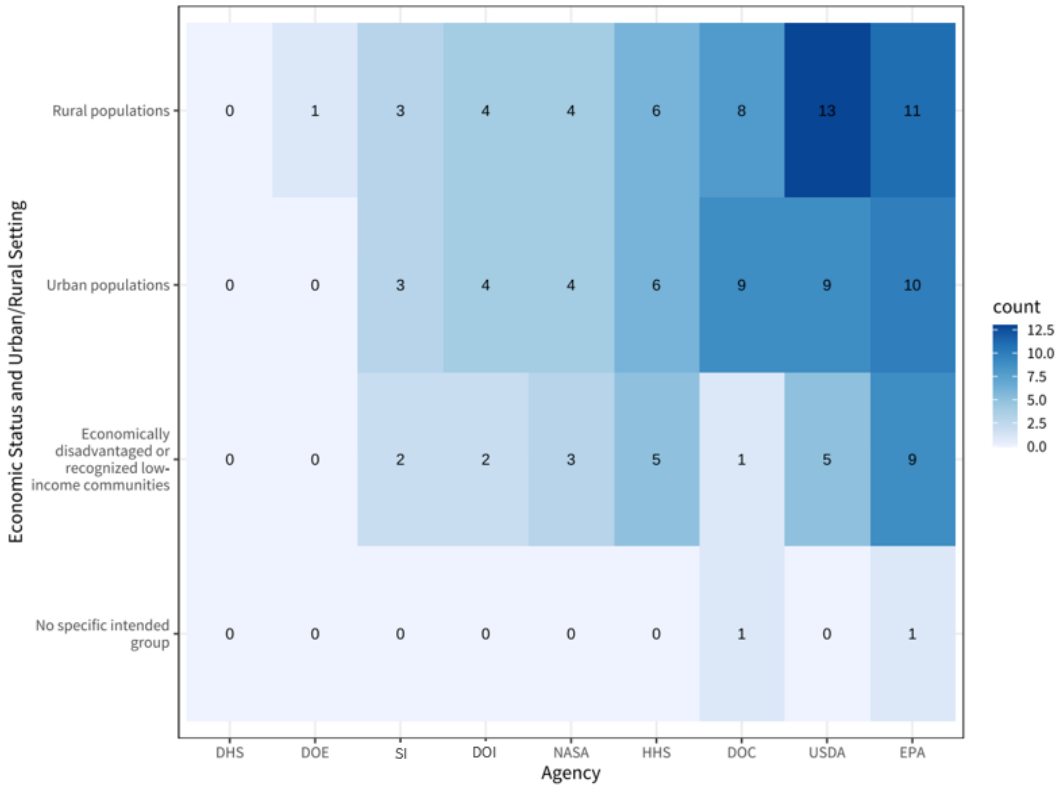


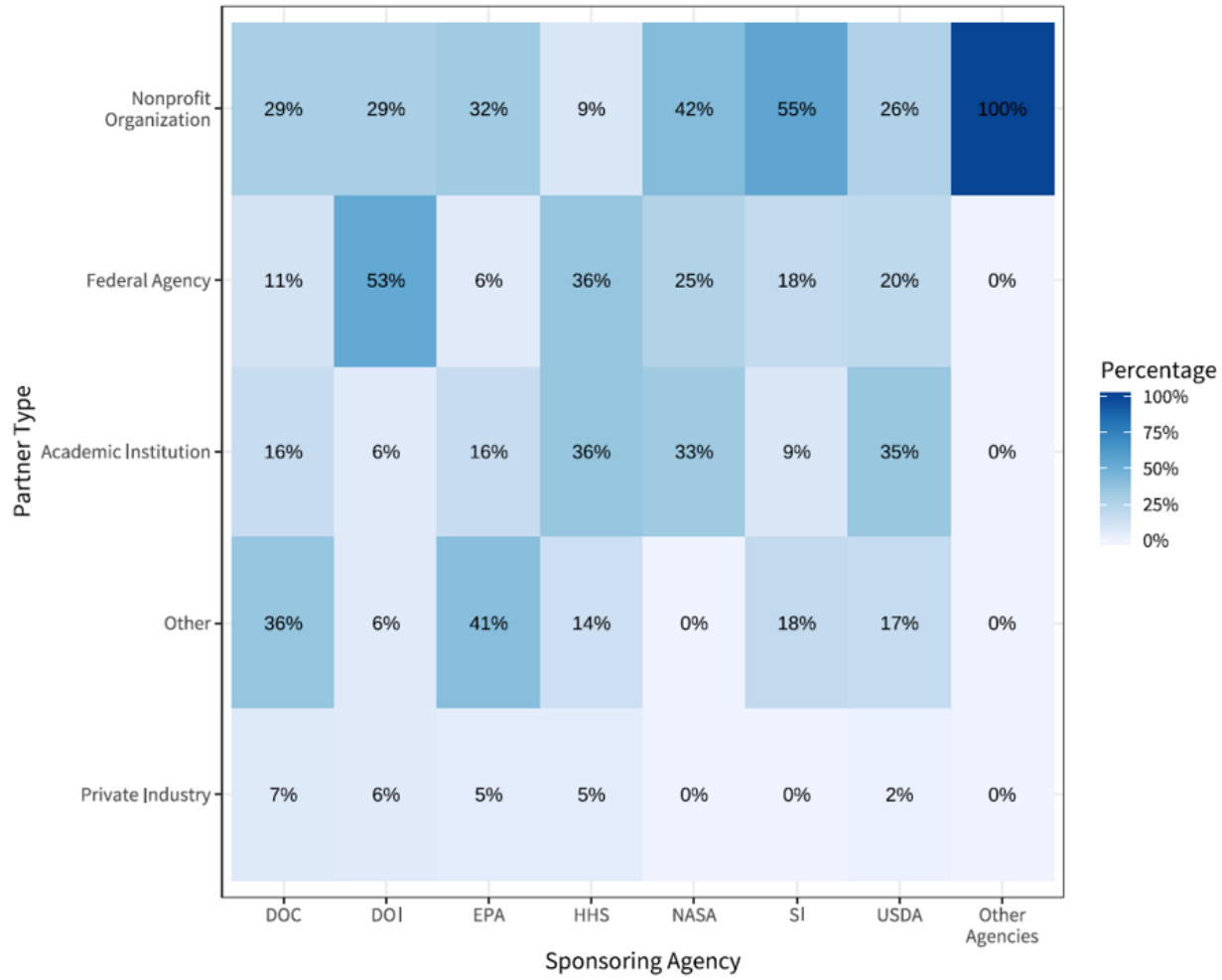
Figure A-10. Groups Defined by Economic Status and Urban/Rural Setting versus Sponsoring Agency.



Partner Types versus Agencies

To achieve various goals and objectives, Federal agencies work with a variety of different types of partners to carry out CCS activities (Figure A-11). It appears that DOI often works with *Federal agencies* (whereas EPA works with *Federal agencies* relatively less often). In addition, HHS works with *nonprofit organizations* relatively less often than either NASA or the Smithsonian Institution. Other relationships that are notable include USDA's proclivity to work with *academic institutions* and the Smithsonian Institution's tendency to work with *nonprofit organizations*, both of which may reflect the nature of those two Federal agencies: USDA has close, cooperative ties to university agriculture programs, including extension services, and the Smithsonian's mission to interact with the public through its museums may favor working with nonprofit organizations.

Figure A-11. CCS Activity Partner Type by Sponsoring Agency.

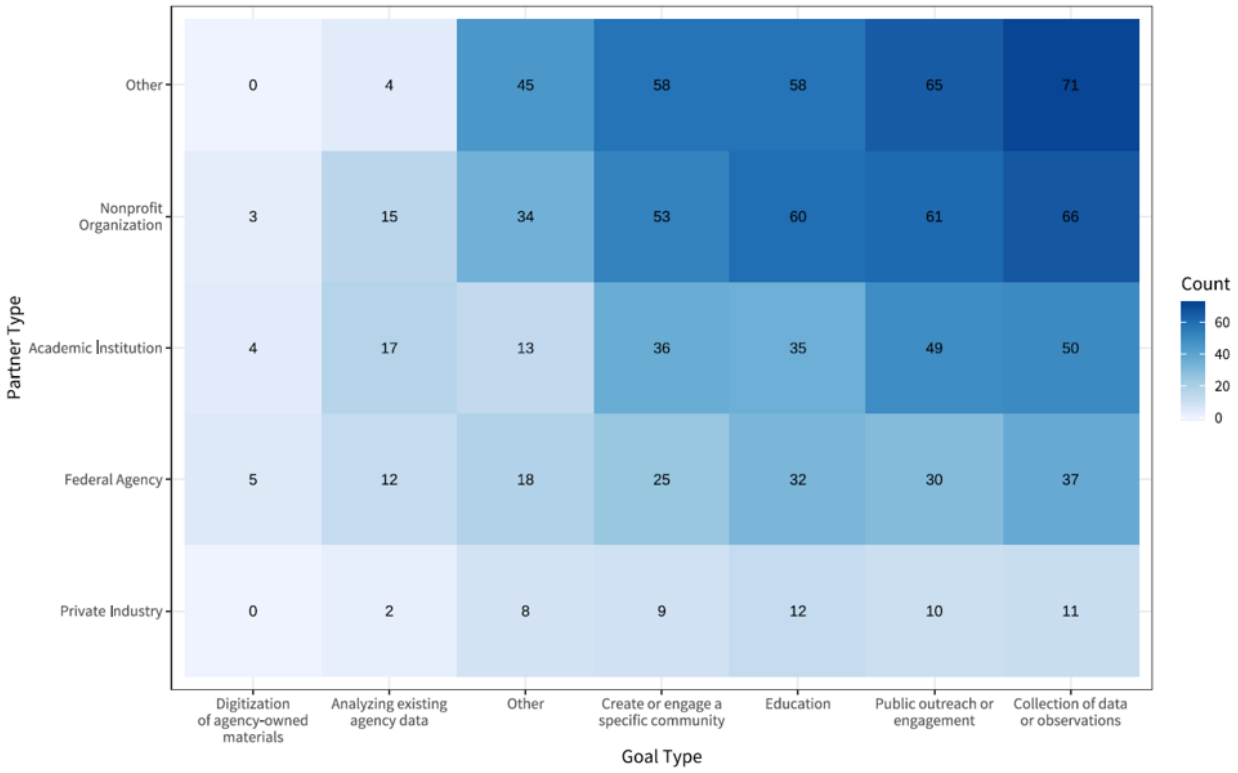


Analysis of Partnerships

Partner Types versus CCS Activity Goals

Collection of data or observations was the single most commonly reported goal, and the most common partnership for activities with this goal was with the *Other* partner type, despite the large number of activities sharing this goal and partner type (Figure A-12). The prevalence of the *Other* partner type category leaves the nature of the identified relationship ambiguous.

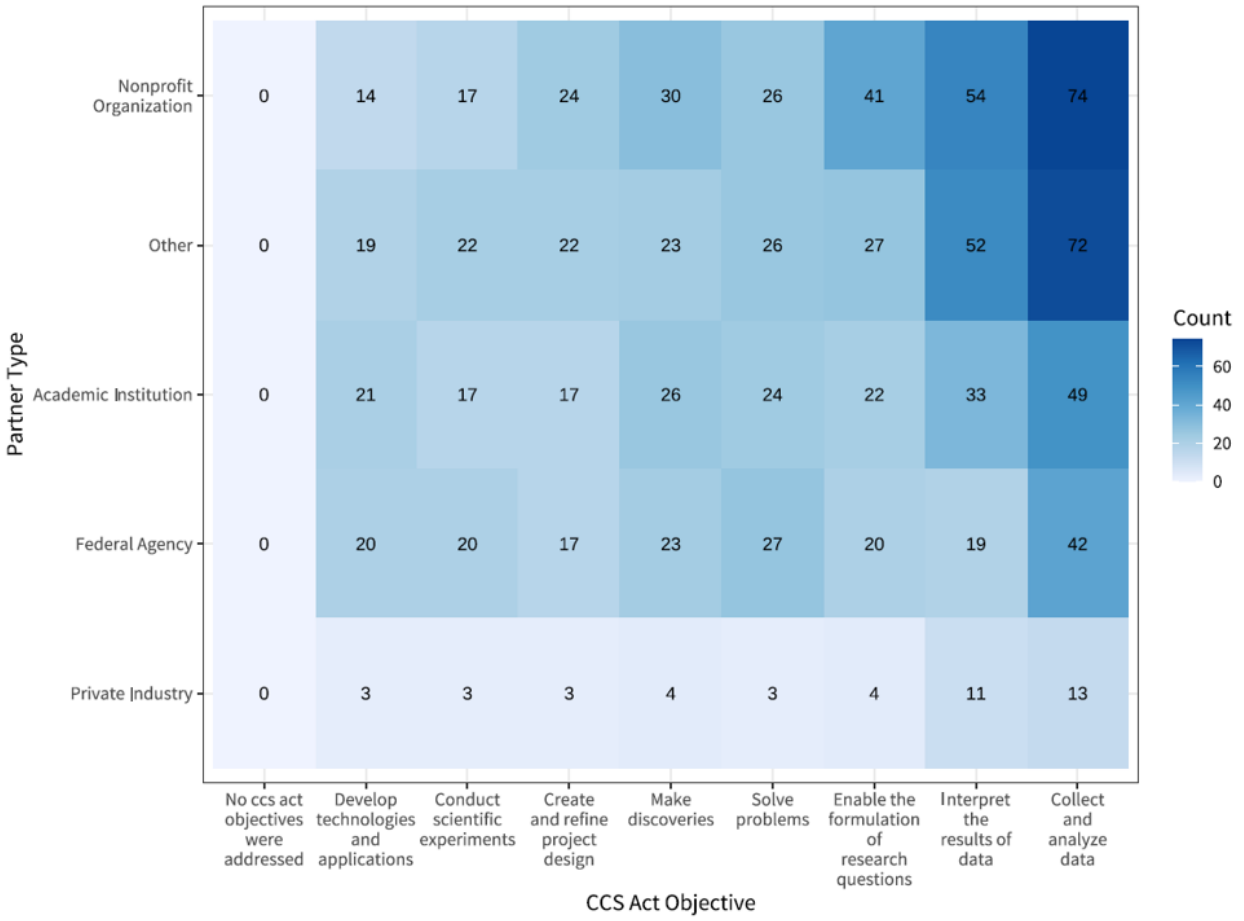
Figure A-12. CCS Activity Partner Type by Activity Goal Type.



Partner Types versus CCS Act Objectives

Analogous to the involvement of different types of partners depending on the goal of a CCS activity, different objectives as described in the CCS Act of 2017 may be better served by or draw the attention of different types of partners (Figure A-13). In this intersection, the most frequent relationship observed occurred in activities where nonprofit organizations were partners and the objective was to collect and analyze data.

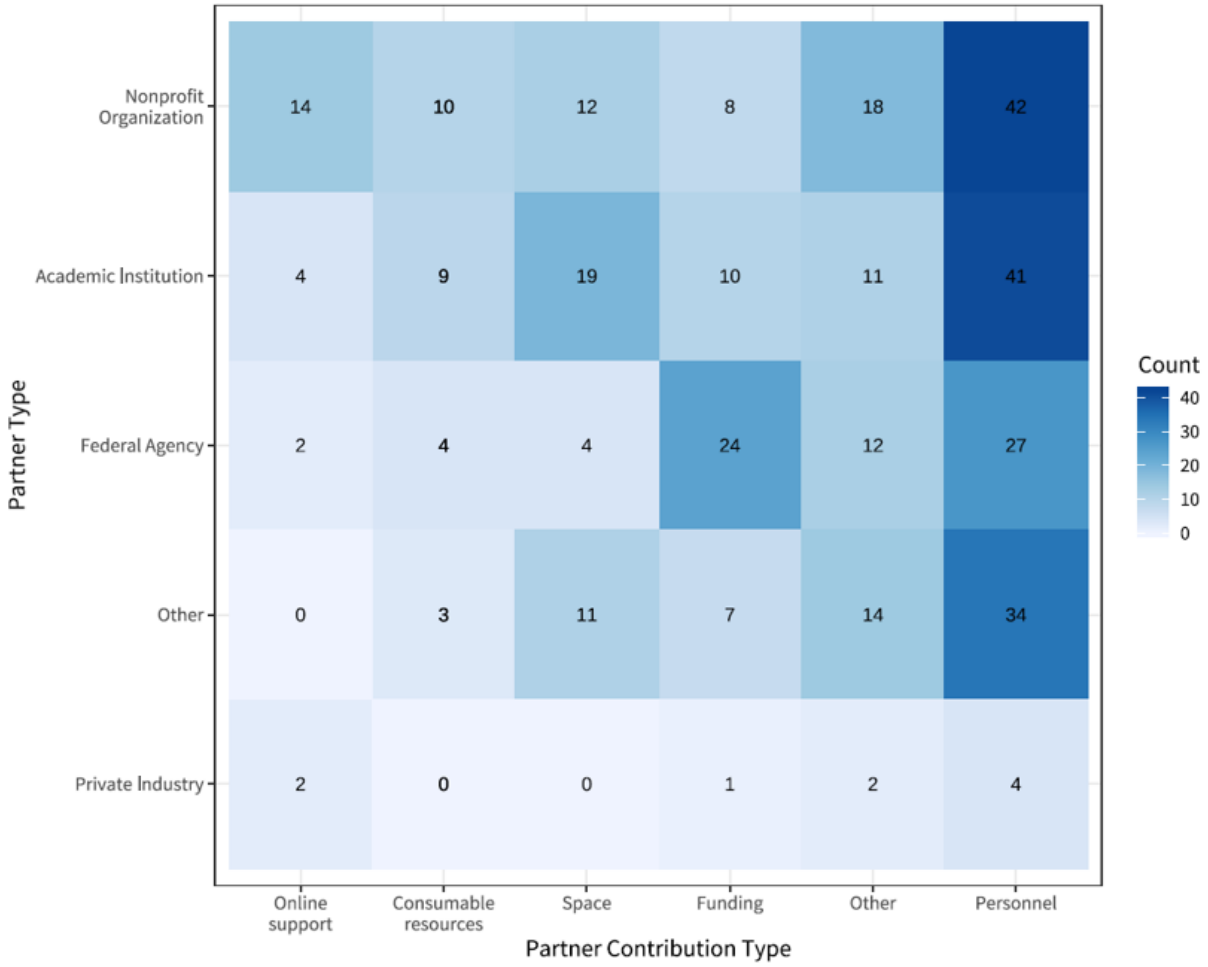
Figure A-13. CCS Activity Partner Type by CCS Act Objective.



Partner Types versus Partner Contribution

The most common contribution made by partners to federally sponsored CCS activities in the FY19–20 reporting period was *Personnel*, who were provided mostly by *Nonprofit organization* and *Academic institution* categories (Figure A-14).

Figure A-14. CCS Activity Partner Contribution Type by Partner Type.



Summary of Relationships in Crowdsourcing and Citizen Science Activities

As was the case for PC&C activities, most Federal agencies in the FY19–20 reporting period used CCS activities to achieve similar goals and objectives. In addition, there is likely not enough data on activities from FY19–20 to indicate whether Federal agencies differ in the groups—historically underrepresented populations, groups with different ages and educational backgrounds, and groups defined by economic status and rural/urban setting—they aimed to include.

There is evidence that agencies work with particular types of partners to achieve specific goals, but exactly which goals and what types of partners is ambiguous because intersections involving unspecified "other" partner types or unspecified "other" goals occur frequently.

An important caveat that limits the interpretation of CCS activities is the relatively small size of the available data set. Although the total number of CCS activities reported for FY19–20 was 97, many agencies reported fewer than 10 total activities and many did not provide answers to voluntary questions in the data collection survey, which resulted in small sample sizes when breaking down the data by agency. Additional relationships may be revealed in the future as the total pool of Federal CCS activities expands over time. In addition, many activities reported partners and goals of types that were not available in the standard survey responses (i.e., "other"). Future data collection may benefit from adding a wider variety of options informed by the Federal CCS Community of Practice and by the open-form text responses about partnerships submitted in the FY19–20 reporting period.

Appendix B. Prizes and Challenges under the COMPETES Reauthorization Act of 2010

This Appendix provides agency-submitted summaries of prizes and challenges conducted in FY19 and FY20 under the prize authority provided in COMPETES. Please note that agency plans for the upcoming two fiscal years are notional and subject to the availability of funding. Please also note that funding estimates in funding tables do not include FTEs and prize purse.

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B.1. Commodity Futures Trading Commission (CFTC)

B.1.1. Project Streetlamp[42]

Sponsoring Agency and Office: LabCFTC

Authority: America COMPETES Reauthorization Act of 2010[43]

Status:

FY19: No activity occurred during FY19

[42] The website for Project Streetlamp is accessible at https://www.challenge.gov/challenge/project-streetlamp/.

[43] Project Streetlamp proceeded under the "Science Prize Competition Act," Section 401 of the American Innovation and Competitiveness Act, 15 U.S.C. 3719 (2017). This legislation was one of several amendments to the America COMPETES legislation.

FY20: Completed

Competition Summary: The mission of the Commodity Futures Trading Commission (CFTC) is to promote the integrity, resilience, and vibrancy of the U.S. derivatives markets through sound regulation. LabCFTC is the focal point for the CFTC's efforts to promote responsible financial technology innovation and fair competition for the benefit of the American public. In accordance with Section 401 of the American Innovation and Competitiveness Act, 15 U.S.C. 3719, LabCFTC launched the Project Streetlamp competition to challenge innovators to develop technology, including artificial intelligence (AI), and innovative approaches that could help detect foreign entities that are not registered with the CFTC, but appear to be acting in a capacity that requires CFTC registration. Such entities are presently catalogued on the CFTCs Registration Deficient (RED) List. The RED List is intended to generate information that enables members of the public to make more informed decisions about whether to trade with, or through, these entities. The goal of Project Streetlamp is to explore how AI and other technologies may help the CFTC maintain a comprehensive, up-to-date RED List by automating the process of identifying foreign entities for potential inclusion on the list. AI could be an important component of such a tool, because the technology has the potential to learn the footprints of actors that are unregistered, but engaged in activity that may require CFTC registration. For example, key identifying data (e.g., keywords, website data, audience information, network and outreach, etc.) associated with unregistered entities known to be engaged in activity that may require CFTC registration could be used to develop a model that is useful for identifying other unregistered entities engaged in similar activity.

Budget and Resources: Agency staff designed and prepared the competition. Subsequent to launch, agency staff designed and implemented a social media publicity program. A plaque was purchased to award the competition winner and time was provided during a public, virtual conference for an award ceremony and presentation. Apart from the plaque, the agency's costs were limited to the value of FTE staffing. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Federal personnel (FTE); Non-monetary award(s)
FTEs	None reported	1.25
Funding Estimate	None reported	$125

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination

Problem or Opportunity Addressed: The Registration Deficient (RED) List provides public notice that a foreign entity is engaged in conduct that requires registration with the CFTC, but has not in fact registered. The goal of the RED List is to provide information to U.S. customers about foreign entities that are acting in an unregistered capacity and to help them make more informed decisions about whether to trade with or through such an entity. Maintaining the RED List currently requires significant time and effort on the part of CFTC staff. It also depends on identifying entities that should be investigated for potential inclusion, which is now largely driven by tips and referrals to CFTC staff from concerned individuals. Technology, including an AI-based tool, could help identify these entities, and

help automate the process to determine whether such entities, in fact, meet the criteria to be included on the RED List.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Less burdensome to design and execute than alternatives; Target audience could not have been reached through traditional mechanisms

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	1	1	2020-11-17

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: The Project Streetlamp competition winner was publicly recognized and designated as a CFTC Innovator of the Year. The winner also received a commemorative award (plaque). The competition winner was invited to present at a public, virtual conference and participate in a brief ceremony. The competition winner has been offered the opportunity to meet senior leadership/staff at the CFTC, including the Chairman and LabCFTC Director.

Participants:

FY19: Not applicable

FY20: 2 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2020-04-21	2020-09-04	2

Solicitation of Submissions: Social media; Email; Press release; Posted on challenge.gov

Submission Types: Prototype device or object; Software or computer code

Submissions: Project Streetlamp sought a tool that utilizes AI and/or other technology to scan public sources and relevant data to identify foreign entities engaged in activity that the CFTC should investigate further for possible inclusion on the CFTC's Registration Deficient (RED) List. A successful tool was expected to be able to assess foreign entities against the criteria listed in the competition announcement; generate output with identifying information; be capable of providing a justification for why any particular foreign entity was identified; and incorporate an archive function that saves searches and results for future reference and audit purposes. Participants were free to determine the best approach to create their tool and to deploy it, as well as the format of the output generated. The announcement specified that the tool's output could be in any common machine readable format (e.g., csv, xml, excel).

Evaluation of Submissions: Upon the close of the competition submission period, each entry was initially reviewed to confirm that it met threshold submission requirements. Qualified entries were then forwarded to the judging panel to evaluate entries and determine the competition winner(s). The evaluation criteria were specified in the competition announcement, and focused on how well the entry could achieve the defined goals, its user-friendliness, and overall quality. Each element had an associated maximum point value. In conducting the evaluation, judges determined the points an entry merited for each element, up to the maximum value specified, and selected a winner based on the total points scored. The judging panel consisted of three CFTC staff members. The panel was constituted to include experience and background useful to evaluate competition submissions.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The mission of the CFTC is to promote the integrity, resilience, and vibrancy of the U.S. derivatives markets through sound regulation. A key element is protecting market users and the public from fraud, manipulation, and abusive practices. The goal of the RED List is to provide information to U.S. customers about foreign entities that are acting in an unregistered capacity and to help them make more informed decisions about whether to trade with or through such an entity. A comprehensive, up-to-date RED List furthers the agency's mission to promote market integrity and protect market users and the public from fraud, manipulation, and abusive practices.

Plan for Upcoming Two Fiscal Years: There are no current plans for the upcoming two fiscal years.

B.2. Department of Homeland Security (DHS)

B.2.1. Trusted User Interface for Digital Wallets Challenge[44]

Sponsoring Agency and Office: Science and Technology Directorate

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: In September 2020, DHS Science and Technology Directorate (S&T) launched the $25,000 Trusted User Interface (UI) Digital Wallets Challenge, calling on innovators to design an easy-to-use and trustworthy UI that improves the overall user experience (UX) and management of digital wallet-based credentials. The challenge is in two parts. In the first stage of the challenge, contestants were judged on the design's UI and end-to-end UX. Three finalists were announced at a virtual community engagement event hosted by S&T on Tuesday, October 27, 2020. At the event, finalists presented their designs and received feedback from the standards and technical communities to prepare for stage 2 of the challenge. Federal Government experts and the World Wide Web Consortium (W3C), a standards group, provided insights and examples about how they are using,

[44] The website for Trusted User Interface for Digital Wallets Challenge is accessible at https://www.challenge.gov/challenge/trusted-user-interface-for-digital-wallets-challenge/ ; https://www.dhs.gov/science-and-technology/prize-competitions

and developing, standards for digital wallets. Each finalist will receive $5,000 and advance to the next stage of the challenge. The three finalists are Dignari, LLC - Alexandria, Virginia; Indicio, Inc. - Washington, DC; and Trinsic, Inc. - Provo, Utah. Each of the finalists have worked on implementing digital wallets that use decentralized identifiers and verifiable credentials in the second stage of the Challenge. The finalists were encouraged to work with the standards and digital wallets technology community to incorporate feedback into their designs. The winning design will be made available under a free and open license to the community. The $10,000 grand prize winner will be announced in FY21.

Budget and Resources: This challenge was the second time DHS has conducted a challenge internally without the assistance of NASA or a private industry partner administering the challenge. To cut down on cost, DHS developed a way to transfer the prize purse to the finalists and ultimately the winning team without much, if any, administrative burden. The S&T team consisted of leadership and support from the Silicon Valley Innovation Program, legal team, prize competition lead, strategic communications, finance division, and leadership approval process. The administrative cost was limited to time and effort. The prize purse came directly from the Silicon Valley Innovation Program's funding. The prize purse was kept low with the thought that the non-monetary benefit of visibility in the community had its own appeal. Most of the effort was in planning for and announcing the challenge, planning and executing the community engagement event in October, judging during stage 1 and stage 2, and the pay outs of the prizes. USCIS and the State Department contributed their time in judging the entrants during stage 1 and 2. In addition, W3C helped with providing more guidance on open standards community for credentialing and digital wallets.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award); Non-monetary award(s); Publicity, advertising, outreach, and/or communications, Web portal or app development and support; Database development; Data entry/analysis; Discovery and design support; Operations or administrative support; Solution acceleration
FTEs	Not applicable	5
Funding Estimate	Not applicable	$25,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: DHS is using technology more for such applications as applying to be a U.S. Citizen and needs user-friendly and trusted credentials technology. DHS is using blockchain and distributed technologies to issue and verify credentials using open standards. These systems use credentials that could be issued by DHS or a third-party and held in a digital wallet. DHS launched this Challenge to find UI designs that support best practices for visual consistency, ensures security and privacy, is interoperable, and can be integrated with existing back-end processes. The UI needed to instill confidence in the user of the digital wallet that their online interactions are secure and that the

parties they are interacting with are legitimate. The challenge sought a design concept for an easy-to-use, trusted UI for digital wallets that improves the overall user experience (UX) for the management of digital wallet-based credentials. The UI could be used by DHS and anyone in the community.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$15,000	3	3	10-27-2020
2	$10,000	1	Not applicable	03-06-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$15,000	$15,000

Non-Cash Prizes Include: Stage 1 finalists participated in a community engagement event where they received feedback on their designs from government and standards experts. Also, the community at large was able to ask questions about their designs. During Stage 2 finalists participated in discussions with the standards community and digital wallet technology developers to engage at a deeper level how their designs would integrate into digital wallet technology.

Participants:

FY19: Not applicable

FY20: 11 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-08-2020	10-15-2020	10-27-2020	11

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Software or computer code; Business or commercial development plan; Creative media

Submissions: In September 2020, DHS S&T called upon innovators to design a better UI for digital wallets that store credentials. DHS's prize competition was for better Trusted UI for Digital Wallets with a total prize purse of $25,000. The winning designs is an easy-to-use, trustworthy and improve the overall user experience and management of digital wallet-based credentials. The challenge was for UI designs that supports best practices for visual consistency, ensures security and privacy, is interoperable, and can be integrated with existing back-end processes. The challenge is in two parts. In the first stage of the challenge, contestants were judged on the design's UI and end-to-end UX. Three finalists were announced at a virtual community engagement event hosted by S&T. Each finalist received $5,000 and advance to the next stage of the challenge. Next, the finalists worked on implementing digital wallets that use decentralized identifiers and verifiable credentials in the second stage of the challenge. The winning design will be made available under a free and open license to the community.

Evaluation of Submissions: The challenge was unique and included a need for UI design that supports the (1) World Wide Web Consortium (W3C) Verifiable Credential (VC) Data Model and (2) Decentralized Identifiers (DID) standards/specifications. Entrants were asked to engage with the W3C Credential Community Group (CCG) to ensure that their proposed designs support W3C standards-based digital wallet implementations. During Stage 1, judging was based on whether the UI is easy-to-use; visual consistency, while supporting interoperability; security; and privacy best practices. During Stage 2, finalists were asked to submit a set of design artifacts including design principles, components, tokens and templates and supporting documentation (e.g., GSA's United States Web Design provides an example) that together can be used to implement the UI experience. Judging was based on all criteria used for stage 1 judging and the ease of use in independently implementing the UI and UX using the design artifacts provided as part of the stage 2 submission.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Citizen and Immigration Services	Federal Agency or Office	Not applicable	None reported	Non-monetary award(s)
Department of State	Federal Agency or Office	Not applicable	None reported	Non-monetary award(s)

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
World Wide Web Consortium	Private Industry	Not applicable	None reported	Non-monetary award(s)

Advancement of Agency Mission: DHS and its partner agencies are using blockchain and distributed technologies to issue and verify credentials using open standards. These systems use credentials that are held in a digital wallet. The challenge was for a better UI design that supports best practices for visual consistency, ensures security and privacy, is interoperable, and can be integrated with existing back-end processes. The UI needed to instill confidence in the user of the digital wallet that their online interactions are secure and that the parties they are interacting with are legitimate. The second part of the challenge was the goal to foster better UIs for digital wallets to be used by DHS and anyone in the community. DHS will be posting the software code in a public forum to be used and remixed, licensed free.

Plan for Upcoming Two Fiscal Years: DHS does not currently have any planned prize competitions. Prize competitions are based on customer need and driven by DHS Components. DHS Science and Technology Directorate supports prize competitions for DHS and helps with planning and execution. There is no dedicated o funding for prize competitions. Funding for prizes will come primarily from DHS customers for each individual prize. In this specific challenge, DHS Science and Technology Directorate funded the challenge and sponsored the challenge through the Silicon Valley Innovation Program. The challenge aligned with DHS's blockchain topic.

B.3. Department of Commerce (USDOC)

B.3.1. 2019 Agile Robotics for Industrial Automation Competition (ARIAC)[45]

Sponsoring Agency and Office: National Institute of Standards and Technology (Engineering Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: A core focus of this competition is to test the agility of industrial robot systems, with the goal of enabling industrial robots on shop floors to be more productive, more autonomous, and to require less time from shop floor workers. In this context, the National Institute of Standards and Technology (NIST) defined agility broadly to address:

- Failure identification and recovery, where a robot can detect failures in a manufacturing process and automatically recover from those failures;
- Automated planning to minimize (or eliminate) the up-front robot programming time when a new product is introduced;

[45] The website for 2019 ARIAC is accessible at https://www.challenge.gov/challenge/ariac.

- Fixtureless environment, where robots can sense the environment and perform tasks on parts that are not in predefined locations.

Budget and Resources: Agency funds were applied to contractor support, travel expenses for federal employees and invited subject matter experts (SMEs), and administrative support for procurements and travel. Contractors provided software development and simulation design and development. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Software development; Transportation of participants	Not applicable
FTEs	1.5	Not applicable
Funding Estimate	$50,000	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: ARIAC addressed a critical limitation of robots used in industrial environments like factory floors: they are not as agile as they need to be. Many robots are not able to detect failures quickly or recover from those failures. They are not able to sense changes in their environment and modify their actions accordingly. Programming these robots for even the simplest tasks takes time and effort. NIST's ARIAC incentivized more agile robotic systems.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$17,500	3	3	2019-05-21

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$17,500	$17,500
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Participants who placed in the top three in the finals were offered invitational travel arrangements to attend a workshop dedicated to the ARIAC Competition at a future robotics conference.

Participants:

FY19: 50 team(s)

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-02-12	2019-04-19	8

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Software or computer code

Submissions: Participants first registered for ARIAC through the online form to be eligible to participate in the qualifier. A minimum score was determined for the qualifier, which participants had to meet or exceed to be eligible for the final competition. Participants had two work weeks from the date that the qualifier was released to submit their software control system that addressed the challenges in the qualifier. For the finals, participants provided NIST with their code by the end date of the challenge; NIST provided their results approximately two weeks later. Participants developed a robot control system (software) to control a robot in simulated industrial environments like those in real-world order fulfillment centers or manufacturing floors. Gazebo, which is an open source robotics simulation environment, was used as the testing platform and the Robot Operating Systems (ROS), an open source set of software libraries and tools, was used to define the interfaces to the simulation system.

Evaluation of Submissions: As outlined in the official rules, evaluation was a combination of automated metrics based on data retrieved from the simulation package (up to 80 points; scoring metrics described in the Rules) and the assessment of a panel of judges (up to 20 points, as described in the Rules). The NIST Director appointed a panel of three qualified judges from outside of NIST with expertise in robot agility and/or simulation. The judges determined winners using the two judging criteria stated in the rules: (1) a score of up to 80 points based on scoring metrics; and (2) up to 20 points for novelty of approach and alignment with the spirit of the competition.

Partnerships: No partners were indicated.

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. The ARIAC Competition spawned innovation by representing industry's challenges with using robots, by using a simulated environment in a way that allows both academia and industry to more easily access and understand these challenges and develop innovative solutions to address them.

Plan for Upcoming Two Fiscal Years: Potential topical areas for the NIST ARIAC prize competitions during the upcoming two fiscal years include modeling additional industry robot challenges in the

simulated environment to allow the competitor to have access to a richer set of challenges, allowing them the opportunity to develop innovative solutions to these challenges.

B.3.2. 2020 Agile Robotics for Industrial Automation Competition (ARIAC) [46]

Sponsoring Agency and Office: National Institute of Standards and Technology (Engineering Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: A core focus of this competition was to test the agility of industrial robot systems, with the goal of enabling industrial robots on your shop floors to be more productive, more autonomous, and to require less time from shop floor workers. In this context, the National Institute of Standards and Technology (NIST) defined agility broadly to address:

- Failure identification and recovery, where a robot can detect failures in a manufacturing process and automatically recover from those failures;
- Automated planning to minimize (or eliminate) the up-front robot programming time when a new product is introduced;
- Fixtureless environment, where robots can sense the environment and perform tasks on parts that are not in predefined locations.

Budget and Resources: Agency funds were applied to travel expenses for federal employees and invited subject matter experts, and administrative support for procurements and travel. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award)
FTEs	Not applicable	3.0
Funding Estimate	Not applicable	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: ARIAC addressed a critical limitation of robots used in industrial environments like factory floors: they are not as agile as they need to be. Many robots are not able to detect failures quickly or recover from those failures. They aren't able to sense changes in their environment and modify their actions accordingly. Programming these robots for even the simplest tasks takes time and effort. NIST's ARIAC incentivized more agile robotic systems.

[46] The website for 2020 ARIAC is accessible at https://www.challenge.gov/challenge/2019-nist-ariac-challenge/.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$17,500	3	3	2020-06-07

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$17,500	$17,500

Non-Cash Prizes Include: Participants who placed in the top three in the finals were offered invitational travel arrangements to attend a live workshop.

Participants:

FY19: Not applicable

FY20: 110 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2020-01-27	2020-05-10	8

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Software or computer code

Submissions: Participants first registered for ARIAC through the online form and are then eligible to participate in the qualifier. A minimum score was determined for the qualifier, which Participants have to meet or exceed to be eligible for the final competition. Participants had two work weeks from the date that the qualifier was released to submit their software control system that addresses the challenges in the qualifier. For the finals, they provided NIST with their code by the due date, and their results were provided to them approximately two weeks later. Participants developed a robot control system (software) to control a robot in a simulated industrial environment like those in real-world order fulfillment centers or manufacturing floors. Gazebo, which is an open-source robotics simulation environment, was used as the testing platform, and the Robot Operating Systems, which is

an open-source set of software libraries and tools, was used to define the interfaces to the simulation system.

Evaluation of Submissions: As outlined in the official rules, evaluation criteria were a combination of automated metrics based on data retrieved from the simulation package (up to 80 points; scoring metrics described in the Rules) and the assessment of a panel of judges (up to 20 points, as described in the Rules). The NIST Director appointed a panel of three qualified judges from outside of NIST with expertise in robot agility and/or simulation. The judges determined winners using the two judging criteria stated in the rules: (1) a score of up to 80 points based on scoring metrics; and (2) up to 20 points for the novelty of approach and alignment with the spirit of the competition.

Partnerships: No partners were indicated.

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. The ARIAC Competition spawned innovation by representing the industry's challenges with using robots, by using a simulated environment in a way that allows both academia and industry to more easily access and understand these challenges and develop innovative solutions to address them.

Plan for Upcoming Two Fiscal Years: Potential topical areas for the NIST ARIAC prize competitions during the upcoming two fiscal years include modeling additional industry robot challenges in the simulated environment to allow the competitor to have access to a richer set of challenges, allowing them the opportunity to develop innovative solutions to these challenges.

B.3.3. Automated Streams Analysis for Public Safety (ASAPS) Prize Challenge: Contest 1[47]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) of the National Institute of Standards and Technology (NIST) conducted the first of four planned contests in the Automated Streams Analysis for Public Safety (ASAPS) Prize Challenge. The ASAPS Challenge focused on the development of algorithms to detect and analyze a variety of emergency events from unstructured public safety data in real time. The increasing magnitude of live data from a variety of sources presents both a challenge and opportunity to public safety in making life-critical decisions regarding response and coordination to emergencies. The ASAPS Challenge was an artificial intelligence (AI) challenge to detect, analyze, and alert public safety to emergencies from streaming data. ASAPS fostered groundbreaking multidisciplinary research and

[47] The website for Automated Streams Analysis for Public Safety (ASAPS) Prize Challenge: Contest 1 is accessible at https://www.challenge.gov/challenge/ASAPSContest1/.

innovation in real-time emergency data analytics using a first-of-its-kind data set of unstructured data from video, audio, textual communications, social media, and sensors. PSCR designed the ASAPS Contest 1 as the initial contest in a four-contest series. PSCR awarded prizes to six teams who submitted innovative concepts that addressed information extraction across multimodal data streams to analyze data in real-time to generate actionable data reports about simulated and staged emergency events. One of the most important objectives of this challenge was to demonstrate how data can be used to enable decision support tools and capabilities for public safety. PSCR originally planned for three follow-on prize competitions; however, in place of follow-on contests, PSCR released the ASAPS Development Data for open research. The robust dataset includes eight continuous hours of over 40 multimodal data streams annotated for 62 emergency events and their corresponding evidence.

Budget and Resources: Agency funds were used for Federal employee salaries and contract for a challenge implementation vendor. In addition to website design, communications, and outreach, the vendor also provided data set creation and software development for phase 1. Overhead paid on the contract costs supported internal administrative and acquisition support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
FTEs	Not applicable	1.3
Funding Estimate	Not applicable	$7,586,000
Agency Fund Use	Not applicable	Federal personnel (FTE); Operations or administrative support; Other (Contracted Vendor); Prize purse (monetary award)

Goal Types: Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: The future of public safety demands automated solutions to analyze data in real-time, provide improved situational awareness, and inform decision making. Extracting information from video, audio, text, social media, and sensor data streams presents a significant analytic challenge. Currently, there are few tools to analyze these types of unstructured data in real-time and virtually no automated tools to create dynamic interfaces for public safety organizations. With the maturation of artificial intelligence (AI) technologies, specialized architectures and processors for AI applications, cloud computing, high-speed communications networks, and streaming data resources, it is now possible to create automated tools to assist public safety organizations in analyzing increasingly large amounts of information. Such tools will help distill, structure, and present information from a plethora of data streams to support time-critical decision making for public safety organizations.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$180,000	5	6	09-24-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$150,000	$180,000

Non-Cash Prizes Include: Winners collaborated and networked with leading researchers in the field of data analytics and were able to promote themselves as leaders in this emerging research area. NIST will recognize participants for their achievements at a wrap-up workshop, and winners will have an opportunity to discuss their solutions.

Participants:

FY19: Not applicable

FY20: 60 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2020-04-13	2020-08-07	2020-09-24	32

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept

Submissions: Participants submitted concept papers outlining their understanding of the research problem and their proposed approach to bridging the technology gaps. Participants targeted their submission to one or more of four topic areas: 1) information extraction across multiple streams and data sources; 2) information fusion across extracted data and generation of live/dynamic information representation; 3) automated emergency event analysis; and 4) extraction-to-analysis systems approach. Success in the ideation contest is dependent upon a clear vision of the components, platform, and novel approaches that fulfill the functions of real-time information extraction, live

dynamic information fusion and representation, and evolving emergency event analysis. Contestants were encouraged to build multidisciplinary teams.

Evaluation of Submissions: As outlined in the official rules for the challenge, subject matter experts reviewed submissions, and a panel of judges, appointed by the NIST Director, determined winners based on the judging criteria. In contest 1, Concept Paper, the judges evaluated each participant's submission in five areas: a) demonstrate a clear understanding of the current state of the art and emerging trends; b) identification of technology gaps; c) approach to bridging technology gaps; d) demonstration of creativity and innovation, and e) discussion of implementation strategies.

Partnerships: No partners were involved in the prize competition.

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. NIST's Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) drives innovation and advances public safety communication technologies through cutting-edge research and development (R&D). PSCR works directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. The ASAPS Challenge advances the agency's mission by driving innovation in real-time data analytics, thus improving emergency alerts, situational awareness, and decision support tools and capabilities for public safety organizations. In line with the PSCR mission, this prize competition seeks to demonstrate an end-to-end system for public safety organizations by collaborating with solvers across a wide variety of sectors and with unique expertise.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years include user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.4. CHARIoT Challenge - Advancing First Responder Communications[48]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The CHARIoT Challenge (Challenge: Augmented Reality and Internet of Things), hosted by the National Institute of Standards and Technology (NIST), Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) and its challenge partners,

[48] The website for CHARIoT Challenge - Advancing First Responder Communications is accessible at https://www.challenge.gov/challenge/chariot/.

invited innovators to build augmented reality (AR) interfaces or Internet of Things (IoT) data emulators by participating in a multi-phase contest. The challenge simultaneously ran two multi-phase contests: Build Augmented Reality Interfaces for First Responders and Emulate Smart City Data for Disaster Scenarios. Police, Fire, and Emergency Medical Services crews cannot respond efficiently without proper situational awareness. Up to now, they have relied on eyewitness, radio, and traditional communications channels for information. Today, IoT devices, smart buildings, and smart cities also have the potential to provide tremendous amounts of information that remain largely inaccessible to first responders and incident command officers. Through the CHARIoT Challenge, the AR and IoT contestants will demonstrate these IoT data streams and integrate them into actionable AR solutions that together will help public safety personnel communicate and respond more efficiently during four emergency scenarios: active shooter, flood, mass transit, and wildfire. The contestants' final submissions will be evaluated in 2021.

Budget and Resources: Agency funds were used for Federal employee salaries and to contract a vendor for prize competition implementation. The vendor provided website design and development; hosted communications and outreach support to promote the prize competition to targeted groups; provided business technical assistance services to the contestants; created challenge-provided IoT data streams and will host the final evaluation at a public safety training center. Overhead paid on the contract costs supported internal administrative and acquisition support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
FTEs	0.25	0.75
Funding Estimate	Not applicable	$460,000
Agency Fund Use	Not applicable	Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award)

Goal Types: Develop/demonstrate technology

Problem or Opportunity Addressed: Public safety first responders operate in challenging environments during emergency responses. Today, America's first responders do not have convenient access to the critical information that they need to make informed decisions during emergencies or disasters; also, current advancements in AR technology have been largely unavailable to first responders. Through this prize competition, developers leveraged AR technology, such as heads-up displays and holographic interfaces, to convey actionable information to first responders without distractions or cognitive overload. Researchers contributed to solutions that enable first responders to have access to IoT devices and smart building data streams. These solutions can significantly improve first responders' situational awareness, allowing them to more effectively plan and respond, decreasing the time it takes for them to make life-saving decisions.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low-risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$30,000	42	26	05-15-2020
2	$246,000	132	78	06-24-2020
3	$202,000	55	39	09-29-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$918,000	$478,000

Non-Cash Prizes Include: Winning contestants may receive additional prizes and technical mentorship opportunities with key challenge partners: Magic Leap, First Responder Network Authority, FirstNet built with AT&T, MSA Safety, and Blueforce Development. Each Augmented Reality contestant that advanced past phase 2 was provided the opportunity to participate in the Kauffman Foundation's FastTrac TechVenture entrepreneurial development program. A final AR contestant will also have the chance to win $10,000 for continued business technical assistance.

Participants:

FY19: Not applicable

FY20: 36 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	03-11-2020	05 -06-2020	05 -15-2020	36
2	05-16-2020	06-17-2020	06-24-2020	24
3	06-17-2020	09-01-2020	09-29-2020	19

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media

Phase	Submission Type
2	Proposal or concept; Prototype device or object; Software or computer code
3	Prototype device or object; Software or computer code

Submissions: In phase 1, each participant submitted a concept paper and video outlining their team's proposed solution, approach, capabilities, knowledge, and skills for their respective contest. In phase 2, the AR contestants demonstrated their partnership with a public safety entity and created/enhanced one augmented reality interface. In phase 2, the IoT contestants emulated sensor data for at least two of the four emergency scenarios. In phase 3, the AR contestants submitted up to 8 interfaces and the IoT contestants finalized their emulated data and submitted a wireless network router and their data transmitters pre-configured for all four emergency scenarios. In phase 4, the AR contestants will submit their finalized interfaces, and the IoT contestants will submit their finalized emulated data and transmitter for evaluation at a public safety training center.

Evaluation of Submissions: Using the official rules for the challenge, subject matter experts reviewed submissions. The panel of judges, appointed by the NIST Director, determined winners based on the judging criteria. In phase 1, Concept Paper, the judges evaluated each participant's proposed approach to ensure the participant demonstrated a clear understanding of the problem and the challenge goals to emulate smart-city data and visualize the data for first responders during emergency scenarios. In phase 2, invited participants from phase 1 were evaluated on (AR) their created/emulated augmented reality interface and completion of the requirements to partner with a public safety entity; (IoT) their emulated data and demonstration of their network transmission skills. In phase 3, judges evaluated: (AR) the participants' augmented reality interfaces and emulated data for the four emergency scenarios. In phase 4, the judges will evaluate the finalized interfaces and emulated data at a public safety training center.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
FirstNet Built with AT&T	Private Industry	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)
First Responder Network Authority	Federal Agency or Office	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)
Magic Leap	Private Industry	Not applicable	$16,000	Non-monetary award(s); Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or app development and support

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
MSA Safety	Private Industry	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)
Blueforce Development	Private Industry	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. The Public Safety Communications Research Division (PSCR) drives innovation and advances public safety communication technologies through cutting-edge research and development (R&D). PSCR works directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. The CHARIoT Challenge advanced the agency's mission by enabling first responders to have access to IoT data and by presenting the information through interfaces designed specifically for first responders. By leveraging augmented reality, this challenge demonstrated how to convey actionable information to first responders without distractions or cognitive overload. These solutions can improve first responders' situational awareness, allowing them to more effectively plan and respond during emergency scenarios.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.5. Consumers Combat Counterfeits[49]

Sponsoring Agency and Office: U.S. Patent and Trademark Office

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

[49] The website for Consumers Combat Counterfeits is accessible at https://www.uspto.gov/trademark/trademark-updates-and-announcements/anti-counterfeiting-video-contest.

Competition Summary: Consumers Combat Counterfeits was part of a public education initiative launched by the USPTO in 2018. Consumers Combat Counterfeits was a video contest aimed at educating the public about the dangers of counterfeit products while also allowing the public to educate us on messages about counterfeit products that would resonate with them. The video contest provided two opportunities to provide intellectual property (IP) education and awareness; during the contest phase, as contestants researched the topic to prepare submissions, and during the promotional phase, as winning entries discussing the dangers of counterfeit products were conveyed to the general public. Each participant created a 60 second video highlighting the dangers of counterfeit products. The contest was open to U.S. citizens age 10 and above in five categories, based on age and affiliation. Prizes for winning entrants included cash prizes, use of the winning entries by the USPTO in our efforts to educate the public about counterfeits, and a paid trip to Alexandria, Virginia for the awards ceremony and a tour of the U.S. Capitol building.

Budget and Resources: No additional agency funds were used beyond paying for the prize purse and non-monetary awards for winners. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Non-monetary award(s); Prize purse (monetary award)	Not applicable
FTEs	1	Not applicable
Funding Estimate	$16,506	Not applicable

Goal Types: Education/training; Outreach/information dissemination

Problem or Opportunity Addressed: Consumers Combat Counterfeits was part of a public education initiative aimed at educating the public on the harms of counterfeit products. Counterfeits pose a serious risk to consumers' health and safety, as well as the economic stability of our nation. Counterfeit goods often imitate legitimate goods by using their branding on goods that have not met the same production standards, thus potentially endangering the health and safety of consumers. Additionally, the criminal organizations who profit from counterfeits present new challenges for consumers, the private sector, and U.S. agencies that enforce intellectual property rights. There is an ongoing need for public education in combatting the growing threat of counterfeits. This video contest was designed to educate and spread awareness about the dangers of counterfeit products and how to distinguish them from safe and legitimate products.

Justification for Using Prizes and Challenges: Most cost-effective approach; Less burdensome to design and execute than alternatives; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$7,000	5	5	03-25-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$7,000	$7,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Pursuant to the authority under the COMPETES Act, winning participants were provided with travel, lodging, and meal expenses for a trip to Alexandria, Virginia for an awards ceremony. Winners were given an award certificate at the ceremony. After the ceremony, the winners were taken on a guided tour of the Capitol building in Washington, DC. The USPTO published the winning videos on our website for public recognition of the winners and winning videos. Winning videos may also be used in future USPTO public awareness campaigns on counterfeit products.

Participants:

FY19: 57 team(s)

FY20: Not applicable

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Adult not affiliated with higher education

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
07-27-2018	11-16-2018	57

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Posted on challenge.gov

Submission Types: Creative media

Submissions: The contest invited entrants to submit creative 30-60 second videos about counterfeit products. The video entries provided information about the harmful effects of counterfeit products and the need to combat the growing worldwide threat of counterfeit products.

Evaluation of Submissions: The videos were first reviewed to determine whether they met the requirements stated in the contest rules, including adhering to the time limitations and rules regarding using the intellectual property of others. Next, the video submissions were reviewed and scored in each of the four judging criteria for the submissions. Nine USPTO employees served as judges. Those criteria were: 1) The video topic's relevance to counterfeiting dangers and solutions; 2) Accuracy and persuasiveness of the information conveyed in the video; 3) Creativity and originality; and 4) Production quality of the video. The top 2 to 3 scores in each category advanced to the final round of judging based on the same judging criteria. The final round included three judges: Commissioner for Trademarks, an attorney in the Office of Policy and International Affairs, and a member of the Trademark Public Advisory Committee.

Partnerships: No partners were involved in the prize competition.

Advancement of Agency Mission: The USPTO's mission is fostering innovation, competitiveness, and economic growth in the United States by conducting high quality and timely patent and trademark examination and review proceedings in order to produce reliable and predictable intellectual property rights; guiding intellectual property policy; and delivering intellectual property information and education worldwide. This contest contributed to the USPTO's goal to deliver intellectual property information and education. The video contest advanced information and education delivery on the dangers of counterfeit products in two phases, first during the contest phase as public contestants researched the topic to prepare submissions, and second during the promotional phase, as winning entries highlighting the dangers of counterfeit products were shared with the general public.

Plan for Upcoming Two Fiscal Years: None reported

B.3.6. Differential Privacy Synthetic Data Challenge[50]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Institute of Standards and Technology (NIST), Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) advances public safety communication technologies through cutting-edge research and development. PSCR works with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. The Unlinkable Data Challenge—comprised of two phases: 1-Advancing Methods in Differential Privacy and 2-Differential Privacy Synthetic Data—advanced NIST's mission by developing data privacy using differential privacy techniques that can substantially improve the privacy protection of a dataset while maintaining the dataset's usefulness for analysis. The advancement of differential privacy algorithms that redact personally identifiable information (PII) while retaining data utility will increase the opportunity to share datasets amongst public safety agencies and researchers. Examples of public safety research issues include identifying risks in aviation, identifying patterns of violence in communities, aiding disaster contingency planning, and assisting in tracking contagious diseases. Four winning teams voluntarily uploaded their source code to an open-source repository, increasing the impact of this challenge by advancing the practical applications of differential privacy for public safety researchers. One of the biggest impacts of this challenge was to show the community of differential privacy experts the results of taking theory and moving it to applied algorithms. There were also new developments in benchmarking techniques and, for the first time, two competing approaches to differential privacy theory were clearly benchmarked

[50] The website for Differential Privacy Synthetic Data Challenge is accessible at https://www.challenge.gov/challenge/differential-privacy-synthetic-data-challenge/ https://www.challenge.gov/challenge/the-unlinkable-data-challenge-advancing-methods-in-differential-privacy/.

against each other. This challenge successfully expanded the solver community for this specialized field by recruiting new data scientists, coders, and statisticians.

Budget and Resources: Agency funds were applied to Federal employee salaries and travel, contractor support, marketing materials, and administrative support for procurements and travel. Contractors provided technical project leadership, contributions to a NIST publication, website development, marketing, outreach, platform support, and competition design and execution. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Purchase of consumable materials; Transportation of participants	Not applicable
FTEs	0.5	Not applicable
Funding Estimate	$6,000	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: The purpose of this challenge was to advance methods of differential privacy to aid public safety data researchers in quickly and reliably de-identifying large datasets for near-real-time analysis. In phase 1, participants proposed new algorithms utilizing existing or new randomized mechanisms with a justification of how the solution would optimize privacy and utility across different analysis types. Solvers also proposed datasets that would be a good use case for their algorithm and provide a means of comparing algorithms. In phase 2, through a series of coding competitions, solvers developed advanced differentially private methods that can substantially improve the privacy protection and utility of the resulting datasets. This competition proved to be the first time that two competing differential privacy approaches were clearly benchmarked against each other. This was also a new opportunity for leaders in the field to take differential privacy theory and convert it to a practical application.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$40,000	5	5	09-15-2018
2	$150,000	32	31	05 -23-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$150,000	$146,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: NIST invited winners to attend the PSCR 2019 Public Safety Broadband Stakeholder Meeting in Chicago to present their solutions. At the meeting, presenters had the opportunity to meet with public safety stakeholders to obtain feedback and to learn more about issues facing public safety first responders.

Participants:

FY19: 50 team(s)

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	05-01-2018	08-02-2018	05-23-2018	11
2	10-13-2018	04-23-2019	05-23-2019	50

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Software or computer code; Analysis or visualization of data

Submissions: For phase 1, solvers submitted concept papers identifying unique theories and methodologies in differential privacy, exposing ideas that may have been evolving but had not yet been documented. The concept papers served to examine current differential privacy theories and set expectations for the coding phase. Phase 1 also encouraged new data scientists to become involved and to learn new privacy techniques. For phase 2, the empirical or coding phase, participants applied and tested new techniques described in phase 1 or new methods that had not previously been identified. Additionally, the NIST team developed new means to evaluate and measure the code for differential privacy techniques. Benchmarks and feedback were incorporated into a series of coding matches designed to rapidly drive improvement of the techniques. The empirical approach provided the motivation and tools for teams to refine their solutions through repeated evaluation of their algorithms on real-world datasets.

Evaluation of Submissions: NIST identified ten differential privacy subject matter experts to assist with the challenge. The selected experts were academic, government, and industry professionals with extensive backgrounds in statistics and mathematics, as well as experience in developing differential privacy-based solutions. The subject matter experts participated in ad hoc design meetings and served as reviewers for contestant submissions. Submissions that passed the compliance review were scored based on accuracy during a sequestered evaluation: each submitter's code was run against a blind (sequestered) dataset, and metrics were computed between analytics results on the synthetic privatized dataset and the original dataset. Judges, appointed by the NIST Director, evaluated the scoring and determined the winners.

Partnerships: No partners were involved in the prize competition.

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. PSCR drives innovation and advances public safety communication technologies through cutting-edge research and development. NIST has a strong commitment to both public safety research and the preservation of data security and privacy, including the use of de-identification methods. The Differential Privacy Synthetic Data Challenge advanced NIST's mission by improving both differential privacy algorithms for developing synthetic data and the methods to test and benchmark these algorithms. In addition, this prize competition broadened the pool of solvers for future data privacy research.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.7. Differential Privacy Temporal Map Challenge[51]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: The Differential Privacy Temporal Map Challenge is a series of contests in data privacy for public safety, running from October 2020 to October 2021, with prize awards up to $276,000. This challenge follows on the success of the National Institute of Standards and Technology (NIST), Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) Differential Privacy Synthetic Data Challenge and seeks new tools to push the boundaries of

[51] The website for Differential Privacy Temporal Map Challenge is accessible at https://www.challenge.gov/challenge/differential-privacy-temporal-map-challenge/.

current technologies for de-identifying data sets relevant to public safety. The series of contests will include a metrics development contest where participants propose algorithm testing metrics in a white paper; a series of algorithm sprints that will explore new methods in differential privacy; and a contest designed to improve the usability of solvers' source code, open to participants of the algorithm sprints. The goal of the challenge is to advance differential privacy technologies by building and measuring the accuracy of algorithms that de-identify datasets containing time (temporal) and spatial (map) information with provable formal privacy. Public safety agencies collect extensive data containing time, geographic, and potentially personally identifiable information. These datasets can be an invaluable tool for policymakers, researchers, and the public in general. However, tools do not yet exist to de-identify these datasets and preserve their utility while guaranteeing the records cannot be used to re-link to individuals. PSCR is inviting the public to explore new computational methods to de-identify these datasets and assess the quality of the output data. Some of the key features and capabilities for de-identification algorithms sought in this challenge include: output data that satisfies formal differential privacy; preservation of the original dataset's characteristics, especially sequential data and geographic characteristics; and robust ability to process a wide variety of temporal and spatial data.

Budget and Resources: Agency funds were used for Federal employee salaries, contractor expertise in data privacy, and contractor support in challenge design, implementation, website design, development, and hosting. Overhead paid on the contract costs supported internal administrative and acquisition support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Operations or administrative support
FTEs	Not applicable	0.5
Funding Estimate	Not applicable	$1,080,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: For critical applications, such as emergency planning and epidemiology, public safety responders may need access to sensitive data, but sharing that data with external analysts can compromise individual privacy. Even if data is anonymized, malicious parties may link the anonymized records with third-party data and re-identify individuals. When data has both geographical and time information, the risk of re-identification increases significantly. Differential privacy provides much stronger data protection than anonymity; it is a provable mathematical guarantee that protects personally identifiable information (PII). Temporal map data, with its ability to track a person's location over a period of time, is particularly helpful to public safety agencies when preparing for disaster response, fire-fighting, and law enforcement tactics. The goal of this challenge is to develop solutions that can protect the privacy of individual citizens and first responders when agencies need to share data.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners;

Develop solutions in a quick timeframe; Most cost-effective approach; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse Available	Awards Available	Awards Given	Winners Announcement Date
1	$29,000	5	Not applicable	02-04-2021
2	$147,000	27	Not applicable	06-16-2021
3	$100,000	30	Not applicable	10-27-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$0	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: Not available

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	10-01-2020	01-05-2021	02-04-2021	None reported
2	10-01-2020	05-17-2021	06-16-2021	
3	06-10-2021	10-09-2021	10-27-2021	

Solicitation of Submissions: Social media; Email; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept

Phase	Submission Type
2	Software or computer code
3	Software or computer code; Business or commercial development plan

Submissions: In phase 1, the Metric Paper Contest, participants will submit a concept paper proposing novel scoring metrics by which to assess the quality of differentially private algorithms on temporal map data. In phase 2, the Algorithm Contest, participants will compete in a series of sprints, writing and testing software algorithms. In the final phase, the Open Source and Development Contest, participants are incentivized to release their solution in an open-source software repository. Participants will provide their algorithms, supporting documentation, software development plan, and differentially private dataset contributions.

Evaluation of Submissions: Concept papers received in the Metric Paper Contest will be reviewed by data privacy experts and evaluated by the judges against the criteria published in the official rules. During the Algorithm Contest, participants will test their algorithms against a prescribed publicly available dataset, producing a synthetic dataset. Participants with algorithms that produce high-quality privatized synthetic datasets that better preserve time and spatial data will receive higher scores. Participant entries from the Algorithm Contest that are validated as differentially private will be invited to the Open Source and Development Contest. These participants will provide algorithms, supporting documentation, software development plans, and differentially private dataset contributions that can support public safety research and development. Software development plans will describe how they will improve their code, improve documentation, and demonstrate the application of their solution to public safety.

Partnerships: No partners were involved in the prize competition.

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. PSCR drives innovation and advances public safety communication technologies through cutting-edge research and development. PSCR works directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. The Differential Privacy Temporal Map Challenge aims to advance the agency's mission by providing public safety data analysts with secure, provable methods for de-identifying datasets that include temporal and spatial characteristics. Once a dataset is securely de-identified, analysts may share that data with other researchers and other public safety agencies with the goal to improve public safety data analytics.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.8. Enhancing Computer Vision for Public Safety Challenge[52]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: The National Institute of Standards and Technology (NIST), Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) launched the Enhancing Computer Vision for Public Safety challenge to create a new line of computer vision research to assist with the development of life-saving tools for public safety. Public-safety officers who rely on computer vision in the field are often limited by image quality issues such as dirt or grease on a camera lens, poor lighting, or simply low-quality camera equipment. To help first responders, PSCR wants to understand what "good quality" means to a computer vision algorithm. The prize competition has three goals: (1) create training data, including images and videos depicting camera impairments that hinder computer vision algorithms; (2) measure failure rate and research the best methods to assess the likelihood that the computer vision algorithms can make reliable decisions; (3) open data to inspire new research. This challenge will enable a new line of research into metrics that will complement computer vision. Referred to as no reference (NR) metrics for computer vision, these algorithms will automatically identify quality problems that hinder computer vision algorithms. PSCR envisions using computer vision systems in combination with NR metrics to mitigate camera impairments. By making these computer vision systems smarter, emergency operations can become safer.

Budget and Resources: Agency funds were applied to Federal employee salaries and benefits, contractor support, and administrative support for procurement. The support contractor provided website development, marketing, video production services, advertising, and webinar production. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Operations or administrative support
FTEs	Not applicable	0.25
Funding Estimate	Not applicable	$37,400

Goal Types: Develop/demonstrate technology; build or strengthen community; generate innovative ideas/designs/concepts

[52] The website for Enhancing Computer Vision for Public Safety Challenge is accessible at https://www.challenge.gov/challenge/enhancing-computer-vision-for-public-safety-challenge/.

Problem or Opportunity Addressed: First responders operate in environments that are very challenging for cameras. Frequent image quality issues arise in emergency scenarios such as dirt or grease on a camera lens, poor lighting, or simply low-quality camera equipment. First responders need robust computer vision systems that can operate in these difficult environments. To develop robust systems for public safety, computer vision researchers need an algorithm that predicts the quality of images and videos and performs root cause analysis. These are referred to as NR metrics for image quality assessment or video quality assessment. Computer vision systems can use this information to mitigate issues or make internal changes, such as identifying the problem and choosing alternate computer vision algorithms. With smarter computer vision systems, emergency operations can become safer. This challenge encourages solvers to advance the capacity of NR metrics and computer vision algorithms.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse Available	Awards Available	Awards Given	Winners Announcement Date
1	$50,000	10	Not available	10-30-2020
2	$190,000	22	Not available	05-19-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$0	$0

Non-Cash Prizes Include: During the challenge, contestants may network with challenge partners, learn from the community, and have an impact on public safety. Previous PSCR challenge winners have been able to continue public safety research, partner with public safety organizations (PSOs), and learn about future funding opportunities. Winners will be featured on the NIST website, newsletters, social media, and other outreach materials.

Participants:

FY19: Not applicable

FY20: 0 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-08-2020	10-20-2020	10-30-2020	None reported
2	11-03-2020	05-04-2021	05-19-2021	

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Creative media; Other (documentation)

Submissions: Participants in phase 1 will submit a concept paper for either category (a)-specific camera impairment or category (b)-single computer vision application. Within the paper, participants will detail their image collection plan, proposed cameras, a method to assess the failure rate of computer vision applications, and the relevant experience of the team. Phase 2 participants will submit datasets of 250+ images or 250+ videos, the failure rates for each image or video, categorical data which subdivides the dataset, and a paper summarizing the execution of the proposal submitted in the contestant's phase 1 concept paper.

Evaluation of Submissions: Based on the judging criteria in the official rules for the challenge, subject matter experts will review submissions, and a judging panel, appointed by the NIST Director, will select the winners for each phase. Phase 1 submissions will be evaluated for knowledge and relevance, technical approach, and subject matter. Phase 2 submissions will be evaluated for compliance, dataset quality, assessment data, and documentation.

Partnerships: The prize competition involved one partner. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
First Responder Network Authority	Federal Agency or Office	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. PSCR drives innovation and advances public safety communication technologies through cutting-edge research and development. PSCR works directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on

commercial networks now expect. The Enhancing Computer Vision for Public Safety Challenge advances NIST's missions by spurring the development of computer vision algorithms to aid in further research in public safety-focused computer vision systems. This challenge also contributes to the NIST mission by expanding the research community and increasing public awareness of NIST's research in the arena of public safety.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.9. Expanding the SIM Card Use for Public Safety Challenge[53]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Through the Expanding the SIM Card Use for Public Safety Challenge, NIST's Public Safety Communications Research (PSCR) Division sought solvers' assistance to explore the possibilities for using the Universal Integrated Circuit Card (UICC), commonly known as the SIM card, as a secure storage container for application credentials. The SIM card, already used in every mobile device, has characteristics that make it a robust, secure storage device. The SIM card is a tamper-resistant hardware storage container. If utilized as an application credential storage container, it would enable applications to use the authentication credentials provisioned to it seamlessly. It offers several usability benefits for public safety, as it would be more user-friendly; allow networks to provision credentials over-the-air via a secure channel; and potentially enable device sharing by keeping sensitive information on the removable SIM card. Since the SIM card is currently used in every mobile device, it could offer cost savings for public safety units as extra hardware would not be necessary. This challenge consisted of three integrated phases that ranged from concept design to the final phase, where contestants created a mobile application that utilized a credential stored on the SIM card that could complete authentication, verified by FIDO2 service providers. The FIDO (Fast Identity Online) Alliance is an open industry association focused on authentication standards to reduce the world's over-reliance on passwords. The FIDO2 specifications include the World Wide Web Consortium's (W3C) Web Authentication (WebAuthn) specification and FIDO Client-to-Authenticator Protocol (CTAP). The winning participants demonstrated that authentication credentials could be stored on a SIM Card and could be read and utilized to complete a secure authentication, certified by a FIDO2 authentication service. Over the three-phase prize competition, NIST awarded 16 prizes

[53] The website for Expanding the SIM Card Use for Public Safety Challenge is accessible at https://www.challenge.gov/challenge/expanding-the-sim-card-use-for-public-safety-challenge/.

totaling $76,000 to 6 teams. The PSCR Security Portfolio team is continuing their research with the challenge partners IBM Security and Nok Nok.

Budget and Resources: Agency funds were used for employee salaries, advertising, and a contract for website design, development, and hosting. The contract vendor also provided communications and outreach support to promote the prize competition to targeted groups. Overhead paid on the contract costs supported internal administrative and acquisition support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Prize purse (monetary award)
FTEs	0.5	0.2
Funding Estimate	$32,000	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community; Other

Problem or Opportunity Addressed: Public safety personnel frequently rely on their mobile devices to access sensitive information and therefore need a secure access mechanism. Current solutions call for external hardware that is both cumbersome in emergency situations and expensive. The UICC, commonly known as the SIM Card, is a robust storage device already found in all mobile devices. The SIM Card is tamper-resistant, can communicate provisioned credentials over-the-air via secure channels, and allows for device sharing. As a storage device for application credentials, the SIM Card would allow public safety personnel to access credentials, receive authentication, and conduct job requirements without hindrance. The purpose of this challenge was to determine if the SIM Card could be used as a storage device for sensitive credentials and be able to retrieve those credentials for secure authentication.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$6,000	20	6	06-03-2019
2	$10,000	10	5	08-14-2019
3	$60,000	5	5	10-23 -2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$40,000	$15,000
FY20	$60,000	$60,000

Non-Cash Prizes Include: Participants took advantage of the opportunity to network with the three partners, First Responder Network Authority, Nok Nok Labs, and IBM Security. The grand prize winner demonstrated their prototype at the 2020 Consumer Electronics Show at the PSCR booth.

Participants:

FY19: 6 team(s)

FY20: 3 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-03-2019	05-22-2019	06-03-2019	6
2	06-03-2019	07-26-2019	08-14-2019	6
3	08-14-2019	10-09-2019	10-23-2019	3

Solicitation of Submissions: Social media; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept; Software or computer code
3	Prototype device or object; Software or computer code

Submissions: In phase 1, participants submitted a concept paper outlining their proposed approach to securely store and then utilize authentication credentials on the SIM card. In phase 2, participants submitted a detailed description of their methodology, including the programs they used for writing the file to the SIM; the file structure of the SIM, including the file location; access rules on the files; and source code. Participants also held a screen share session with subject matter experts and judges to demonstrate their solution for storage on the SIM card. Participants demonstrated the following: the process to provision the file to a SIM card; storage of a file on a SIM card; file structure of a SIM card, including file's location. In phase 3, judges evaluated the participant's mobile application and how

that application (a) utilized a credential stored on the SIM card and (b) completed an authentication verified by one or more FIDO2 service providers.

Evaluation of Submissions: As outlined in the official rules for the challenge, subject matter experts reviewed submissions, and a panel of judges, appointed by the NIST Director, determined winners based on the judging criteria. In phase 1, Concept Paper, the judges evaluated each participant's proposed approach to ensure that the participant demonstrated a clear understanding of the problem and the objective to securely store and then utilize authentication credentials on the SIM card for first responders. In phase 2, invited participants from phase 1 were evaluated on their methodology for storing a file on a SIM Card and on their demonstration of that methodology. In phase 3, judges evaluated the participant's mobile application and how that application (a) utilized a credential stored on the SIM card and (b) completed an authentication verified by one or more FIDO2 service providers.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**	**Partner Contribution Types**
First Responder Network Authority	Federal Agency or Office	$3,000	$0	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)
Nok Nok Labs	Private Industry	$3,000	$10,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges; Authentication Services for Phase 3; hosted a webinar for contest participants to demonstrate their authentication service.)
IBM Security	Private Industry	$3,000	$10,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges; Authentication Services for Phase 3; hosted a webinar for contest participants to demonstrate their authentication service.)

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. NIST's PSCR Division drives innovation and

advances public safety communication technologies through cutting-edge research and development. This challenge advanced NIST's mission by improving the ways in which public safety personnel access and store their information. The challenge required solutions to leverage the existing capabilities of the SIM Card while respecting the needs of public safety personnel. Contestants created solutions that eliminated the need for burdensome equipment in favor of lightweight, readily available mobile devices. Using the SIM Card as a storage mechanism will also protect sensitive information via network-provisioned credentials by providing public safety personnel with convenient, secure, and inexpensive solutions to store and access their information.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.10. First Responder UAS Endurance Challenge[54]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The National Institute of Standards and Technology (NIST), Communications Technology Laboratory, Public Safety Communications Research Division (PSCR) drives innovation and advances public safety communication technologies through cutting-edge research and development. PSCR works directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. PSCR launched the First Responder UAS Endurance Challenge, a 4-stage challenge with prize awards up to $552,000, on April 1, 2020. The advancement of Unmanned Aircraft Systems (UAS) research achieved through this challenge will help support the development and operation of UAS that are intended to host critical tools for public safety missions, such as wireless communications systems. In pursuit of this goal, PSCR is investigating drones (i.e., UAS) as deployable systems to enable first responders with broadband connectivity services by increasing the UAS flight endurance and efficiency when carrying a payload. In a typical search-and-rescue scenario, teams of law enforcement, firefighters, and other emergency agencies may be dispatched to a location where broadband LTE communications are unavailable. To maintain communication amongst first responders on the ground, a drone carrying an LTE system could be deployed that would extend the communications coverage area beyond the immediate area. Currently, first responders are using drones to provide many different mission capabilities, but the drones' flight time is limited. The UAS payload capacity, energy source and flight

[54] The website for First Responder UAS Endurance Challenge is accessible at https://www.challenge.gov/challenge/first-responder-uas-endurance-challenge/.

time are linked through design trade-offs that can be optimized for efficiency and flexibility. This challenge is designed to keep a UAS and its payload airborne for the longest time possible to support first responders on the ground while they conduct their mission. The challenge will culminate in 2021.

Budget and Resources: Agency funds were used for Federal employee salaries, staff travel, and to contract with an implementation vendor. Overhead paid on the contract costs supported internal administrative and acquisition support. The agency obligated $824,000 in FY19 and $112,300 in FY20 in support of this challenge for the contest design and implementation vendor; these costs include overhead. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Other (contracted vendor)	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Other (contracted vendor)
FTEs	0.4	0.5
Funding Estimate	$824,000	$112,300

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: One of the barriers for the public safety community is having access to drones that can fly for long periods of time, ninety minutes or more, while carrying a heavy payload. Emergency responders can accomplish their mission more efficiently and effectively if the drone flight time for a known payload is maximized. In a typical search-and-rescue scenario, a team of one or two first responders may be dispatched to a location where broadband LTE communications are unavailable. To maintain communications, first responders might deploy an LTE system using a drone to provide communications to first responders on the ground and extend coverage to an area that is remote from where the drone initially launched. This challenge solicits innovative drone designs that can be cost-effectively manufactured and that support a variety of first responder use cases.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low-risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$100,000	20	20	06-16-2020
2a	$70,000	30	14	08-26-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$175,000	$170,000

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: 45 team(s)

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-01-2020	04-30-2020	06-16-2020	45
2a	06-01-2020	08-03-2020	08-26-2020	20

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2a	Prototype device

Submissions: In stage 1, participants submitted a concept paper outlining their knowledge, skills, capabilities and approach for this challenge. In stage 2, invited participants from stage 1 submitted documentation for a preliminary design review (milestone 1). In 2021, the participants will undergo a stage 2 critical design review (milestone 2). Participants who meet all standards for the stage 2 reviews will be invited to stage 3, along with selected walk-on participants. Stage 3 participants will submit videos of test and evaluation flights of their prototype to ensure the team has completed the minimum requirements for safety, hardware configuration, flight time, and payload. Winners of stage 3 will advance to stage 4, the live test and evaluation contest, which will include a safety review, static tests, technical flights, and an endurance flight of submitted drones.

Evaluation of Submissions: As described in the official rules for the 4-stage challenge, subject matter experts (SMEs) reviewed submissions prior to evaluation by the judges. A panel of judges, appointed by the NIST Director, determined winners based on the judging criteria. In stage 1, Concept Paper, the

judges evaluated submissions to ensure the participant demonstrated a clear understanding of the problem and the objective to design, build, and test a UAS for first responders' requirements. In stage 2, invited participants from stage 1 underwent a preliminary design review and were awarded cash prizes for passing this review. Later in stage 2 (2021), judges will evaluate participants' documentation for a critical design review. In stage 3, subject matter experts (SMEs) and judges will study the participants' video submissions for a comprehensive safety review. Finally, in stage 4, SMEs and judges will observe safety checks, flight tests, and endurance tests.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**	**Partner Contribution Types**
FirstNet Built with AT&T	Private Industry	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts)
First Responder Network Authority	Federal Agency or Office	Not applicable	$3,000	Publicity, advertising, outreach, or/and communications; Other (Subject Matter Experts and Judges)

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. PSCR drives innovation and advances public safety communication technologies through cutting-edge research and development. PSCR works directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. The First Responder UAS Endurance Challenge is advancing the agency's mission by crowdsourcing ingenuity by setting challenging requirements that push the boundary of drone technology and ancillary component development. The intended impacts of the results of the Challenge include collaborations and new partnerships; insights into new technologies and an array of new products; and influencing industry competitiveness while driving down UAS production costs.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.11. Haptic Interfaces for Public Safety Challenge[55]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Public safety officials perform tasks in a variety of environments that severely limit their senses and ability to communicate. Haptic devices, such as actuators, vibration motors, force feedback devices, temperature elements, electrical stimulation, or other tactile feedback devices, may assist first responders during a mission by augmenting senses and by improving communication with incident commanders and other first responders. Developing and testing most devices for public safety users can be costly as iterative testing in live scenarios is expensive and time-consuming. The researchers at the Public Safety Communications Research Division (PSCR) developed virtual reality (VR) environments specific to public safety (i.e., law enforcement, emergency medical services (EMS), and fire service) to study the potential of using VR environments for less-expensive, quicker iterative testing of new innovations for public safety. To address these two issues, NIST's PSCR Division hosted the Haptic Interfaces for Public Safety Challenge to investigate the relevance of haptic interfaces to assist in first responder tasks; to assess the potential of using virtual reality environments as a development tool to prototype and iterate on designs for public safety technologies; and to convene innovators to advance the state of haptic interfaces for public safety. Through this five-phase challenge, contestants developed haptic interface prototypes and integrated the prototypes into three PSCR-provided virtual reality scenarios. Finalists also embedded one of their haptic prototypes into firefighter personal protective equipment (PPE) for use in a live search and rescue task at a firefighter training facility. The solutions proved that haptic devices can successfully aid first responders in accomplishing their mission. Several innovators are furthering their research in haptic interfaces for public safety. The challenge design proved that VR environments are helpful for repeated testing prior to live environment testing.

Budget and Resources: Agency funds were applied to contractor support, travel expenses for Federal employees and invited subject matter experts (SMEs) and judges, and administrative support for procurements and travel. Contractors provided website development and hosting, marketing, and outreach. Funds were also used to rent the fire training center for the live event (phase 5, FY20). The following table indicates the budget and resources to support the activity.

[55] The website for Haptic Interfaces for Public Safety Challenge is accessible at https://www.challenge.gov/challenge/haptic-interfaces-for-public-safety-challenge/.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Non-monetary award(s); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Prize purse (monetary award); Transportation of participants
FTEs	0.75	0.25
Funding Estimate	$30,100	$5,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community; Other

Problem or Opportunity Addressed: The purpose of this challenge was to assess the potential of using VR environments as a development tool to prototype and iterate on designs for public safety technologies. The challenge also sought to investigate the relevance of haptic interfaces to assist in first responder tasks. This challenge also sought to convene members of the haptic provider community and innovators in the development community to advance the state of haptic interfaces for public safety.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	12	11	05-10-2019
2	$65,000	12	11	05-23-2019
3	$55,000	12	11	07-03-2019
4	$40,000	15	9	09-10-2019
5	$109,500	11	9	11-15-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$303,000	$160,000
FY20	$122,000	$109,500

Non-Cash Prizes Include: Non-monetary incentives included access to PSCR researchers and public safety professionals during the challenge. Participants who advanced to phase 3 were invited to attend the PSCR 2019 Public Safety Broadband Stakeholder Meeting to demonstrate their prototypes. The meeting attendees, who represented all segments of the public safety community, were asked to provide feedback to the prototype developers. Participants who advanced to phase 5, the live competition at the fire training center, were offered invitational travel arrangements.

Participants:

FY19: 16 team(s)

FY20: 6 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	03-18-2019	05-03-2019	05-10-2019	16
2	05-13-2019	05-21-2019	05-23-2019	11
3	05-24-2019	06-26-2019	07-03-2019	11
4	07-09-2019	08-23-2019	09-10-2019	11
5	09-10-2019	11-05-2019	11-15-2019	6

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Other
3	Other
4	Prototype device or object; Software or computer code
5	Prototype device or object; Other

Submissions: In phase 1 of the challenge, contestants from both the Haptic Providers and Haptic Development Teams submitted their concept papers outlining their proposed solution, approach, capabilities, knowledge, and skills for this challenge. In phase 2, the Haptic Providers and Haptic Development Teams submitted either signed teaming agreements or letters of intent to advance through the competition without teaming. The challenge consisted of three additional phases: phase 3, Demonstration of Haptic Interface Prototypes in Virtual Reality; phase 4, Evaluation Round 1-Haptic

Interface Prototypes in Virtual Reality; and phase 5, Evaluation Round 2 Haptic Interface Prototypes at Firefighter Navigation Course.

Evaluation of Submissions: As outlined in the official rules for the challenge, SMEs reviewed submissions. A panel of judges, appointed by the NIST Director, determined winners based on the judging criteria. The participants, consisting of Haptic Providers and Haptic Development Teams, and their haptic interface prototypes were evaluated in two key areas: 1) the impact of each prototype on a first responder's performance in three virtual reality (VR) scenarios [law enforcement, emergency medical services, and fire service] and 2) the effectiveness of the prototypes, once embedded into firefighter PPE, on a firefighter's ability to conduct a search and rescue task at a firefighter training facility.

Partnerships: The prize competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
First Responder Network Authority	Federal Agency or Office	$3,000	Not applicable	Operations or administrative support; Other (Subject Matter Experts and Judges)
FirstNet, built with AT&T	Private Industry	$3,000	Not applicable	Operations or administrative support; Other (Subject Matter Experts and Judges)
West Metro Fire Protection District	State or Local Government	Not applicable	$1,000	Purchase of consumable materials; Operations or administrative support; Other (Subject Matter Experts and Judges; loan of firefighter personal protective equipment (PPE))
MSA Safety	Private Industry	Not applicable	$3,000	Non-monetary award(s); Other (Webinar for contestants)

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. PSCR drives innovation and advances public safety communication technologies through cutting-edge research and development. PSCR works

directly with first responders and the solver community to address public safety's urgent need to access the same broadband communications and state-of-the-art technologies that consumers on commercial networks now expect. The Haptic Interfaces for Public Safety Challenge advanced NIST's mission by broadening our innovator community into a new community, haptic feedback researchers; proving that haptic interfaces embedded in first responder personal protective equipment can enhance mission effectiveness; and demonstrating that the use of virtual reality environments for design testing can streamline and reduce the cost of prototype development for the public safety users.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.3.12. Tech to Protect Challenge[56]

Sponsoring Agency and Office: National Institute of Standards and Technology (Communications Technology Laboratory)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Tech to Protect Challenge was an ambitious five-phase open innovation opportunity led by the National Institute of Standards and Technology, Communications Technology Laboratory, Public Safety Communications Research Division (PSCR). The prize competition focused on ten discrete problem statements (contests) to solve first responders' communications technology issues by creating smartphone applications. In the first and second phases, participants attended Codeathons events in ten different U.S. cities and submitted 77 early-stage software applications. Codeathon participants consulted with local public safety experts, PSCR researchers, and co-sponsors at the events to understand the problem statements and refine their models. NIST awarded 79 prizes to winning Codeathon teams for a total of $280,500. In the Online Contest, phase 3, teams submitted 62 software applications; NIST invited 25 teams to phase 4. In the Demonstration & Seed Contest, phase 4, each team completed a 12-minute demonstration presentation. The Judges awarded the $450,000 prize purse to the 25 competing teams and $360,000 to the 12 teams selected to advance to phase 5. In the Progress Contest, phase 5, which concluded in November 2020, the 12 finalists presented their current application and growth strategy progress. NIST judges awarded $497,000 to the 12 finalists; prizes ranged from $49,000 to $70,000 each. This challenge was the first prize competition at NIST to award over $1 million in cash prizes; the cumulative prize total was $1,587,500. Overall, the competition included over 20 co-sponsors and supporting organizations from across the country. The successful solutions will transition from research and development to

[56] The website for Tech to Protect Challenge is accessible at https://www.challenge.gov/challenge/tech-to-protect-challenge/.

commercialization, supporting emergency responders' use of advanced communications technologies in accomplishing their day-to-day activities and critical responsibilities in emergencies.

Budget and Resources: Agency funds were used for Federal employee salaries, employee and invitational travel, and commercial off-the-shelf items used in testing submissions. In FY18, agency funds ($2.6 M) were obligated on a contract for a challenge implementation vendor. Overhead paid on the contract costs supported internal administrative and acquisition support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Purchase of consumable materials	Federal personnel (FTE); Prize purse (monetary award)
FTEs	1.25	0.75
Funding Estimate	$45,000	$75,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community; Other (increase the solver community for public safety communications technology issues)

Problem or Opportunity Addressed: Public Safety professionals work to improve the safety of people and the communities in which they live and work. For emergency responders, effective communications can mean the difference between life and death. For example, while attempting rescues during the collapse of the World Trade Centers in New York in 2001, first responders from different districts could not communicate across districts using their portable radios. The Tech to Protect Challenge focused on developing new technologies, tools, and resources that are reliable, dependable, and innovative for public safety's use. Public safety professionals, students, researchers, programmers, engineers, and more came together to connect, collaborate, and create new technologies—from software programs to mobile applications—that will help emergency responders operate more efficiently, effectively, and safely in accomplishing their mission.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Low-risk approach and/or pay-for-performance structure; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$100,500	56	25	09-29-2019

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$180,000	85	54	11-03-2019
3	$0	50	25	01-25-2019
4	$810,000	37	37	05-01-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$140,000	$100,500
FY20	$1,220,000	$990,000

Non-Cash Prizes Include: Non-monetary incentives for Tech to Protect included access to a community of entrepreneurs, inventors, and innovators with diverse backgrounds who share a common interest in creating technology to improve community safety. All participants were invited to join researchers and emergency responders and to share their talents in advancing technologies and applications for public safety. More than 50 public safety experts attended the phase 1 and 2 codeathon events, sharing their time and expertise with participants. Participants had direct access to PSCR researchers, industry professionals, and technical experts during the challenge. Participants also had access to specialized software tools and data sets to support their work. The network of experts supporting this program provided regular responses via Q&A, feedback to all participants, and regular interaction with participants in an online forum active during phases 1, 2, and 3. In phase 4, each participant was provided direct feedback on their presentation, technical demo, and strategy in three formal review sessions with reviewers who represented the research team, industry experts, and representatives from public safety. These phase 4 feedback and coaching sessions enabled all teams to present their work in a fortified format for judging in May 2020.

Participants:

FY19: 60 team(s)

FY20: 77 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-27-2019	09-29-2019	09-29-2019	19
2	11-01-2019	11-03-2019	11-03-2019	58
3	06-01-2019	11-15-2019	01-25-2020	60
4	01-31-2020	04-20-2020	05-01-2020	25

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Software or computer code
2	Proposal or concept; Prototype device or object; Software or computer code
3	Prototype device or object; Software or computer code
4	Prototype device or object; Software or computer code; Business or commercial development plan

Submissions: NIST PSCR sought applications for hand-held communications devices (e.g., mobile phones, tablets) that would aid public safety responders in executing tasks during routine or emergency missions. In the regional in-person events and the online contest (phases 1-3), all eligible participants, regardless of area or level of expertise, were invited to create a concept and early-stage software solution to one or more of the ten technical contests. Submissions sought were generally software applications (e.g., mobile, web, database) that would aid public safety responders in executing tasks during routine or emergency missions. In phase 4, selected participants were invited to present a working prototype solution and a growth strategy for moving their innovation forward towards commercial or broad use within the public safety community. In many of the technical contests, the working prototype involved both software and hardware components.

Evaluation of Submissions: Evaluation criteria for the determination of winners were outlined in the Official Rules for the challenge. For phases 1 and 2, SMEs advised participants, and judges, appointed by the NIST Director, performed an initial compliance check, evaluated app demonstration, and scored the team presentation to determine successful submissions. Judges then performed an in-depth evaluation of successful submissions before determining awards. For phase 3, SMEs performed preliminary compliance checks and app testing before the judges evaluated the app submissions across three technical criteria unique to each of the 10 technical contests. For phase 4, judges evaluated each participant's video showcasing their solution, their market entry and scale-up strategy, and their 6-month growth plan. In the Progress Contest, scheduled for November 2020, the judges evaluated the Seed Contest winners' progress in further developing their app and in the execution of their growth strategy.

Partnerships: The prize competition involved 22 partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
FirstNet Built with AT&T (AT&T Corp)	Private Industry	$12,500	$12,500	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Database development; Software development; Data entry/analysis; Discover and design support; Operations or administrative support; Solution acceleration; Other (access to the FirstNet App Developer program; education for participants on the process to have their apps reviewed and listed within the FirstNet App Catalog, a nationwide directory of apps for first responders)

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
First Responder Network Authority (FirstNet Authority)	Federal Agency or Office	$12,500	$12,500	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Database development; Software development; Data entry/analysis; Discover and design support; Operations or administrative support; Solution acceleration; Other (supported the prize competition from inception to the final judging process; technical staff proposed first responder telecommunications issues to solve, and they continued supporting the challenge with competition design, submission reviews, and interacting with contestants, as appropriate)
Coding Dojo	Private Industry	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
DotProduct, LLC	Private Industry	$25,000	None reported	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Database development; Software development; Discover and design support; Operations or administrative support; Solution acceleration
Galvanize, Inc	Private Industry	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration
Hacker Fund	Other (Nonprofit)	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration
The City College of New York	Academic Institution	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Decode Miami	Private Industry	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration
San Francisco State University	Academic Institution	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration
Texas A&M University	Academic Institution	$5,000	None reported	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Operations or administrative support; Solution acceleration
Bespoken Holdings, Inc	Private Industry	$25,000	None reported	Non-monetary award(s); Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Discovery and design support; Operations or administrative support; Solution acceleration

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Motorola Solutions, Inc	Private Industry	$25,000	None reported	Non-monetary award(s); Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Discovery and design support; Operations or administrative support; Solution acceleration
IBM (International Business Machines Corp)	Private Industry	$25,000	None reported	Non-monetary award(s); Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Database development; Software development; Discovery and design support; Operations or administrative support; Solution acceleration
Appirio, Inc (TopCoder)	Private Industry	$25,000	None reported	Publicity, advertising, outreach, or/and communications; Solution acceleration
Office of Unified Communications, Washington, D.C.	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
City of Houston, Public Safety Communications Division	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Miami – Dade Police Department	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
Texas Department of Public Safety	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
Arlington County (Virginia) Fire Department	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
Rockford (Illinois) Fire Department	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
City of Houston Police	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
Chicago Police Department	State or Local Government	$5,000	None reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration

Advancement of Agency Mission: NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life. NIST's PSCR Division drives innovation and advances public safety communication technologies through cutting-edge research and development. The Tech to Protect Challenge advanced NIST and NIST's PSCR missions by engaging

entrepreneurs, technologists, students, programmers, designers, and public safety experts to create solutions across critical technical areas of public safety communications, including secure communications, location-based services, public safety data analytics, mission-critical voice, and user interface/user experience (UI/UX). The participant solutions will support emergency responders' use of advanced communications technologies in accomplishing their day-to-day activities, critical responsibilities in emergencies and support the continued development of tools and technology designed for and used by public safety.

Plan for Upcoming Two Fiscal Years: Potential topical areas for NIST PSCR prize competitions during the upcoming two fiscal years are user interfaces targeting the public safety community; cybersecurity and device security issues with the understanding of critical applications and user interfaces required by first responders; real-time, multi-modal analytics to support public safety communications; data de-identification to expand the quantity and quality of datasets available to public safety organizations; and unmanned aerial system research to support first responders.

B.4. Department of Defense (DOD)

B.4.1. xTechSearch 3[57]

Sponsoring Agency and Office: Army

Authority: America COMPETES Reauthorization Act of 2010; 15 United States Code (U.S.C.) 3719

Status:

FY19: Launched

FY20: Completed

Competition Summary: The Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) announced the third cohort of the Army xTechSearch prize competition. xTechSearch highlights opportunities for small businesses to collaborate with the Army to tackle the most critical Army modernization challenges. ASA(ALT) recognizes that the Army must enhance its engagement with the entrepreneurial funded community, small businesses, and other non-traditional defense entities by: Understanding the spectrum of technologies being developed commercially that may benefit the Army; Integrating the sector of non-traditional defense entities into the Army's Science and Technology (S&T) ecosystem; Providing mentorship and expertise to accelerate, mature, and transition technologies of interest to the Army. The xTechSearch competition will provide resourcing to select small businesses to demonstrate proof of concept for their technologies pertaining to Army challenges. The program will also integrate these small businesses into the Army's S&T ecosystem by providing research opportunities with Army labs, including access to the Army's organic intellectual and technical capital. xTechSearch is an opportunity for businesses to pitch novel technology solutions—a new application for an existing technology or a new technology concept entirely—to the Army. The Army will provide non-dilutive seed prizes for small businesses to demonstrate proof of concept in an Army-relevant challenge area. The authority of this program is 15 United States Code (U.S.C.) 3719.

[57] The website for xTechSearch 3 is accessible at https://www.arl.army.mil/xtechsearch/competitions/xtechsearch-3.html.

Budget and Resources: Funds were used for contest execution, including support of the xTechSearch competition office that is responsible for contest planning, event execution, evaluation software and services, communication, marketing, website, and social media support. Funding was also used to execute an xTech Accelerator program for the contest finalists. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Software development; Solution acceleration; Web portal or app development and support	Data entry/analysis; Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Software development; Solution acceleration; Web portal or app development and support
FTEs	4	4
Funding Estimate	$500,000	$500,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community.

Problem or Opportunity Addressed: ASA(ALT) recognizes that the Army must enhance its engagement with small businesses by: understanding the spectrum of technologies being developed commercially that may benefit the Army; integrating the sector of small business innovators into the Army's Science and Technology (S&T) ecosystem; and providing mentorship and expertise to accelerate, mature, and transition technologies of interest to the Army. The xTechSearch competition also strives to integrate these small businesses into the Army's S&T ecosystem by providing research opportunities with Army labs, including authorized access to the Army's organic intellectual and technical capital. Participating companies will have access to training, mentorship, and other support infrastructure as they progress through the contest to determine how best to align their technology solutions with real users and buyers within the Army.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition; Other (lower barrier to entry for applicants)

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$255,000	51	51	06-12-2019
2	$240,000	24	24	08-16-2019
3	$1,440,000	12	12	10-16-2019

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
4	$250,000	1	1	09-11-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$505,000	$505,000
FY20	$1,800,000	$1,800,000

Non-Cash Prizes Include: In addition to the prizes, the xTechSearch competition will provide education, mentorship, and networking opportunities to help integrate small businesses into the Army science and technology ecosystem.

Participants:

FY19: 141 teams

FY20: 24 teams

Intended Participants: Small businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-30-2019	06-12-2019	06-12-2019	141
2	08-06-2019	08-16-2019	08-16-2019	50
3	10-14-2019	10-16-2019	10-16-2019	24
4	09-09-2020	09-11-2020	09-11-2020	12

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Proposal or concept; Creative media; Analysis or visualization of data
3	Proposal or concept; Business or commercial development plan; Creative media; Analysis or visualization of data
4	Proposal or concept; Prototype device or object; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: A concept white paper outlining the technology, the potential impact on the Army, the scientific viability of their approach, and the dual-use technology applications for both the commercial and defense spaces.

Evaluation of Submissions: Submissions were evaluated by a panel of Army science and technology ecosystem subject matter experts (warfighter, acquisition, and research and development) as well as technical and business experts from outside the Army. Part 1: Concept White Papers were evaluated and ranked using the following Scoring Criteria: Potential for Impact/Revolutionizing the Army: 45%; Scientific and Engineering Viability: 45%; Proposal Quality: 10%. Part 2: Technology Pitches were evaluated and ranked using the following Scoring Criteria: Potential for Impact/Revolutionizing the Army: 35%; Scientific and Engineering Viability: 35%; Team Ability: 20%; Presentation Quality: 10%.

Partnerships: No partners were indicated.

Advancement of Agency Mission: xTechSearch is a competition targeting small businesses to uncover novel dual-use science and technology solutions to tackle the Army's most critical modernization challenges.

Plan for Upcoming Two Fiscal Years: The Army plans to continue to execute the xTechSearch open-topic prize competition annually as well as support problem-focused competitions using the same competition structure and process as approved on a case-by-case basis. We estimate that the xTech program will execute 4 to 5 competitions per fiscal year.

B.4.2. xTechSearch 4[58]

Sponsoring Agency and Office: Army

Authority: America COMPETES Reauthorization Act of 2010; 15 United States Code (U.S.C.) 3719

Status:

FY19: Launched

FY20: Completed

Competition Summary: The Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) announced the fourth cohort of the Army xTechSearch prize competition. xTechSearch highlights opportunities for small businesses to collaborate with the Army to tackle the most critical Army modernization challenges. ASA(ALT) recognizes that the Army must enhance its engagement with the entrepreneurial funded community, small businesses, and other non-traditional defense entities by: Understanding the spectrum of technologies being developed commercially that may benefit the Army; Integrating the sector of non-traditional defense entities into the Army's Science and Technology (S&T) ecosystem; Providing mentorship and expertise to accelerate, mature, and transition technologies of interest to the Army. The xTechSearch competition will provide resourcing to select small businesses to demonstrate proof of concept for their technologies pertaining to Army challenges. The program will also integrate these small businesses into the Army's S&T ecosystem by providing research opportunities with Army labs, including access to the Army's organic intellectual and technical capital. xTechSearch is an opportunity for businesses to pitch novel technology solutions—a new application for an existing technology or a new technology concept entirely—to the Army. The Army will provide non-dilutive seed prizes for the small businesses to demonstrate proof of concept in an Army-relevant challenge area. The authority of this program is 15 United States Code (U.S.C.) 3719.

[58] The website for xTechSearch 4 is accessible at https://www.arl.army.mil/xtechsearch/competitions/xtechsearch-4.html.

Budget and Resources: Funds were used for contest execution including support of the xTechSearch competition office that is responsible for contest planning, event execution, evaluation software and services, communication, marketing, website, and social media support. Funding was also used to execute an xTech Accelerator program for the contest finalists. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Data entry/analysis; Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Software development; Web portal or app development and support
FTEs	0	4
Funding Estimate	$0	$800,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The ASA(ALT) recognizes that the Army must enhance its engagement with the small businesses by: understanding the spectrum of technologies being developed commercially that may benefit the Army; integrating the sector of small business innovators into the Army's Science and Technology (S&T) ecosystem; and providing mentorship and expertise to accelerate, mature, and transition technologies of interest to the Army. The xTechSearch competition also strives to integrate these small businesses into the Army's S&T ecosystem by providing research opportunities with Army labs, including authorized access to the Army's organic intellectual and technical capital. Participating companies will have access to training, mentorship, and other support infrastructure as they progress through the contest to determine how best to align their technology solutions with real users and buyers within the Army.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$240,000	48	48	12-15-2019
2	$200,000	20	20	01-23-2020
3	$1,200,000	10	10	03-19-2020
4	$340,000	10	10	10-16-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$1,640,000	$1,640,000

Non-Cash Prizes Include: In addition to the prizes, the xTechSearch competition will provide education, mentorship, and networking opportunities to help integrate small businesses into the Army science and technology ecosystem.

Participants:

FY19: No teams reported

FY20: 320 teams

Intended Participants: Small businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	10-01-2019	11-11-2019	12-15-2019	320
2	01-06-2020	01-22-2020	01-23-2020	48
3	03-17-2020	03-18-2020	03-19-2020	20
4	10-12-2020	10-14-2020	10-16-2020	10

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Proposal or concept; Creative media; Analysis or visualization of data
3	Proposal or concept; Business or commercial development plan; Creative media; Analysis or visualization of data
4	Proposal or concept; Prototype device or object; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: A concept white paper outlining the technology, the potential impact on the Army, the scientific viability of their approach, and the dual-use technology applications for both the commercial and defense spaces.

Evaluation of Submissions: Submissions were evaluated by a panel of Army science and technology ecosystem subject matter experts (warfighter, acquisition, and research and development) as well as technical and business experts from outside the Army. Part 1: Concept White Papers are evaluated

and ranked using the following Scoring Criteria: Potential for Impact/Revolutionizing the Army: 35% Scientific and Engineering Viability: 35% Dual Use: 20% Proposal Quality: 10%. Part 2: Technology Pitches were evaluated and ranked using the following Scoring Criteria: Potential for Impact/Revolutionizing the Army: 30%; Scientific and Engineering Viability: 30%; Dual Use: 20%; Team Ability: 10%; Presentation Quality: 10%.

Partnerships: No partners were indicated.

Advancement of Agency Mission: xTechSearch is a competition targeting small businesses to uncover novel dual-use science and technology solutions to tackle the Army's most critical modernization challenges.

Plan for Upcoming Two Fiscal Years: The Army plans to continue to execute the xTechSearch open-topic prize competition annually as well as support problem-focused competitions using the same competition structure and process as approved on a case-by-case basis. We estimate that the xTech program will execute 4 to 5 competitions per fiscal year.

B.4.3. xTechSearch 5[59]

Sponsoring Agency and Office: Army

Authority: America COMPETES Reauthorization Act of 2010; 15 United States Code (U.S.C.) 3719

Status:

FY19: Completed

FY20: Ongoing

Competition Summary: The Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) announced the third cohort of the Army xTechSearch prize competition. xTechSearch highlights opportunities for small businesses to collaborate with the Army to tackle the most critical Army modernization challenges. The ASA(ALT) recognizes that the Army must enhance its engagement with the entrepreneurial funded community, small businesses, and other non-traditional defense entities by: Understanding the spectrum of technologies being developed commercially that may benefit the Army; Integrating the sector of non-traditional defense entities into the Armys Science and Technology (S&T) ecosystem; Providing mentorship and expertise to accelerate, mature, and transition technologies of interest to the Army. The xTechSearch competition will provide resourcing to select small businesses to demonstrate proof of concept for their technologies pertaining to Army challenges. The program will also integrate these small businesses into the Army's S&T ecosystem by providing research opportunities with Army labs, including access to the Army's organic intellectual and technical capital. xTechSearch is an opportunity for businesses to pitch novel technology solutions—a new application for an existing technology or a new technology concept entirely—to the Army. The Army will provide non-dilutive seed prizes for the small businesses to demonstrate proof of concept in an Army-relevant challenge area. The authority of this program is 15 United States Code (U.S.C.) 3719.

Budget and Resources: Funds were used for contest execution including support of the xTechSearch competition office that is responsible for contest planning, event execution, evaluation software and

[59] The website for xTechSearch 5 is accessible at https://www.arl.army.mil/xtechsearch/competitions/xtechsearch-5.html.

services, communication, marketing, website, and social media support. Funding was also used to execute an xTech Accelerator program for the contest finalists. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Software development; Transportation of participants; Web portal or app development and support
FTEs	None reported	4
Funding Estimate	None reported	$500,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: ASA(ALT) recognizes that the Army must enhance its engagement with the small businesses by: understanding the spectrum of technologies being developed commercially that may benefit the Army; integrating the sector of small business innovators into the Army's Science and Technology (S&T) ecosystem; and providing mentorship and expertise to accelerate, mature, and transition technologies of interest to the Army. The xTechSearch competition also strives to integrate these small businesses into the Army's S&T ecosystem by providing research opportunities with Army labs, including authorized access to the Army's organic intellectual and technical capital. Participating companies will have access to training, mentorship, and other support infrastructure as they progress through the contest to determine how best to align their technology solutions with real users and buyers within the Army.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$300,000	60	60	05-15-2020
2	$200,000	20	20	07-11-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported

FY	Prize Purse Offered	Prize Purse Awarded
FY20	$500,000	$500,000

Non-Cash Prizes Include: In addition to the prizes, the xTechSearch competition will provide education, mentorship, and networking opportunities to help integrate small businesses into the Army science and technology ecosystem.

Participants:

FY19: No teams reported

FY20: 382 teams

Intended Participants: Small businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	02-24-2020	03-31-2020	05-15-2020	382
2	07-07-2020	07-10-2020	07-11-2020	60

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Proposal or concept; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: A concept white paper outlining the technology, the potential impact on the Army, the scientific viability of their approach, and the dual-use technology applications for both the commercial and defense spaces.

Evaluation of Submissions: Submissions were evaluated by a panel of Army science and technology ecosystem subject matter experts (warfighter, acquisition, and research and development) as well as technical and business experts from outside the Army. Part 1: Concept White Papers were evaluated and ranked using the following Scoring Criteria: Potential for Impact/Revolutionizing the Army: 35%; Scientific and Engineering Viability: 35%; Dual Use: 20%; Proposal Quality: 10%. Part 2: Technology Pitches were evaluated and ranked using the following Scoring Criteria: Potential for Impact/Revolutionizing the Army: 30%; Scientific and Engineering Viability: 30%; Dual Use: 20%; Team Ability: 10%; Presentation Quality: 10%.

Partnerships: No partners were indicated.

Advancement of Agency Mission: xTechSearch is a competition targeting small businesses to uncover novel dual-use science and technology solutions to tackle the Army's most critical modernization challenges.

Plan for Upcoming Two Fiscal Years: The Army plans to continue to execute the xTechSearch open-topic prize competition annually as well as support problem-focused competitions using the same competition structure and process as approved on a case-by-case basis. We estimate that the xTech program will execute 4 to 5 competitions per fiscal year.

B.5. Department of Energy (DOE)

B.5.1. American-Made Solar Challenge[60]

Sponsoring Agency and Office: Solar Energy Technologies Office

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The American-Made Solar Prize is a prize competition from the U.S. Department of Energy (DOE) that is designed to energize U.S. solar manufacturing. The competition aims to support the growth of U.S. solar manufacturing and reenergize American energy innovation by tapping into Americans' competitive spirit and the Nation's unparalleled innovation ecosystem. Through a series of three contests, innovators from across the country work to transform big ideas into concepts and then prototypes ready for industry testing on a condensed timeline. The Solar Prize offers competitors $3 million in cash prizes and support from the American-Made Network, helping connect entrepreneurs to National Laboratories, industry experts, facilities, and other resources they need to succeed. Through the American-Made Network, the world's best-in-class National Laboratory research base is combined with an unparalleled entrepreneurial support system consisting of pioneering fabrication facilities, energy incubators, and other valuable resources. Together, they support competitors in the Solar Prize to create a sweeping portfolio of innovations primed for private investment and commercial scale up.

Budget and Resources: In order for the prize to operate, funds are needed for the Prize Administrator, the National Renewable Energy Laboratory (NREL), for its efforts to support to execution of the program and the facilitation of the American Made Network. The following table indicates the budget and resources to support the activity.

[60] The website for American-Made Solar Challenge is accessible at https://americanmadechallenges.org/solarprize/index.html.

Funding	FY19	FY20
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	3	3
Funding Estimate	$1,100,000	$1,100,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The American-Made Solar Prize is the inaugural prize of the American-Made Challenges program, which incentivizes the Nation's entrepreneurs to provide American leadership in the energy marketplace. These new challenges seek to lower the barriers U.S.-based innovators face in reaching manufacturing scale by accelerating the cycles of learning from years to weeks, while helping to create partnerships that connect entrepreneurs to the private sector and the network of DOE's National Laboratories across the Nation.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$1,000,000	20	20	09-24-2019
2	$1,000,000	10	10	03-30-2020
3	$1,000,000	2	2	08-28-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$3,900,000	$3,900,000
FY20	$3,900,000	$3,900,000

Non-Cash Prizes Include: Winners of the solar prize receive a voucher for technical support. The vouchers allow winners from the Set! and Go! Contests to access tools, equipment, and expertise at National Laboratories and approved organizations and facilities so that they may develop, test, and validate their innovative solutions.

Participants:

FY19: 300 teams

FY20: 300 teams

Intended Participants: Master/PhD students; Small businesses; Large businesses; Other (Lab researchers)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	03-22-2012	07-16-2019	09-24-2019	128
2	09-24-2019	03-04-2020	03-30-2020	20
3	03-30-2019	08-11-2020	08-28-2020	10

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Prototype device or object; Creative media
3	Prototype device or object; Business or commercial development plan; Creative media

Submissions: Competitors in each Solar Prize participate in three progressive prize competitions: the Ready!, Set!, and Go! Contests. The American Made Solar Prize seeks to have a low barrier of entry by having a simple application process comprised of a 90-second video pitch, a summary slide, and a five-page application describing the challenge, proposed technical solution, team, and plan. Ready! Contest: Winners will be selected after identifying an impactful idea or solution addressing a critical need in the solar industry and will then be eligible to compete in the Set! Contest. Anyone can submit a package to compete in the Ready! Contest. Set! Contest: Competitors will work to substantially advance their technology solution toward a viable and promising proof of concept. Go! Contest: Competitors will work to substantially advance their solution from proof of concept to a refined prototype and find a partner to perform a pilot test of the prototype.

Evaluation of Submissions: The American Made Solar Prize seeks to have a low barrier of entry by having a simple application process comprised of a 90-second video pitch, a summary slide, and a

five-page application describing the challenge, proposed technical solution, team, and plan. These materials are scored by a panel of expert reviewers from industry, National Laboratories, and government. The last two phases of the prize also include a live demo day event evaluated by a panel of judges. The final phase of the prize requires a legally binding agreement from a commercial partner to perform a pilot test with the competitor.

Partnerships: The prize competition involved five formal contracted partners and more than 100 connector partners included in the American Made network (the list of additional partners is accessible at https://americanmadechallenges.org/network/index.html). The following table lists the formal partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Renewable Energy Lab	Other	$500,000	$500,000	Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Software development; Discovery and design support; Operations or administrative support; Solution acceleration
Carnegie Mellon University	Academic Institution	$100,000	$100,000	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
Nation of Makers	Nonprofit Organization (excluding Academic Institutions)	$100,000	$100,000	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
ADL Ventures	Private Industry	$100,000	$100,000	Publicity, advertising, outreach, or/and communications; Database development; Software development; Discovery and design support; Solution acceleration
University of Arizona Center for Innovation	Academic Institution	$100,000	$100,000	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration

Advancement of Agency Mission: The Solar Prize supports work to spur solar manufacturing, develops innovative solar solutions and products, and creates domestic jobs and opportunities through public-private partnerships. The prize model disrupts traditional thinking, and introduces, expands, and evolves what is possible for Federal agencies. Prize competitions increase the number of perspectives

working to solve difficult problems, foster interdisciplinary collaboration, remove barriers to participation, and make innovation easy, fast, and agile.

Plan for Upcoming Two Fiscal Years: The fourth round of the American Made Solar Prize is underway and will continue in FY21.

B.5.2. EPIC Prize[61]

Sponsoring Agency and Office: Office of Technology Transitions

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The DOE Office of Technology Transitions (OTT) is launching a $1,000,000 prize competition to award cash prizes to the Nation's most innovative incubators for creative plans to build clusters supporting entrepreneurs and innovators launching businesses focused on energy-related technologies. OTT welcomes incubators, organizations that aid in the development of new business ventures, business accelerators, co-working startup communities, or any other organizations that self-identify as advocates for innovation and entrepreneurship. This prize also seeks to strengthen innovation clusters or geographic concentrations of specialized skills, industries, and technologies that have the ability to turn their talents towards energy innovation. To support the national advancement of energy entrepreneurship and commercialization, the DOE Energy Program for Innovation Clusters (EPIC) Prize seeks to recognize the most novel, comprehensive, and impactful incubator plans that focus on developing strong innovation clusters, connections, and support for energy-related technology and entrepreneurial innovation. Incubators and other entrepreneurially focused organizations are critical to the growth of an innovation ecosystem; these organizations help entrepreneurs accelerate the launch, growth, and scale of their businesses, ultimately resulting in the development of jobs in the United States.

Budget and Resources: Funds were used to support prize administration through the National Renewable Energy Laboratory (NREL) American Made Challenges platform. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award)
FTEs	None reported	0.6
Funding Estimate	None reported	$120,000

[61] The website for EPIC Prize is accessible at https://americanmadechallenges.org/epic/.

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The private sector has had difficulty providing sufficient capital, business development services, and entrepreneurial training to early-stage, high-risk, longer-term, capital-intensive technologies. There is a capital gap in funding to organizations that support early stage energy entrepreneurs.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$1,000,000	20	20	10-07-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$1,000,000	$1,000,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 20 teams

Intended Participants: Small businesses; Other (incubators, accelerators, and similar innovation accelerating organizations)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
07-20-2020	09-10-2020	67

Solicitation of Submissions: Social media; Email; Press release; Posted on challenge.gov; Other (americanmadechallenges.org)

Submission Types: Proposal or concept; Business or commercial development plan

Submissions: To compete, competitors must submit a 10-slide presentation and a 90-second video.

Evaluation of Submissions: The Prize Administrator screened all completed submissions and, in consultation with DOE, assigned subject matter expert reviewers to independently score the content of each submission. The expert reviewers were Federal and non-Federal employees with expertise in relevant areas. Expert reviewers reviewed submissions according to the evaluation criteria described in the rules document. Expert reviewers may not (a) have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered competitor in the Prize; or (b) have a familial or financial relationship with an individual who is a registered competitor.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The EPIC Prize seeks to address a capital gap to support these organizations supporting early stage energy entrepreneurs, encourage these organizations to think more expansively about their role in the broader regional and national innovation and entrepreneurial ecosystem, enable winners of this prize to enhance their organization's resilience and operational sustainability, and in general to support the national advancement of energy entrepreneurship and commercialization.

Plan for Upcoming Two Fiscal Years: None reported

B.5.3. FAST Commissioning Prize[62]

Sponsoring Agency and Office: Under Secretary for Energy (Water Power Technologies Office)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The Furthering Advancements to Shorten Time (FAST) Commissioning for Pumped-Storage Hydropower (PSH) Prize aims to attract ideas to reduce the time, cost, and risk required to commission PSH projects. This is the first prize of its kind and is structured to support anyone with a great idea and the motivation to develop their idea into a full business concept. Today's electricity system is changing rapidly and hydropower and PSH have an essential role in contributing to the resilience, reliability, and affordability of the U.S. power system. PSH is by far the largest source of energy storage on the grid, and it will play a key role in supporting increased integration of variable generation resources. But large capital investments and long lead times for PSH commissioning are deterrents to would-be developers and utilities. The goal of the prize is to catalyze new solutions, designs, and strategies to accelerate PSH development by reducing the time, cost and risk to commission PSH. Ideas could include innovative PSH ideas, new layouts, creative construction management, improved construction equipment, application of advanced manufacturing, or standardization of equipment.

[62] The website for FAST Commissioning Prize is accessible at https://americanmadechallenges.org/fast/.

Budget and Resources: Agency funds were used to support prize administration at the National Renewable Energy Laboratory (NREL), promotion and outreach through NREL, and to support DOE Federal employees, contractors, and fellows. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	0.25	0.25
Funding Estimate	$100,000	$50,000

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: The primary barriers to PSH development in the U.S. are lengthy construction and implementation timelines due to the long-term investment periods associated with physical development and commissioning. The large capital investments and long lead times required to get PSH commissioned serve as a deterrent to developers and utilities. Innovative approaches and new technologies for reducing construction and commissioning timelines are needed to increase interest in further development. Although PSH project costs and risks are also deterrents to development, the focus of this program is on improving overall project timelines. The FAST Commissioning Prize is part of a multi-lab effort to conduct industry-relevant analysis and support industry-driven concepts and technologies to reduce the time, cost, and risk to commission PSH, with the ultimate goal of halving the time to commission PSH from 10 years to less than five.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	9	9	07-10-2019
2	$0	9	9	10-04-2019
3	$550,000	4	4	10-08-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$550,000	$550,000

Non-Cash Prizes Include: Finalists from the Concept stage were offered up to 50 hours of support at the National Laboratories to refine their ideas and pitches, and pitch contest winners were offered $100,000 in lab vouchers for additional research and development (R&D) work to advance their concepts.

Participants:

FY19: 31 teams

FY20: 9 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-01-2019	06-08-2019	07-10-2019	31
2	07-30-2019	10-04-2019	10-04-2019	9
3	10-07-2019	10-07-2019	10-08-2019	9

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Analysis or visualization of data
2	Proposal or concept; Business or commercial development plan
3	Proposal or concept; Business or commercial development plan; Analysis or visualization of data

Submissions: During the Concept stage, each submission included a concept paper submission. For the Incubate and Pitch stages, each submission included a technical paper and a slide deck for the pitch.

Evaluation of Submissions: Submissions were reviewed by experts from DOE, the National Laboratories, other Federal agencies, and external (non-government reviewers). These reviewers

scores were averaged and ranked, to inform the decision of the judge in selecting the finalists and winners.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: This prize sought fresh solutions and technologies from innovators to address the non-regulatory challenges that PSH developers face when deploying new projects such as significant upfront capital costs, a lack of market certainty, and long construction times. The prize-winning ideas for this key storage technology will help bring more PSH online to support increased integration of variable renewable resources like wind and solar.

Plan for Upcoming Two Fiscal Years: None reported

B.5.4. Fish Protection Prize[63]

Sponsoring Agency and Office: Under Secretary for Energy (Water Power Technologies Office)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The Fish Protection Prize sought innovative solutions, designs, and strategies to protect fish from water infrastructure, such as water diversions and pipes, and intakes at hydropower dams. This prize built on the initial Fish Exclusion Prize, run by the Department of the Interior, Bureau of Reclamation, released on March 6, 2019. The winners of the first prize were announced in December 2019. The next three-staged prize invited competitors to share their innovative approach along with a design and research plan for keeping fish away from water diversions and intakes. Competitors proposed solutions for any fish species found in the United States that could be applied to river and irrigation canal diversions, unscreened diversion pipes for irrigation or municipal water supplies, cooling water intakes of power plants, or dam intakes. New ideas for addressing fish exclusion or improvements to existing technologies were also welcome. After the Concept stage, nine finalists were selected to enter the Incubation stage. In the Incubation stage, participants were paired with experts from Pacific Northwest National Laboratory (PNNL) and received up to 50 hours of technical analysis or other support in advance of the Pitch Contest. The Pitch Contest took place September 15-16, 2020 at the virtual American Fisheries Society meeting. The winning teams split $700,000 in the form of cash and in-kind support to further their solutions, with expertise provided by PNNL to evolve and develop their concepts.

Budget and Resources: Agency funds were used to support prize administration at the National Renewable Energy Laboratory (NREL) and Pacific Northwest National Laboratory (PNNL), promotion and outreach through NREL, team support for finalists at PNNL, cash awards for winning teams, and lab vouchers for winning teams at PNNL. The following table indicates the budget and resources to support the activity.

[63] The website for Fish Protection Prize is accessible at https://americanmadechallenges.org/fishprotection/.

Funding	FY19	FY20
Agency Fund Use	None reported	Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	None reported	0.5
Funding Estimate	None reported	$250,000

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Alterations to the natural environment caused by water resource development have impacted many aquatic species. Declines in the number of native fish, both resident and migratory, in the United States have led to numerous listings of fish species as threatened or endangered under Federal and/or state laws. The goal of the Fish Protection Prize is to catalyze new solutions, designs, and strategies to improve fish exclusion technology by decreasing the numbers of entrained fish from river and canal diversions, unscreened diversion pipes, or intakes at hydropower dams. Proposed solutions and research designs can include radical new ideas or technologies that are ready to commercialize. Submissions that address fish exclusion for one or more freshwater or migratory riverine species of concern in the United States, at any life stage, will be accepted.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	None reported	10	9	06-30-2020
2	None reported	0	0	08-30-2020
3	$700,000	3	3	09-26-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$700,000	$700,000

Non-Cash Prizes Include: Finalists from the Concept stage were offered up to 50 hours of support at PNNL to refine their ideas and pitches, and Pitch Contest winners were offered $100,000 in lab vouchers for additional R&D work to advance their concepts.

Participants:

FY19: No teams reported

FY20: 21 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	01-25-2020	05-14-2020	06-30-2020	21
2	07-01-2020	08-30-2020	08-30-2020	9
3	09-15-2020	09-16-2020	09-26-2020	9

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Analysis or visualization of data
2	Proposal or concept; Business or commercial development plan
3	Proposal or concept; Business or commercial development plan; Analysis or visualization of data

Submissions: During the Concept stage, each submission included a concept paper and video submission. For the Incubate and Pitch stages, each submission included a technical paper and a slide deck for the pitch.

Evaluation of Submissions: Submissions were reviewed by experts from DOE, the National Laboratories, other Federal agencies, and external (non-government reviewers). These reviewers scores were averaged and ranked, to inform the decision of the judges in selecting the finalists and winners.

Partnerships: The prize competition involved one partner. The following table lists this partner and its contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Bureau of Reclamation	Federal Agency or Office	None reported	$500,000	Prize purse; Publicity, advertising, outreach, or/and communications; Discovery and design support

Advancement of Agency Mission: The Fish Protection Prize, and the resulting technologies and solutions, help DOE meet the dual imperative of energy generation and environmental stewardship. These types of solutions are critical to advancing next-generation water power technologies and strengthening existing water infrastructure nationwide.

Plan for Upcoming Two Fiscal Years: The prize winners will be paired with the Pacific Northwest National Laboratory (PNNL) to execute their lab vouchers and perform further R&D to advance their solutions.

B.5.5. Geothermal Manufacturing Prize[64]

Sponsoring Agency and Office: Under Secretary for Energy

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: The American-Made Geothermal Manufacturing Prize is designed to catalyze manufacturing innovation in the American geothermal industry by harnessing the rapid advances additive manufacturing can provide in improving design, fabrication, and functionality of geothermal tools, equipment, and components. This will be accomplished through a series of four prize competitions and the development of a diverse and powerful support network that leverages National Laboratories, energy incubators, and other resources from across the United States.

Budget and Resources: The National Renewable Energy Laboratory has a budget of $1,000,500 to administer the Prize. This administration budget covers: developing strategic partnerships for prize outreach, developing prize branding and other outreach materials, leading outreach event coordination and execution, HeroX website development and management, competitor and reviewer coordination, and coordinating three Prize Power Connectors (the University of Texas at Austin, Carnegie Mellon University, and Nation of Makers) to promote the prize to relevant stakeholders and ensure that these Connectors mentor potential applicants during the open phase of the Ready! Contest. In addition to the Geothermal Technologies Office (GTO) budget, the DOE Advanced Manufacturing Office is a partner in the Manufacturing Prize and contributes $750,000 for the Manufacturing Demonstration Facility (MDF) at Oak Ridge National Laboratory (ORNL) to participate as expert consultants to facilitate design support for prize winners. MDF leadership and staff held a

[64] The website for Geothermal Manufacturing Prize is accessible at https://americanmadechallenges.org/geothermalmanufacturing/index.html.

multi-day design for additive manufacturing workshop with Ready! winners the week of November 2, 2020 and designated MDF staff will work with each team one-on-one to provide concept design feedback during the Set! Contest. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Discovery and design support; Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	None reported	0.67
Funding Estimate	None reported	$1,750,500

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Geothermal environments pose significant challenges for manufacturing tools, components, and equipment because they require materials that can withstand harsh geothermal conditions, including variable subsurface stresses resulting from high temperatures, high rock strengths, and corrosive working fluids. Consequently, these environmental conditions necessitate expensive and sometimes custom manufacturing with high-grade materials and specialized geometries. Moving beyond this paradigm will require significant technical innovation, such as those underway in the additive manufacturing community, whose innovations benefit a multitude of American industries. The opportunity exists to leverage the rapid innovations that additive enables with the U.S. geothermal industry's ongoing need for manufacturing innovation to reduce design and manufacturing lead times, save money and materials, and improve the performance necessary to thrive in geothermal environments.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$500,000	20	15	10-18-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$500,000	$0

Non-Cash Prizes Include: This prize offers multiple different non-monetary incentives to prize participants and Ready! winners. Through the DOE American-Made Network, prize participants gain access to a vast set of organizations that can assist in developing their idea, polishing their application, and leading them to success. More specifically, three Power Connectors offered consulting services to prize applicants and ran multiple free outreach events and seminars during summer 2020 that provided important opportunities to spark potential team connections. Another important incentive offered to the 15 Ready! winners is the opportunity to gain access to the unparalleled expertise from the Oak Ridge National Laboratory Manufacturing Demonstration Facility (ORNL MDF). A multi-day workshop was held exclusively with Ready! winners the week of November 2, 2020 that provided information on the progression in systems, materials, design, software and methodologies in additive manufacturing that could improve both the fabrication and performance of key components in their respective geothermal applications. Teams are also receiving up to 50 hours of one-on-one design consulting with MDF staff in order to bolster and incorporate design best practices into their respective approaches during the Set! Contest.

Participants:

FY19: No teams reported

FY20: 36 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-29-2020	08-26-2020	10-18-2020	36

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept

Submissions: Competitors propose an innovative design concept wholly or partially incorporating additive manufacturing approaches for a geothermal tool, component, or equipment. The required submission materials for the first contest, Ready!, included a 90-second video, cover page, summary PowerPoint slide, technical assistance request, and a technical narrative covering the geothermal

problem the team seeks to solve, what additive innovation they propose to solve the problem, who they are, and a description of their plan to achieve their goals during the competition. The team could also submit optional letters of support.

Evaluation of Submissions: For Ready!, the National Renewable Energy Laboratory (NREL), as the Prize Administrator, screened all completed submissions, and in consultation with DOE, assigned eligible submissions to a qualified panel of expert reviewers composed of subject matter experts in additive manufacturing as well as geothermal/oil and gas technologies from DOE, DOE National Laboratories, and external industry experts. These reviewers scored submissions according to the applicable judging criteria outlined in the prize rules. At DOE's discretion, DOE can conduct interviews with teams for additional information and context per procedures outlined in the prize rules. The Geothermal Technologies Office and Advanced Manufacturing Office Directors are the official judges of the competition, and made the final determination for Ready! winners and will be the final judges for all remaining competition stages as well.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Renewable Energy Laboratory	Other	None reported	$0	Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Discovery and design support; Operations or administrative support; Solution acceleration
Oak Ridge National Laboratory	Other	None reported	$0	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support; Solution acceleration

Advancement of Agency Mission: The prize aligns with DOE Office of Energy Efficiency and Renewable Energy (EERE) goals to create and sustain American leadership in the transition to a global clean energy economy by rapidly advancing approaches to new technology innovations that can lead to more flexibility and distributed U.S. clean energy manufacturing supply chains, drive down development times and costs for components necessary for geothermal exploration, drilling, and operations, use more advanced geometries, and be made out of resilient, widely available materials. Such innovations will be necessary to unlock the 60 GW of projected U.S. geothermal electricity generation capacity by 2050 as outlined in the landmark 2019 DOE GeoVision Report.

Plan for Upcoming Two Fiscal Years: The Geothermal Manufacturing Prize is scheduled to complete its three remaining stages and award grand prize winners in Q3 FY 2022. In addition, GTO is currently

running a Geothermal Collegiate Competition focusing on geothermal infographic development and data visualization with a planned winner announcement date in January 2021. Additional Collegiate Competitions are planned for spring and fall timeframes through FY 2022, and topics are under active discussion. Additionally, GTO will release a Geothermal Lithium Extraction Prize in FY 2021 that seeks to establish the viability of the market for extracting lithium from geothermal brines.

B.5.6. Groundbreaking Hydro Prize[65]

Sponsoring Agency and Office: Under Secretary for Energy (Water Power Technologies Office)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: Like roots to a tree, geotechnical foundations provide structural support to a hydropower facility, and must be developed to ensure stability, safety, and performance for decades. While foundations are central to dam safety, challenges in their design and construction can lead to major project delays and cost overruns, potentially jeopardizing a project's success. Through the Groundbreaking Hydro Prize, the Water Power Technologies Office (WPTO) is soliciting solutions that address key challenges faced in one or more of the three foundation development phases, namely: 1) Geotechnical Site Assessment: Activities performed to obtain information needed to design and construct a hydropower foundation system; 2) Foundation Design: Process of using information from the site assessment to perform analyses and develop a cost-effective foundation system that meets the project design criteria; 3) Foundation Construction: Activities performed by the contractor, from mobilization through project commissioning, to fully develop the foundation system.

Budget and Resources: Agency funds were used to support prize administration at the National Renewable Energy Laboratory (NREL) and engage experts from the Oak Ridge National Laboratory (ORNL), promotion and outreach through NREL, and cash awards for winning teams. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.5
Funding Estimate	None reported	$250,000

[65] The website for Groundbreaking Hydro Prize is accessible at https://americanmadechallenges.org/groundbreakinghydro/.

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination

Problem or Opportunity Addressed: The technical, economic, and environmental challenges associated with geotechnical foundation design and construction present major challenges to new development, yet opportunities exist to develop innovative solutions. With this understanding, it is critically important to establish the current state of practice for hydropower geotechnical foundations, identify key challenges, and define opportunities for innovative solutions. The Groundbreaking Hydro Prize solicits novel concepts applicable to the three development phases: 1) Geotechnical Site Assessment; 2) Foundation Design; 3) Foundation Construction.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	9	0	04-01-2021

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 30 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
08-24-2020	02-01-2021	None reported

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal or concept; Business or commercial development plan; Analysis or visualization of data

Submissions: Submissions are in the form of concept papers describing teams' unique solutions to the challenge.

Evaluation of Submissions: Submissions will be reviewed by experts from DOE, the National Laboratories, other Federal agencies, and external (non-government reviewers). These reviewers' scores will be averaged and ranked, to inform the decision of the judge in selecting the finalists and winners.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: Reducing the costs, timelines, and risks associated with the development of hydropower will help enable its continued trajectory of growth as a key renewable energy resource for the grid.

Plan for Upcoming Two Fiscal Years: In FY21, the prize will close and winners will be awarded cash prizes. No activities are planned for FY22.

B.5.7. Innovations in Advanced Manufacturing Prize[66]

Sponsoring Agency and Office: Under Secretary for Energy (Water Power Technologies Office)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: Advanced manufacturing technologies are revolutionizing the way products are designed and built across countless industries. While the benefits of advanced manufacturing are well-understood, the high-impact opportunities for incorporating it into hydropower have yet to be tapped. The Innovations in Advanced Manufacturing Hydropower (I AM Hydro) Prize sought innovative solutions to strengthen hydropower by applying advanced manufacturing technologies to reduce construction costs and repair frequency, improve efficiency and energy capture, and more. I AM Hydro is designed to: 1) Spur innovation by engaging a national community of visionaries who are not typically associated with the hydropower industry; 2) Target levelized cost of electricity (LCOE) reductions in hydropower design, manufacturing, and operation and maintenance.

Budget and Resources: Agency funds were used to support prize administration at the National Renewable Energy Laboratory (NREL) and engage experts from the Oak Ridge National Laboratory (ORNL), promotion and outreach through NREL, and cash awards for winning teams. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications

[66] The website for Innovations in Advanced Manufacturing Prize is accessible at https://americanmadechallenges.org/iamhydro/.

Funding	FY19	FY20
FTEs	None reported	0.25
Funding Estimate	None reported	$150,000

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: While novel applications of advanced manufacturing have ushered in benefits in other energy sectors, the potential benefits for hydropower applications remain largely unexplored. This presents an opportunity to leverage the rapid innovations enabled by advanced manufacturing to solve hydropower challenges. The Innovations in Advanced Manufacturing for Hydropower (I AM Hydro) Prize is designed to spark innovation and pursue these opportunities.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$250,000	16	0	12-31-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 27 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
06-30-2020	10-31-2020	27

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types: Proposal or concept; Creative media

Submissions: Submissions are in the form of concept papers and videos describing teams' unique solutions to the challenge.

Evaluation of Submissions: Submissions will be reviewed by experts from DOE, the National Laboratories, other Federal agencies, and external (non-government reviewers). These reviewers' scores will be averaged and ranked, to inform the decision of the judge in selecting the finalists and winners.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: DOE has a diverse water power research portfolio aimed at improving our Nation's access to affordable, reliable, and clean electricity. The I AM Hydro Prize will leverage the power of advanced manufacturing to develop the next-generation water-power technologies and advance hydropower innovations that will help us meet the dual imperative of energy generation and environmental stewardship.

Plan for Upcoming Two Fiscal Years: In FY21, the prize will close and winners will be awarded cash prizes. No activities are planned for FY22.

B.5.8. Lithium-Ion Battery Recycling Prize[67]

Sponsoring Agency and Office: Energy Efficiency and Renewable Energy

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Lithium-Ion Battery Recycling Prize is a $5.5 million phased prize competition designed to incentivize American entrepreneurs to find innovative solutions to collecting, storing, and transporting discarded lithium-ion batteries for eventual recycling. The prize will award cash prizes totaling $5.5 million to contestants in three progressive phases designed to accelerate the development of solutions from concept to prototype to demonstration. For Phase I, fifteen innovators from across the country shared the $1 million prize (each winner will receive $67,000). These innovative concepts include ideas on how blockchain, car sharing, existing reverse logistics industries, and sorting technologies can be utilized to potentially collect 90% of discarded lithium batteries when scaled across the Nation.

[67] The website for Lithium-Ion Battery Recycling Prize is accessible at https://americanmadechallenges.org/batteryrecycling/#:~:text=The%20Battery%20Recycling%20Prize%20is%20a%20%245.5-million%20phased,materials%20for%20re-introduction%20into%20the%20U.S.%20supply%20chain..

Budget and Resources: The National Renewable Energy Laboratory serves as the Prize Administrator for the Lithium-Ion Battery Recycling Prize on behalf of DOE's Office of Energy Efficiency and Renewable Energy Vehicle Technologies and Advanced Manufacturing Offices. The National Renewable Energy Laboratory (NREL) is the Prize Administrator for the American-Made Challenges. In this capacity NREL works closely with the U.S. Department of Energy to administer the challenges, maintain the website platform, assist in building the network, and pay prize money to the winning teams. For each phase of the competition, for example, NREL helps develop the prize rules; coordinate webinars, website updates, networking meetings, presentations, press releases, demo days; manage the review of submissions, and develop voucher guidelines. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Operations or administrative support
FTEs	0.5	0.5
Funding Estimate	$500,000	$700,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: The Department of Energy is looking at the battery supply chain from raw material supply, battery material production, electrode/cell fabrication, manufacturing, and battery recycling. The ReCell Center and the Critical Materials Institute are advancing innovation solutions to enable direct recycling and recovery of critical materials. A supply of spent lithium-ion batteries is needed for recycling. The Lithium-Ion Battery Recycling Prize is designed to identify innovative solutions for collecting, sorting, storing, and transporting spent and discarded lithium-ion batteries from electric vehicle (EV), consumer electronics, industrial, and stationary applications for eventual recycling and materials recovery.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Most cost-effective approach; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$67,000	25	15	09-25-2019
2	None reported	10	None reported	None reported

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$5,500,000	$1,000,000
FY20	None reported	None reported

Non-Cash Prizes Include: Phase II winners will also receive a non-cash prize of up to $100,000 in vouchers that may be redeemed at National Laboratories and qualified members of the American-Made Network. Voucher funds can be used to validate or support the demonstration of a full end-to-end solution during the Phase III contest.

Participants:

FY19: 51 teams

FY20: 14 teams

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	02-15-2019	08-01-2019	09-25-2019	58
2	01-13-2020	10-13-2020	None reported	14

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept; Prototype device or object; Business or commercial development plan

Submissions: The Lithium-Ion Battery Recycling Prize focuses on identifying innovative solutions for collecting, sorting, storing, and transporting spent and discarded lithium-ion batteries from electric vehicle (EV), consumer electronics, industrial, and stationary applications for eventual recycling and materials recovery. The competition consists of three phases that will fast-track efforts to identify, develop, and test disruptive solutions to meet battery recycling needs. Each phase includes a contest period when participants work to rapidly advance their solutions. Phase I: Concept Development and Incubation. Phase II: Prototyping and Partnering. Phase III: Pilot Validation.

Evaluation of Submissions: Submissions for Phase I and Phase II Battery Recycling Prize were evaluated based on the weighted scoring criteria defined in the rules for that phase, e.g., end-to-end solution, impact, teams/partnerships. Judges for the Battery Recycling Prize are a mix of individuals from DOE, EPA, and DOT.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: Energy storage is a key priority for the Department of Energy. Battery technology is key to ushering in an electric vehicle (EV) transformation and creating the grid of the future with integrated resiliency and flexibility. DOE is looking at the battery supply chain from raw material supply, battery material production, electrode/cell fabrication, manufacturing, and battery recycling of lithium-ion batteries and next-generation energy storage.

Plan for Upcoming Two Fiscal Years: The Battery Recycling Prize will continue with Phase III in FY21 and FY22.

B.5.9. Ocean Observing Prize[68]

Sponsoring Agency and Office: Under Secretary for Energy (Water Power Technologies Office)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The Powering the Blue Economy: Ocean Observing Prize challenges innovators to integrate marine renewable energy with ocean observation platforms, ultimately revolutionizing our ability to collect the data needed to understand, map, and monitor the ocean. This joint prize between the Water Power Technologies Office (WPTO) at the U.S. Department of Energy and the Integrated Ocean Observing System (IOOS) Office at the National Oceanic and Atmospheric Administration (NOAA) seeks to develop new technologies that can help fill the data gaps making it difficult to realize the full potential of the Blue Economy. The Ocean Observing Prize includes a series of competitions with millions of dollars in awards to encourage rapid innovation in the fields of marine energy and ocean observations, that began with the DISCOVER Competition and is followed by the DEVELOP Competition. The Pacific Northwest National Laboratory and the National Renewable Energy Laboratory are supporting DOE and NOAA on the development and administration of the prize.

Budget and Resources: Agency funds were used to support prize administration and development at the National Renewable Energy Laboratory (NREL) and Pacific Northwest National Laboratory (PNNL), promotion and outreach through NREL, and to support DOE federal employees, contractors, and fellows. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	None reported	1.5

[68] The website for Ocean Observing Prize is accessible at https://americanmadechallenges.org/oceanobserving/.

Funding	FY19	FY20
Funding Estimate	None reported	$300,000

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: WPTO supports the research and development (R&D) of marine energy systems. In addition to R&D for electric grid-scale marine energy systems, WPTO also supports R&D of non-grid applications where marine energy is uniquely suited to provide a source of power, including for blue economy applications. The technologies used for ocean observing almost all rely on batteries, but batteries are temporary energy sources and must be recharged periodically. For systems that are operating far offshore or deep underwater for sustained periods, recharging a battery becomes a challenging and costly endeavor. The Ocean Observing Prize will incentivize new solutions that integrate ocean observing and marine energy to reduce or eliminate the energy constraint that limits our ability to monitor the ocean. Improved ocean observations will promote sustainable growth in the blue economy and help us better understand the ocean and its value to humankind.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$125,000	11	11	04-02-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$125,000	$125,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 61 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	11-15-2019	02-13-2020	04-02-2020	61

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media

Submissions: Submissions are in the form of concept papers and videos describing teams' unique solutions to the challenge.

Evaluation of Submissions: Submissions were reviewed by experts from DOE, the National Laboratories, other Federal agencies, and external (non-government reviewers). These reviewers scores were averaged and ranked, to inform the decision of the judge in selecting the finalists and winners.

Partnerships: The prize competition involved 1 partner. The following table lists this partner and its contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Oceanic and Atmospheric Administration	Federal Agency or Office	None reported	None reported	Discovery and design support; Other (Personnel time)

Advancement of Agency Mission: This Ocean Observing Prize will demonstrate how marine energy technologies are uniquely suited to power the systems that collect data to expand our understanding of the ocean, and continue the leadership of the United States in developing next-generation marine renewable energy technologies.

Plan for Upcoming Two Fiscal Years: The next three stages of the Ocean Observing Prize will be carried out in FY21 and FY22.

B.5.10. Solar Desalination Prize - Contest 1[69]

Sponsoring Agency and Office: Solar Energy Technologies Office

Authority: America COMPETES Reauthorization Act of 2010

Status:

[69] The website for Solar Desalination Prize - Contest 1 is accessible at https://americanmadechallenges.org/solardesalination/.

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: For Contest 1, innovative individuals or groups of competitors will demonstrate that they have identified a novel and feasible concept for a technology that can deliver desalinated water using solar-thermal energy. The innovation can be a solar-thermal desalination system component or an entire system. Successful competitors in Contest 1 will have taken steps to determine the technical feasibility, scalability, and other potential benefits of the proposed solution and articulated a credible pathway to commercialization. Competitors selected to advance will receive $50,000 and be eligible to compete in the Teaming contest. Winners of this contest will be referred to as quarterfinalists.

Budget and Resources: In order for the prize to operate, funds are needed for the Prize Administrator, NREL, and its efforts to support to execution of the program and the facilitation of the American Made Network. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	None reported	3
Funding Estimate	None reported	$500,000

Goal Types: Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: Removing salt from water takes a lot of energy! Many of the largest untapped water resources in the U.S. and around the world cannot be cost-effectively used because of high concentrations of dissolved salts. Water treatment processes, like reverse osmosis, are efficient when salt concentrations are low, but can't treat high-salt waters like those that are produced from oil and gas wells, concentrated brines, and some industrial and agricultural wastewaters. Novel thermal desalination technologies can purify water with very high salt content without dramatically increasing the amount of energy required. By using solar thermal as the energy source, desalination technologies could be used in a variety of important environments, especially in arid areas with high sun exposure, where water purification is especially important.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$950,000	20	19	10-19-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$7,500,000	$950,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 162 teams

Intended Participants: Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-27-2020	07-16-2020	10-19-2020	162

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept

Submissions: Individuals or groups of competitors will demonstrate that they have identified a novel and feasible concept for a technology that can deliver desalinated water using solar-thermal energy. The innovation can be a solar-thermal desalination system component or an entire system. Successful competitors in Contest 1 will have taken steps to determine the technical feasibility, scalability, and other potential benefits of the proposed solution and articulated a credible pathway to commercialization. Competitors selected to advance will receive $50,000 and be eligible to compete in the Teaming contest.

Evaluation of Submissions: The prize seeks to have a low barrier of entry by having a simple application process comprised of a 90-second video pitch, a summary slide, and a five-page application describing the challenge, proposed technical solution, team, and plan. These materials are scored by a panel of expert reviewers from industry, National Laboratories, and government.

Partnerships: The prize competition involved 3 partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Renewable Energy Laboratory	Other	None reported	$500,000	Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Software development; Discovery and design support; Operations or administrative support; Solution acceleration
International Desalination Association	Nonprofit Organization (excluding Academic Institutions)	None reported	$10,000	Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
Nation of Makers	Nonprofit Organization (excluding Academic Institutions)	None reported	$3,500	Discovery and design support; Solution acceleration

Advancement of Agency Mission: The Solar Desalination Prize is part of a larger effort known as the Water Security Grand Challenge, a White House-initiated and DOE-led framework to advance transformational technology and innovation to meet the global need for safe, secure, and affordable water. Goal 1 of the Water Security Grand Challenge, which this prize addresses, is to launch desalination technologies that deliver cost-competitive clean water.

Plan for Upcoming Two Fiscal Years: Dependent on congressional appropriation, this prize, and future rounds of this prize are planned to be the primary means of funding research, development, and demonstration of solar thermal desalination technologies. The current round is fully funded from current appropriations, so additional appropriations will enable future rounds.

B.5.11. Waves to Water Prize[70]

Sponsoring Agency and Office: Water Power Technologies Office

[70] The website for Waves to Water Prize is accessible at https://americanmadechallenges.org/wavestowater/ https://www.herox.com/wavestowater/.

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Ongoing

Competition Summary: The Water Power Technologies Office (WPTO) at the U.S. Department of Energy (DOE) seeks innovators to design water desalination systems powered by marine renewable energy. The Waves to Water prize, aligned with the Water Security Grand Challenge, is a five-stage competition that offers up to $3.3 million in cash prizes, with a goal to demonstrate small, modular, cost-competitive desalination systems that use the power of ocean waves to provide clean drinking water for disaster recovery and for remote and coastal communities.

Budget and Resources: DOE funds were used to administer the prize, including communications support for the prize and technical analysis and support. The prize was administered, and heavily informed through the technical support of, the National Renewable Energy Laboratory. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support	Data entry/analysis; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	2	2
Funding Estimate	$400,000	$900,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Desalination is an energy-intensive process, where energy is typically used for a variety of purposes, which could include driving fluid through a membrane, providing heat for a distillation or evaporation process, and/or hybrid configurations. The high energy costs (in many cases electricity costs) of these systems have economic implications for their owner/operators. Threats to water supply, particularly in remote communities or after disasters

strike, can leave people and populations vulnerable. This prize seeks to demonstrate the economic and energy promise of wave powered desalination.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$200,000	20	20	11-14-2019
2	$800,000	20	17	06-08-2020
3	$800,000	20	Not applicable	02-03-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$200,000	$0
FY20	$1,600,000	$1,000,000

Non-Cash Prizes Include: Technical webinars.

Participants:

FY19: 67 teams

FY20: 49 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	06-13-2019	09-11-2019	11-14-2019	67
2	11-14-2019	03-13-2020	06-08-2020	49
3	06-08-2020	11-30-2020	02-03-2021	Not applicable

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept
3	Proposal or concept

Submissions: The Waves to Water prize calls on U.S. innovators to leverage the power of the ocean to provide potable drinking water to remote coastal and island communities through wave energy-powered desalination systems. The prize has five stages, aimed to support concepts through demonstration, with the final stage culminating in an open water testing competition at Jennette's Pier, where the systems will produce clean water using the power of waves.

Evaluation of Submissions: The Prize Administrator screens all completed submissions for eligibility and, in consultation with DOE, assigns reviewers to independently score the content of each submission. The reviewers comprised of Federal and non-Federal subject matter experts with expertise in relevant areas. Reviewers reviewed submissions according to the described evaluation criteria per stage. The Prize Administrator tallies the scores. The Director of WPTO is the judge and made the final determination.

Partnerships: The prize competition involved 2 partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
International Desalination Association	Nonprofit Organization (excluding Academic Institutions)	$5,000	$5,000	Publicity, advertising, outreach, or/and communications
Coastal Studies Institute	Academic Institution	None reported	None reported	Operations or administrative support

Advancement of Agency Mission: Part of the American-Made Challenges series, the Waves to Water Prize was the first prize announced in DOEs Water Security Grand Challenge. The challenge is focused on advancing transformational technology and innovation to meet the global need for secure and affordable water.

Plan for Upcoming Two Fiscal Years: Waves to Water is one of many prizes that will be executed in FY21 and FY22. Following the ADAPT Stage, currently open, competitors will return to the lab for the CREATE Stage, launching in February 2021. Running through September 2021, this stage will challenge contestants to build a functional prototype or proof-of-concept of their system and develop a plan to build and deliver their technology for testing at Jennette's Pier during the final DRINK Stage, a 5-day, open-water test, scheduled for the spring of 2022.

B.6. Department of the Interior (DOI)

B.6.1. Improving Fish Exclusion from Water Diversions and Intakes[71]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The Improving Fish Exclusion from Water Diversions and Intakes Prize Competition sought methods for excluding fish species found in freshwater rivers and/or estuaries in the United States from water diversions and intakes. Without a fish exclusion device or method, fish can be entrained into a diversion or intake which means that they are removed from their natural environment. This can result in the loss of native fishes and reduced operating capabilities of the involved infrastructure. Opportunities to reduce entrainment at diversions and intakes promote more sustainable and reliable water resource systems that can provide greater benefits for aquatic species and the public. Prize Competition submissions could present new ideas for addressing fish exclusion or improvements to existing technologies. Solutions could be applied to river and canal diversions, unscreened diversion pipes, or intakes at dams. Submissions that addressed fish exclusion for one or more fish species of concern in the United States at any life stage (e.g. salmon, steelhead, green, pallid, or shovelnose sturgeon, paddlefish, eel, Pacific, brook, or river lamprey, Delta smelt, shad, suckers, alewife or blueback herring, bull trout) were accepted. Successful solutions were expected to have high fish protection efficiencies, low costs, and provide minimal impact to fish health and the environment. The Prize Competition was a theoretical challenge which required submission of a written proposal describing the fish exclusion idea in detail along with drawings, specifications, and supporting data and literature. Thirty-eight submissions were received for review by the multi-agency judging panel. Six selected winners shared a total prize award amount of $75,000 with four winners meeting all of the technical criteria and two winners meeting some of the technical criteria.

Budget and Resources: Agency funding supported vendor contract (platform and solver engagement), competition design, data management, judging, promotion and outreach, and administrative activities such as solver payment and post-competition announcements. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable

[71] The website for Improving Fish Exclusion from Water Diversions and Intakes is accessible at https://www.usbr.gov/research/challenges/fishexclusion.html; https://innocentive.wazoku.com/#/challenge/9ed9f20c430b4689a356cfcac9789b16?scrollTo=scrollDisco&searchIndex=12.

Funding	FY19	FY20
FTEs	0.2	Not applicable
Funding Estimate	$15,300	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Alterations to the natural environment due to water resource development has impacted many aquatic species. Declines in native fish populations, both resident and migratory, in the United States have led to numerous listings of fish species as threatened or endangered under Federal and/or state laws. Unscreened or ineffectively screened water diversions and pipes used to redirect water for irrigation, water supply, and hydropower intakes provide avenues for fish to move into unnatural environments. Fish entrainment into water diversions and intakes can have population-level impacts, threatening biodiversity and impeding fish recovery efforts for threatened and endangered species. While effective fish exclusion for some fish species and life history stages can be achieved, improvements are needed to increase fish protection efficiencies, target a wider range of fish species and sizes, and reduce construction, operation, and maintenance costs compared to conventional fish exclusion methods.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$75,000	Not applicable	6	11-12-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$75,000	$75,000
FY20	None reported	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 38 teams

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
03-06-2019	05-06-2019	38

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Reclamation Prize Webpage)

Submission Types: Proposal or concept

Submissions: The Improving Fish Exclusion from Water Diversions and Intakes Prize Competition sought new ideas for gaining successful and cost-effective fish exclusion at water diversions and intakes and improvements to existing fish exclusion technologies (e.g. designs, materials, and cleaning techniques). Solutions were expected to have high fish protection efficiencies, low costs, and low impact to fish health and the environment. Competitors could submit solutions deemed effective for any fish species and life stage found in freshwater rivers and/or estuaries in the United States. The theoretical competition required submission of a written proposal describing in detail how the proposed concept met the required technical criteria stated in the competition posting.

Evaluation of Submissions: Submissions were evaluated based on established technical criteria stated in the competition posting (novelty, effectiveness, applicability, cost, impact to fish health and the environment). Judges provided an independent numerical score to determine the highest-ranking proposals. The judging panel met via web conference to discuss the highest-ranked proposals in detail and arrive at consensus opinion on winning submissions. The judging panel consisted of 13 Federal subject matter experts in biology and engineering internal and external to the Bureau of Reclamation (Reclamation).

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Department of Energy's Water Power Technologies Office	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
U.S. Geological Survey	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
NOAA Fisheries	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
U.S. Fish and Wildlife Service	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
U.S. Army Corps of Engineers	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
State of Washington, Department of Fish and Wildlife	State or Local Government	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)

Pacific Northwest National Laboratory	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)

Advancement of Agency Mission: Novel technologies or improvements to existing technologies provide water managers and technical experts with better solutions to reduce potential harm to fish species of concern while maintaining reliable delivery of water and power. Opportunities to reduce entrainment at diversions and intakes promote more sustainable and reliable water resource systems that can provide greater benefits for aquatic species and the public.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

B.6.2. Lowering the Cost of Continuous Stream Flow Monitoring[72]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: Water resources planning, management, and research rely extensively on accurate and reliable streamflow data. Long-term streamflow records, for example, are critical to the design of water supply and flood control projects, as well as infrastructure in and adjacent to stream channels. Similarly, water managers rely on real-time streamflow data to support water supply and flood control operations, including forecast and early warning systems for droughts and floods. Long-term and real-time streamflow data also support a broad range of water resources and environmental research. The Bureau of Reclamation (Reclamation) and U.S. Geological Survey (USGS) sought new and innovative methods to significantly reduce the cost of continuous streamflow monitoring compared to current methods. The Challenge sought white paper submissions detailing proposed methods for continuous streamflow monitoring, including thorough descriptions of the physical principles underlying the proposed method, all equipment and operation and maintenance (O&M) procedures required, and estimated costs. Methods proposed in submissions were required to be applicable to continuous monitoring of the volumetric flow rate of water in open channels, including

[72] The website for Lowering the Cost of Continuous Stream Flow Monitoring is accessible at https://www.usbr.gov/research/challenges/streamflow.html; https://innocentive.wazoku.com/#/challenge/82ea95f2d429421bad145d3752d16c16?scrollTo=scrollDisco&searchIndex=7.

natural channels (e.g., streams and rivers) and engineered channels (e.g., aqueducts, canals, and drainage channels). Methods should have been applicable across a wide range of flow rates, channel sizes, and channel geometries, and the accuracy and reliability of methods should be comparable or better than current methods. The competition was posted on February 22, 2019 and was open for 45 days, with all submissions due by April 8, 2019. Submission packages were required to include a detailed description of the proposed solution, along with rationale as to how the proposed solution improves on existing technologies or approaches currently used for continuous streamflow monitoring.

Budget and Resources: Agency funding was used to support vendor contract, competition design, data management, judging, and administrative activities such as solver payment and post competition. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable
FTEs	0.17	Not applicable
Funding Estimate	$15,300	Not applicable

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Despite the importance of streamflow data, the existing network of continuous streamflow monitoring stations (also referred to as stream gages) in the United States has generally declined over the past several decades. The primary driver of this decline is the cost of installing, operating, and maintaining stream gages. Between 2000 and 2009, additional funding was made available to reactivate approximately half of the deactivated gages; however, the cost of installing, operating, and maintaining stream gages remains a significant challenge to Federal, Tribal, State, and local water agencies. This Prize Competition sought new methods or technologies to significantly reduce the equipment and/or labor costs of continuous streamflow monitoring. Solutions were to be applicable to continuous monitoring of the volumetric flow rate of water in open channels, including natural channels (e.g., streams and rivers) and engineered channels (e.g., aqueducts, canals, and drainage channels).

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$75,000	5	5	01-21-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$75,000	$75,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 40 teams

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-22-2019	04-08-2019	40

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Agency prize webpage)

Submission Types: Proposal or concept

Submissions: The Lowering the Cost of Continuous Streamflow Monitoring Prize Competition sought innovative ideas to significantly reduce the cost of continuous streamflow monitoring compared to current methods while also increasing the availability of streamflow data. Accurate and reliable records from continuous streamflow monitoring stations are vital to water resources planning, design, management, and research. The methods proposed had to be applicable to continuous monitoring of the volumetric flow rate of water in open channels, including natural channels (e.g., streams and rivers) and engineered channels (e.g., aqueducts, canals and drainage channels). In addition, the methods had to be applicable across a wide range of flow rates, channel sizes, and channel geometries.

Evaluation of Submissions: A judging panel of subject matter experts evaluated the submissions and decide which solvers are selected for an award. The judging panel was composed of Federal scientists, engineers, and other technical experts, internal and external to Reclamation.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Geological Survey	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluations)

Advancement of Agency Mission: Water resources planning, management, and research rely extensively on accurate and reliable streamflow data. Long-term streamflow records, for example, are critical to the design of water supply and flood control projects, as well as infrastructure in and adjacent to stream channels. Similarly, water managers rely on real-time streamflow data to support water supply and flood control operations, including forecast and early warning systems for droughts and floods. Long-term and real-time streamflow data also support a broad range of water resources and environmental research.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

B.6.3. Pathogen Monitoring Challenge Stage 1[73]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The Pathogen Monitoring Challenge Stage 1 Prize Competition sought to identify new or improved methods for monitoring pathogens - specifically viruses - to facilitate the indirect and direct reuse of municipal wastewater as a means to alleviate water shortages and expand current water supplies. The Prize Competition was a theoretical challenge that required solvers to submit an idea along with detailed descriptions, specifications, and data that supported how their concept met the objectives described in the Challenge posting. The Competition was structured so that solvers could propose solutions in three distinct areas: improved sampling and concentration methods for direct virus monitoring, improved analytical methods for virus quantification, and new surrogate methods for monitoring reverse osmosis process performance. Advancements in any of these three areas could stimulate innovation in water monitoring technologies that can lead to more

[73] The website for Pathogen Monitoring Challenge Stage 1 is accessible at https://www.usbr.gov/research/challenges/pathogen.html; https://innocentive.wazoku.com/#/challenge/c6525c79f53c424482f56195b1b45790?scrollTo=scrollDisco&searchIndex=12.

effective, affordable, and reliable methods to ensure water quality and protection of public health in water reuse applications. Submissions were scored by a team of subject matter experts based on the stated criteria for each solution area, which included considerations such as virus quantification, labor requirements and operator effort, calibration protocols, and how quickly the proposed solution can provide results. The Competition was posted on May 10, 2018 and was open for 90 days, with all submissions due by August 8, 2018. Submission packages were required to include a detailed description of the proposed solution, along with rationale as to how the proposed solution improves on existing technologies or approaches currently used for pathogen monitoring and detection.

Budget and Resources: Agency funding was used to support vendor contract, competition design, data management, judging, and administrative activities such as solver payment and post competition announcements. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable
FTEs	0.005	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: While advanced water treatment technologies exist to produce high quality, potable water from wastewater, there is a need to better ensure treatment process integrity through improved pathogen detection and monitoring. Waterborne pathogens are regulated due to the risk they pose to human health, and their presence must be limited in water intended for potable use. To facilitate regulatory and public acceptance of water reuse, it is necessary to develop techniques for rapid detection of pathogens. Virus monitoring can be improved by reducing response times for direct measurements, by identifying robust surrogate monitoring techniques, or by identifying appropriate indicator organisms. Most direct pathogen detection methods have turnaround times on the order of days due to sample collection, transport, culture, and analysis times. Long response times and the lack of on-site, real-time pathogen monitoring lead to cost-inefficient operations and increased treated water storage requirements.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$80,000	5	5	03-28-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	$80,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
05-10-2018	08-09-2018	27

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: The Pathogen Monitoring Challenge Prize Competition sought to improve pathogen detection and monitoring methods and asked solvers to provide detailed technical descriptions on how their concepts addressed one of three areas of interest described in the Competition. Solvers were asked to provide rationale as to how their concept addressed each solution requirement defined in the Challenge, quantitatively where possible. Solvers were also asked to compare their proposed solutions against existing technologies that address the Competition criteria.

Evaluation of Submissions: The judges panel consisted of 11 subject matter experts from Reclamation, Xylem Inc., U.S. Environmental Protection Agency, Water Research Foundation, California State Water Resources Control Board, and University of Colorado Boulder. The judges met to discuss the solutions that were submitted under this Prize Competition, review the evaluations performed by each judge, and make a final recommendation for the winners of the monetary award(s).

Partnerships: The Prize Competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Xylem, Inc	Private Industry	$40,000	Not applicable	Prize purse; Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
Water Research Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)
Environmental Protection Agency	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluation)

Advancement of Agency Mission: As western U.S. water demands grow and water supplies become scarcer, water reuse is becoming an increasingly important water management strategy. Wastewater is a drought-resistant and reliable water source that is readily available in urban centers for beneficial reuse. In particular, potable reuse, both direct and indirect, is recognized by several states (e.g., California, Texas, and Arizona) as necessary for meeting future water needs.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

B.6.4. Powering Electronic Instruments on a Rotating Shaft[74]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: America COMPETES Reauthorization Act of 2010

Status:

[74] The website for Powering Electronic Instruments on a Rotating Shaft is accessible at https://www.usbr.gov/research/challenges/shaft-power.html; https://innocentive.wazoku.com/#/challenge/a17b5b0f19214298af96118837f41212?scrollTo=scrollDisco&searchIndex=12.

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: Reclamation's hydropower-generating units are expected to safely and reliably produce the power that is delivered to the western electric grid. Equipment monitoring via electronic instruments on the generator shaft provides critical advancement toward keeping these units operational and reducing costly outages. These instruments require a continuous power source in order to keep them online and performing their key roles. New power source solutions are needed to permanently install low-power instruments on the generator's rotating shaft to collect continuous data pertinent to operation and performance of the machine. Reclamation and its collaborators sought novel methods and technologies to reliably provide direct current power for loads of up to twenty watts to instruments on rotating shafts. Proposed solutions were required to be applicable to 18- to 144-inch diameter rotating shafts, whether at rated speed (72 to 550 revolutions per minute), standstill, or when ramping up or down. Small, lightweight solutions were preferred, and could be achieved via multiple methods, including air movement, light, vibration, magnetic induction, kinetic motion, or wireless energy transfer. The Competition was posted on September 6, 2018 and was open for 90 days, with all submissions due by December 8, 2018. Phase I submission packages were required to include a detailed description of the proposed solution, along with rationale as to how the proposed solution improves on existing technologies or approaches currently used. Phase II required solvers to submit a prototype for lab testing and potential testing at a Reclamation hydropower plant.

Budget and Resources: Agency funding supported vendor contract (platform and solver engagement), competition design, data management, judging, promotion and outreach, solver webinar to provide feedback, and administrative activities such as solver payment and post competition announcements. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable
FTEs	0.21	Not applicable
Funding Estimate	$30,630	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: Reclamation is the second largest hydropower producer in the nation, operating 53 powerplants with a generation capacity of 14,730 megawatts and more than 40 billion kilowatt-hours of electricity produced annually. Reclamation's hydropower-generating units are expected to safely and reliably produce the power that is delivered to the western electric grid. Monitoring these generating units provides a critical advancement toward keeping the units operational and reducing costly outages. Monitoring instruments require a continuous power source in order to keep them online and performing their key roles. New solutions are needed to permanently install low-power instruments on a rotating shaft in order to collect continuous data

pertinent to generator operation and performance. Presently, the available power sources for electronic instruments on rotating shafts include batteries and contact solutions. A battery does not provide continuous operation and requires generator downtime to replace.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$50,000	No limit	6	08-30-2019
2	$200,000	No limit	2	09-24-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$250,000	$65,250
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Non-monetary incentives offered included a demonstration event with invitees from industry, non-profit organizations, and venture capital representatives. After multiple attempts to address safety concerns associated with the prototypes received, Reclamation was unable to install solutions for demonstration; thus, an event did not occur. Reclamation hosted a webinar with each of the final solvers to provide a summary of the lab evaluation, feedback on solutions, and respond to solver questions.

Participants:

FY19: 66 teams

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-06-2018	12-08-2018	08-30-2019	66
2	01-15-2019	04-20-2019	09-24-2019	2

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Agency Prize Webpage)

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Prototype device or object

Submissions: The Bureau of Reclamation and its collaborators sought devices to provide direct current power for loads of up to 20 watts (20 W) to electronic instruments on rotating shafts. Proposed solutions must be applicable to 18 to 144-inch diameter rotating shafts, whether during rotation (72 to 550 rpm), standstill, before generator rotation begins or after it ends. New devices or significant improvements to existing methods and technologies, as long as the improvements offer substantial enhancement were sought. This was a two-phase Reduction-to-Practice Challenge that requires (Phase 1) written documentation, proof-of-concept data and, (Phase 2) prototype delivery for experimental validation.

Evaluation of Submissions: A judge's panel reviewed all Phase 1 submissions. Entries were reviewed against evaluation criteria that included power efficiency, robustness, ease of implementation, cost, and feasibility of mass production. The evaluation panel included Federal subject matter experts internal and external to Reclamation. Phase II evaluations included laboratory testing to determine operability, safety, and validation of submission. Phase II results were evaluated by Reclamation subject matter experts.

Partnerships: The prize competition involved 3 partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Army Corps of Engineers	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Phase 1 Submission Evaluations)
Bonneville Power Administration	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Phase 1 Submission Evaluations)
Department of Energy	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Phase 1 Submission Evaluations)

Advancement of Agency Mission: Reclamation is the second largest hydropower producer in the nation, operating 53 powerplants with a generation capacity of 14,730 megawatts and more than 40 billion kilowatt-hours of electricity produced annually. Reclamation's hydropower-generating units are expected to safely and reliably produce the power that is delivered to the western electric grid. Monitoring these generating units provides a critical advancement toward keeping the units operational and reducing costly outages.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

B.6.5. Saving the ʻŌhiʼa[75]

Sponsoring Agency and Office: Office of the Secretary

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Two newly discovered invasive fungal pathogens are killing hundreds of thousands of ʻŌhiʼa trees (*Metrosideros polymorpha*) on Hawaii island. This mortality is known as Rapid ʻŌhiʼa Death (ROD) and strikes at the heart of not only the Native Hawaiian people who revere the tree as part of their family, but to everyone who has ever been touched by the wondrous beauty of the Hawaiian Islands. The importance of ʻŌhiʼa cannot be overstated: it is the keystone native tree species, and provides food and habitat for a myriad of species found nowhere else on Earth. Initially thought to be *Ceratocystis fimbriata*, researchers have confirmed that these two new pathogens are not just new to Hawaii, but also new to science, and are now called *Ceratocystis lukuohia* and *Ceratosistis huliohia*. The Saving the ʻŌhiʼa Challenge was presented as an open challenge to solicit ideas and projects as potential solutions and encourage collaboration on the ROD issue.

Budget and Resources: The non-prize purse funds allocated for the challenge were utilized to hire a contractor to assist with the administration of the Challenge. This included such things as: social media and traditional media activities; live event assistance; coordination between bureaus and agencies; messaging; and overall guidance on the Challenge grant model. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	None reported

[75] The website for Saving the 'Ōhiʼa is accessible at https://conservationx.com/challenge/invasives/ohia.

Funding	FY19	FY20
FTEs	0.1	0
Funding Estimate	$30,000	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Two newly discovered invasive fungal pathogens, *Ceratocystis lukuohia* and *Ceratocystis huliohia* (formerly *Ceratocystis fimbriata*), are killing hundreds of thousands of ʻŌhiʻa (*Metrosideros polymorpha*) on Hawaii Island. First observed in 2010, these fungi are responsible for Rapid ʻŌhiʻa Death (ROD). ROD can affect individual trees and entire forests, but is only known on Hawaii Island, where currently, over 100,000 acres of forests are affected. While there is widespread support for research and management to halt the spread of ROD, many unanswered questions remain. For example, we do not fully understand how trees become infected, or how the disease spreads through forests. Understanding the spread of ROD is critical, yet the difficulty of detecting the fungus presents a significant barrier.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$70,000	3	3	07-10-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$70,000	$70,000
FY20	$0	$0

Non-Cash Prizes Include: 2 Honorable Mentions

Participants:

FY19: 56 teams

FY20: 56 teams

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
08-27-2018	02-01-2019	62

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept; Prototype device or object; Analysis or visualization of data

Submissions: The Challenge is to create low-cost solutions to detect (and predict) the invasion pathways and the spread of the fungus in the environment, as well as to develop solutions that would help contain or reduce the spread of fungi without harming other beneficial species. Three categories were available for solutions in the Challenge: 1) Field-based detection of rapid ʻŌhiʻa death in asymptomatic trees; 2) Detection of the fungus at the landscape level; and 3) environmental pathway identification, including predictive assessment

Evaluation of Submissions: Judges were cross agency and external. Judging occurred in four phases: Phase 1, initial scan of applications for eligibility; Phase 2, first application review period and virtual judging panel discussion; Phase 3, virtual pitch sessions; and Phase 4, final selection of winner(s).

Partnerships: The Prize Competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Hawaii Volcanoes National Park	Federal Agency or Office	$0	None reported	Publicity, advertising, outreach, or/and communications; Data entry/analysis; Discovery and design support; Operations or administrative support
Conservation X Labs	Other	$10,000	None reported	Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Data entry/analysis; Discovery and design support; Operations or administrative support; Solution acceleration

Advancement of Agency Mission: The ʻŌhiʻa Challenge advanced the Agency's missions of: 1) Creating a conservation stewardship legacy second only to Teddy Roosevelt (by protecting National Park and U.S. Wildlife Refuge resources that were attacked by ROD); 2) Restoring trust with Local Communities (the local communities saw that we were addressing an issue that would drastically affect their water supply and potentially cause billions of dollars in damages to the economy); and 3) Preservation of Native Hawaiian natural and cultural resources (the trees being attacked by the invasive fungus are sacred to the Native Hawaiian Community)

Plan for Upcoming Two Fiscal Years: None reported

B.6.6. Sediment Removal Techniques for Reservoir Sustainability Stage 1[76]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The Sediment Removal Techniques for Reservoir Sustainability Competition sought new or improved techniques for reservoir sediment removal (i.e. collection, transport, and delivery to the downstream river) in a cost-effective manner that preserves and sustains the operational objectives of the reservoir. The lifespan of reservoirs directly correlates with the ability to manage sediment. Sediment constantly enters reservoirs and slowly reduces available water storage, thus affecting the ability to meet critical operational objectives such as storage for water supply or flood risk reduction. Sedimentation also impacts dam outlets, reservoir water intakes, water quality, recreation, upstream flood stage, and downstream habitats which can result in additional maintenance costs or adverse effects to the environment. This Competition resulted in 40 submissions providing a wide range of theoretical solutions. Six submissions were considered worthy of a prize award in the areas of collection and transport. Four of the six solutions were determined to meet or exceed the solution requirements. The winning ideas were from solvers not affiliated with the reservoir sediment management industry. With technical input and guidance, the winning concepts have potential to reach a prototype level and be tested. The Competition resulted in ideas that were either not previously considered or were novel advancements of existing or emerging technologies and was successful in raising awareness of reservoir sedimentation issues and the need for advanced technologies to sustain the aging reservoirs.

Budget and Resources: Agency funding supported vendor contract (platform and solver engagement), competition design, data management, judging, promotion and outreach, and administrative activities such as solver payment and post competition announcements. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable
FTEs	0.3	Not applicable

[76] The website for Sediment Removal Techniques for Reservoir Sustainability Stage 1 is accessible at https://www.usbr.gov/research/challenges/sediment-removal.html; https://innocentive.wazoku.com/#/challenge/1d18b4364bf44d97a0e21a9139c3fa20?scrollTo=scrollDisco&searchIndex=12.

Funding	FY19	FY20
Funding Estimate	$22,500	Not applicable

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: Reservoir sedimentation has become a significant problem with the aging of water storage facilities. Sediment deposition in reservoirs limits the active life of reservoirs by reducing storage capacity for water supply or flood risk reduction. Sedimentation also impacts dam outlets, reservoir water intakes, water quality, recreation, upstream flood stage, and downstream habitats. Conventional temporary dredging has been used to remove sediment from some reservoirs, but it can be very expensive. Periodic pressure flushing with a full reservoir is another method used, but only removes a small amount of sediment around the dam outlet. Drawdown flushing can be effective through low-level outlets but sacrifices the much-needed water stored in the reservoir. Conventional dredging and flushing methods have shortcomings that reduce their applicability to large reservoirs designed for multi-year water storage, with relatively larger volumes of sediment that require removal.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$75,000	No limit	6	07-11-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$75,000	$75,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 40 teams

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
10-10-2018	01-04-2019	40

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Agency prize webpage, pre-recorded video promoting the competition, and webinar to share additional information during the submission period)

Submission Types: Proposal or concept

Submissions: The Sediment Removal Techniques for Reservoir Sustainability Competition sought new methods for sediment removal that could effectively minimize the future loss of reservoir capacity due to sedimentation. For the purpose of this Competition, sediment removal included 1) The collection of sediments; 2) Transport of sediment through or around a reservoir; and 3) Delivery of sediment to the downstream river channel. Solvers were asked to provide a new and novel solution for either sediment collection from the reservoir, transport from the reservoir past the dam, or delivery to the downstream channel. Solvers were not required to provide new and novel solutions for all three of these categories.

Evaluation of Submissions: The judge's panel consisted of Federal and non-Federal subject matter experts. Judging was conducted by blind review as all submissions were assigned a number. Each judge was asked to become familiar with all 40 solutions and review ten specific solutions in detail. Judges scored their ten submissions independently. A conference call near the beginning of the judging process was held to establish grading criteria and re-discuss competition criteria. Scores were used during the in-person judge's team meeting (with both small-group and large-group discussions) to collectively discuss the strengths and weaknesses of each submission and arrive at a judges consensus opinion. The full panel of 15 judges discussed the ten best solutions and determined the winning solutions.

Partnerships: The Prize Competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Army Corps of Engineers	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluations)
Federal Energy Regulatory Commission	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluations)
Natural Resource Conservation Service	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluations)

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
American Rivers	Nonprofit Organization (excluding Academic Institutions)	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other (Submission evaluations)

Advancement of Agency Mission: This Competition sought new or improved techniques for reservoir sediment removal in a cost-effective manner that still preserved and sustained the operational objectives of reservoirs managed by the Bureau of Reclamation. Implementation of more efficient and less expensive sustainable sediment management options on a large scale would better enable Reclamation to continue to meet its water and power deliveries.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

B.6.7. White-Nose Syndrome - Fight the Fungus, Save Our Bats[77]

Sponsoring Agency and Office: United States Fish and Wildlife Service

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Ongoing

Competition Summary: Hibernating bats in North America are in trouble. An invasive fungus, *Pseudogymnoascus destructans*, that causes a disease called white-nose syndrome, is spreading across the continent and killing millions of bats. Bats eat insects and are integral to thriving ecosystems. With the loss of millions of bats because of this deadly fungus, many millions more forest and agriculture insect pests are left to feed on trees and crops, ultimately affecting the balance of nature and even human health. There is no known cure for white-nose syndrome, but scientists from all over the world are working together to study the disease, how it spreads and infects bats, and what we can do to control it. Much of this work has been done under the umbrella of the United States National Response to White-nose Syndrome, a broad, multi-agency effort led by the U.S. Fish and Wildlife Service. The White-Nose Syndrome Prize Challenge seeks ideas that may lead to a permanent solution to this crisis of wildlife health by eliminating, weakening, or disarming the fungus that causes it. The White-Nose Syndrome Challenge sought ideas that can permanently eliminate, disarm, or weaken *P. destructans* in the wild without harming other beneficial species or the environment. Ideas

[77] The website for White-Nose Syndrome - Fight the Fungus, Save Our Bats is accessible at https://www.whitenosesyndrome.org/static-page/white-nose-syndrome-challenge.

recognized through this challenge will be the focus of future collaborations to establish an appropriate research and development plan to bring the envisioned tools to fruition. Experts in relevant fields, including members of winning teams, if appropriate, will come together to identify critical research and technology needs to develop the solution. After that, qualified scientists, designers, and engineers will have an opportunity to apply to do this work and develop prospective tools for use. Once ready, we hope the tool(s) will be used throughout the country to improve survival of bats susceptible to white-nose syndrome.

Budget and Resources: Agency funds were used to develop, coordinate, and administer the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE)	Federal personnel (FTE)
FTEs	0.29	0.19
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Other (Improve wildlife conservation.)

Problem or Opportunity Addressed: The White-Nose Syndrome Challenge sought ideas that can permanently eliminate, disarm, or weaken *P. destructans*, an invasive fungus that causes white-nose syndrome in bats in the wild. Bats eat insects and are integral to thriving ecosystems. With the loss of millions of bats because of this deadly fungus, many millions more forest and agriculture insect pests are left to feed on trees and crops, ultimately affecting the balance of nature and even human health.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Promote awareness of a specific topic or agency research area; Other (The challenge offered a novel opportunity to explore options to achieve the goals of the White-nose Syndrome National Plan.)

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$100,000	5	1	11-10-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$100,000	$0
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: The U.S. Fish and Wildlife Service will work with partners to determine how to best carry out the idea for bat conservation. The agency may further develop ideas recognized through this challenge, working with other partners as appropriate. Winners, including honorable mentions, may be invited to participate in a follow-up collaboration to establish an appropriate Research and Development plan for bringing the envisioned tools to fruition. Follow-up research

could subsequently be funded by the Bats for the Future Fund or another grant program, or the U.S. Fish and Wildlife Service may choose to implement it directly.

Participants:

FY19: 47 teams

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
10-24-2019	12-31-2019	47

Solicitation of Submissions: Social media; Email; Press release; Posted on challenge.gov; Other (Webinars to discuss the challenge)

Submission Types: Proposal or concept

Submissions: We invited ideas that can lead to solutions to reduce the effects of the fungus that causes White-nose Syndrome without harming other beneficial species or the environment and that can be used in the field in the near future.

Evaluation of Submissions: The Service implemented a judging plan to ensure objectivity. Contact information was removed from all submissions to ensure anonymous review. Judges with scientific expertise in issues we anticipated would be part of submissions were recruited from Federal agencies, non-governmental organizations, and academia. The agency had criteria, published in our announcement, which we used to evaluate all submissions.

Partnerships: The prize competition involved four types of partners. Partners from academia, Federal agencies, international governmental agencies, and non-governmental organizations provided judges for the challenge.

Advancement of Agency Mission: The challenge directly relates to the mission of the U.S. Fish and Wildlife Service, which is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

Plan for Upcoming Two Fiscal Years: The U.S. Fish and Wildlife Service will announce the winner and award $20,000 in November 2020. The Wildlife and Sport Fish Restoration Program is administering six new prize challenges to catalyze technology innovation to advance wildlife and habitat conservation. The Theodore Roosevelt Genius Prize Competitions will engage the public to help address six important issues: preventing wildlife poaching and trafficking, promoting wildlife conservation, managing invasive species, protecting endangered species, promoting nonlethal human-wildlife conflict, and reducing human-predator conflict. The John D. Dingell, Jr., Conservation, Management, and Recreation Act, March 12, 2019 (Pub. L. 116-9), established five prize competitions, and America's Conservation Enhancement Act (Pub. L. 116-188) established the sixth. The submission window is March 1-April 30, 2022, with the winner announcements in September 2022.

B.7. Department of Labor (DOL)

B.7.1. Veterans' Employment Challenge[78]

Sponsoring Agency and Office: Veterans' Employment and Training Service (VETS)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The goal of this challenge is to develop a job-matching tool that will be piloted in a Transition Assistance Program (TAP) Employment Workshop at selected military base locations. If the tool is effective, it could be added to the Employment Workshop curriculum for all transitioning service members. In 2018, the Department of Labor (DOL), the Department of Defense (DoD), and the Department of Veterans Affairs (VA) began a cross-agency effort to understand the transition of service members from active duty to civilian employment, from the perspective of the individual navigating this process rather than the perspective of the Federal organizations that support a plethora of existing programs. The agencies built a journey-map of this process and found a recurring theme: navigating the sea of support and resources relating to the job search can be a challenging task. Veterans complete their military service with unique and technical skill sets that can bring value to all sectors of the economy, but can encounter challenges framing their experience and skills for civilian employers. American businesses report that they are also missing an opportunity to attract and retain a capable, competent workforce, and recognize the value in veterans and their spouses. Many job boards, veteran hiring programs, and other initiatives exist, but there are disparate platforms of valuable data. Traversing across these resources can be overwhelming for both first-time job-seeking veterans and businesses with limited time to fill urgent needs. Additionally, most job search tools for service members are based purely on military occupational specialties, which do not accurately represent the breadth of experiences many individuals have. Finally, small businesses in particular do not have the staff capacity to build out robust skills profiles that better describe hiring needs. There is a need for both a more sophisticated matching mechanism and a simpler interface that can pull from existing data sources.

Budget and Resources: Federal personnel managed the competition activities, submissions, communications, and overall organization/execution of the competition. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award)
FTEs	Not applicable	1
Funding Estimate	Not applicable	$0

[78] The website for Veterans' Employment Challenge is accessible at https://www.challenge.gov/challenge/vets-match/.

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination

Problem or Opportunity Addressed: The goal of this challenge was to develop a job-matching tool that will be piloted in a Transition Assistance Program (TAP) Employment Workshop at selected military base locations. Many job boards, veteran hiring programs, and other initiatives exist, but there are disparate platforms of valuable data. There is a need for both a more sophisticated matching mechanism and a simpler interface that can pull from existing data.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	10	10	01-31-2020
2	$100,000	5	5	03-06-2020
3	$300,000	3	3	05-08-2020
4	$300,000	1	1	07-10-2020
5	$300,000	1	1	09-18-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$1,000,000	$1,000,000

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: 51 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	12-11-2019	01-24-2020	01-31-2020	51
2	02-03-2020	02-28-2020	03-06-2020	10
3	03-09-2020	05-01-2020	05-08-2020	5
4	05-11-2020	07-03-2020	07-10-2020	3

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
5	07-13-2020	09-04-2020	09-18-2020	1

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Other (Wireframe)
3	Other (Minimum Viable Product)
4	Prototype device or object; Other (Alpha Product Version, 30-minute TAP module)
5	Prototype device or object; Other (Beta Product Version, 30-minute TAP module)

Submissions: Phase I: Concept Paper; Phase II: Wireframe; Phase III: Minimum Viable Product; Phase IV: Alpha Product Version, 30-minute TAP module; Phase V: Beta Product Version, 30-minute TAP module

Evaluation of Submissions: To judge the competition, 12 Federal employee judges with expertise in IT/Software Development and/or Veterans' Employment were selected. The Federal agencies included: DoD, DOL, VA, General Services Administration (GSA), Office of Management and Budget (OMB), and Office of Personnel Management (OPM).

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Department of Defense	Federal Agency or Office	Not applicable	$0	Discovery and design support; Other (Judges provided)
Department of Veterans Affairs	Federal Agency or Office	Not applicable	$0	Discovery and design support; Other (Judges provided)

Advancement of Agency Mission: In 2018, the Department of Labor (DOL), the Department of Defense (DOD), and the Department of Veterans Affairs (VA) began a cross-agency effort to understand the transition of service members from active duty to civilian employment, from the perspective of the individual navigating this process rather than the perspective of the Federal organizations that support a plethora of programs. The agencies built a journey-map of this process and found a recurring theme: navigating the sea of support and resources relating to the job search can be a challenging task. Veterans complete their military service with unique and technical skill sets that bring value to all sectors of the economy, but can encounter challenges framing their experience and

skills for civilian employers. American businesses report that they are also missing an opportunity to attract and retain a capable, competent workforce, and recognize the value in veterans and their spouses.

Plan for Upcoming Two Fiscal Years: There are no current plans for the upcoming two fiscal years.

B.8. Department of Transportation (DOT)

B.8.1. Inclusive Design Challenge[79]

Sponsoring Agency and Office: Office of the Secretary

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The DOT's Inclusive Design Challenge seeks innovative design solutions that can enable people with physical, sensory, and cognitive disabilities to use automated vehicles to access jobs, healthcare, and other critical destinations. The challenge is a part of a larger set of departmental initiatives on accessibility, announced at DOT's Access and Mobility for All Summit in October 2019. The challenge intends to seek solutions to improve passenger vehicle accessibility, encourage cross-disciplinary collaborations, incentivize development of new designs and technologies, and tap into the creativity and knowledge of the disability community, researchers, advocates, and entrepreneurs.

Budget and Resources: Agency funds have been used in the design, development, and implementation of the challenge. Funds have been used to support Federal and contractor labor to conduct market research and early-stage planning for challenge design; develop the Request for Information and Challenge Statement; develop the website and related web pages; conduct outreach via social media and webinars; and conduct the evaluation process. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Discovery and design support; Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	1.27
Funding Estimate	Not applicable	$287,000

[79] The website for Inclusive Design Challenge is accessible at https://www.transportation.gov/accessibility/inclusivedesign.

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: DOT seeks to draw attention to the topic of passenger vehicle accessibility; encourage new cross-disciplinary collaborations; incentivize the development of new approaches and technologies to improve mobility; and tap into the creativity and knowledge of the disability community, researchers, advocates, manufacturers, and entrepreneurs. DOT aims to attract ideas from around the Nation to identify new solutions for common access issues. This challenge seeks inclusive solutions, referring to features and designs that enable access to and use of a vehicle by people with a wide range of physical, sensory and cognitive disabilities. Technology has already changed how most of us get around. This challenge seeks to ensure that these new technology-driven mobility options are inclusive of all Americans.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	None reported	10	None reported	None reported

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$3,000,000	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: 0 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2020-04-21	2020-10-30	None reported	None reported

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Business or commercial development plan; Creative media

Submissions: In Stage I, DOT solicits brief technical proposals for inclusive design features that could then be demonstrated in prototype form by semifinalists in Stage II. The submission is a proof-of-concept paper less than ten pages, with supporting materials. Solutions must address one or more aspects of use of Level 4 and Level 5 Automated Driving Systems (ADS) - such as locating and entering an ADS-dedicated vehicle (ADS-DV) or interacting with the vehicle in routine and emergency situations - through physical hardware and/or human-machine interface (HMI) designs.

Evaluation of Submissions: DOT had a 13-person evaluation team comprised of subject matter experts from across the Department in automation, safety analysis, vehicle design, human factors, and accessibility. Participating Operating Administrations and Office of the Secretary (OST) offices include: Federal Highway Administration (FHWA), National Highway Safety Traffic Administration (NHTSA), Federal Transit Administration (FTA), OST-Policy, and Office of the Chief Information Officer (OCIO). The judges will review all proposals independently and complete evaluation forms prior to participating in a consensus meeting to identify the recommended proposals. That list will then be submitted to the Office of the Secretary's Strategic Review Team for final selection before going to the Secretary or designee for approval.

Partnerships: No partners were indicated.

Advancement of Agency Mission: DOT is eager to realize the potential mobility benefits that ADS-DVs could bring to people with disabilities. ADS-DVs could offer greater levels of mobility for individuals who either cannot drive or require a vehicle with extensive modifications, but only if their needs are considered explicitly and incorporated into future ADS-DV designs. DOT recognizes that the diversity of disabilities and resulting implications for vehicle design features makes this a complicated engineering challenge. While some mobility services (e.g., public transportation or for-hire vehicles, such as taxis) currently incorporate some accessibility features, few of these features are universally included in passenger vehicles as part of vehicle design. Meanwhile, aftermarket solutions tend to be expensive and cumbersome.

Plan for Upcoming Two Fiscal Years: Ten Semifinalists were announced January 6, 2021 to participate in Stage II of the Challenge. Stage II will be for 18 months, January 2021 to June 2022 (Fiscal Year 2021-2022). In Stage II, the Semifinalists selected to advance from Stage I will develop their concepts into functional prototypes of an inclusive design solution. Solutions will focus on hardware, software, or full vehicle design solutions for use in automated vehicles, particularly ADS-DVs that are operated exclusively at Levels 4 and 5. Stage II will also include several engagement events that will offer an opportunity for teams to receive input and feedback from both DOT and its stakeholders. Prototype demonstrations by the Semifinalists are expected to occur in June 2022. DOT anticipates making final selections after all demonstrations are complete.

B.8.2. Solving for Safety Visualization Challenge[80]

Sponsoring Agency and Office: Office of the Secretary (Bureau of Transportation Statistics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The Solving for Safety Visualization Challenge was designed to advance the use of data visualizations and visual analytics answer analytical questions related to roadway and rail system safety. Currently, transportation decision makers have a limited number of analytical visualization tools available that reveal insights, and even fewer focused on safety and prevention of serious crashes. Analytical visualization tools can cast new light on the data to reveal insights not seen though tabular analysis. A new opportunity lies in the rapid growth and advancement in technology and analytics markets combined with the volume and variety of transportation and other data now collected by the public and private sectors. Technology has already changed how we get around. USDOT seeks to harness the power of visualization technology to reduce surface transportation crashes.

Budget and Resources: In FY18, the Bureau of Transportation Statistics (BTS) allocated $476,000 of the Agency's funds authorized in the FAST Act, sec. 6002 (a)(6), $350,000 of which was obligated for competition prizes. In FY18, the Bureau of Transportation obligated $63,000 for a BTS Fellow from the Department of Energy's Oak Ridge Institute for Science and Education Program. The BTS Fellow served as the Challenge developer and coordinator. A total of $86,885 ($63,837 FY18 and $23,048 in FY19) was obligated for the DOT Volpe Center, a cost reimbursable unit of DOT that provided support for the evaluation of ideations submitted to the competition. All funds obligated to Volpe were expended. The 0.25 FTE represents program management and oversight from the BTS Director of Spatial Analysis and Visualization, review of documents by counsel, and the DOT staff who evaluated the ideations. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	federal personnel (FTE); operations or administrative support	federal personnel (FTE); operations or administrative support
FTEs	0.25	0.1
Funding Estimate	$23,048	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: The Solving for Safety Visualization Challenge is designed to advance the use of data visualizations and visual analytics to answer analytical questions related to

[80] The website for Solving for Safety Visualization Challenge is accessible at https://www.transportation.gov/policy-initiatives/solving-safety/solving-safety-visualization-challenge.

roadway and rail system safety. Currently, transportation decision makers have a limited number of analytical visualization tools available that reveal insights, and even fewer focused on safety and prevention of serious crashes. Analytical visualization tools can cast new light on the data to reveal insights not seen though tabular analysis. A new opportunity lies in the rapid growth and advancement in technology and analytics markets combined with the volume and variety of transportation and other data now collected by the public and private sectors. Technology has already changed how we get around. USDOT seeks to harness the power of visualization technology to reduce surface transportation crashes.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	10-26-2018
2	$100,000	5	5	04-08-2019
3	$250,000	2	2	11-19-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$100,000	$100,000
FY20	$250,000	$250,000

Non-Cash Prizes Include: Semi-finalists and Finalists were nationally recognized by USDOT and given the opportunity to present their work at prestigious events.

Participants:

FY19: 5 team(s)

FY20: 2 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	06-14-2018	07-31-2018	10-26-2018	54

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
2	10-26-2018	11-16-2018	04-08-2019	5
3	04-08-2019	05-31-2019	11-19-2019	2

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Prototype device or object; Creative media; Analysis or visualization of data
3	Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: In this challenge, solvers competed for cash prizes by developing innovative analytical visualization tools to gain insights into fatalities and serious injuries on the U.S. road and rail systems that policymakers, providers, and operators can use to inform the development of safety solutions. Challenge solvers chose between two types of analytical visualization tools to develop: (1) Discover Insights Tools will analyze data to reveal patterns and trends, and will use compelling visualizations to explain what is happening, understand the meaning behind the data, and draw conclusions. (2) Simulation tools will assist in decision-making by visualizing data by developing mathematical and statistical models to identify issues, determine correlations, and assign probabilities with a degree of accuracy.

Evaluation of Submissions: Submissions were reviewed by internal panels of technical experts in transportation safety analysis, data, IT, and visualization. These judging criteria were weighted equally. If the level of detail was deemed insufficient by the experts, the submission was not regarded as feasible. The evaluation panels considered each proposal's alignment with each of the criteria and made recommendations to the selecting official. Criteria for all three stages: functionality and technical effectiveness, deployment approach, sustainability, and expected return on investment.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Safety is USDOT's top strategic and organizational goal. USDOT is pursuing data-informed decision-making to help strategically prioritize and address transportation safety risks. The USDOT created the Safety Data Initiative (SDI) to support its high priority goal of reducing highway fatalities and serious injuries. The Initiative seeks to build USDOT's capacity to translate the successes of predictive data analytics tools used by private industry and universities to identify systemic factors contributing to serious crashes. It comprises three core components: data visualization, data integration, and predictive insights. The Solving for Safety Visualization Challenge is an SDI project that challenges innovators from across the Nation to develop analytical visualization tools that can help reduce serious crashes on the US road and rail system.

Plan for Upcoming Two Fiscal Years: None reported

B.9. Environmental Protection Agency (EPA)

B.9.1. EEFs: Environmental and Agronomic Challenge[81]

Sponsoring Agency and Office: Office of Research and Development (ORD)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: Nitrogen and phosphorus fertilizers facilitate the growth of crops, including corn, at yields that provide sustained global food production. However, fertilizers applied without consideration of the appropriate rate, timing, source, and method, can have harmful effects on the environment and human health. Enhanced Efficiency Fertilizer (EEF) is a term for new formulations that control fertilizer release or alter reactions that reduce nutrient losses to the environment. EEFs and other product technology innovations may be an important addition to a system of conservation practices that help reduce the impacts from row crop agriculture on the environment, while maintaining or increasing agricultural productivity and profitability. This challenge aims to identify existing EEFs currently on or near-market that meet or exceed certain environmental and agro-economic criteria.

Budget and Resources: Agency funds were used for a scoping workshop in October 2019, and then used for development of the Challenge, which included biweekly meetings with the Steering Committee, web development, and administrative support. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	0.5
Funding Estimate	$10,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Nitrogen and phosphorus fertilizers facilitate the growth of crops, including corn, at yields that provide sustained global food production. However, fertilizers applied

[81] The website for EEFs: Environmental and Agronomic Challenge is accessible at https://www.challenge.gov/challenge/eefs-environmental-agronomic-challenge/.

without consideration of the appropriate rate, timing, source, and method, can have harmful effects on the environment and human health. EEF is a term for new formulations that control fertilizer release or alter reactions that reduce nutrient losses to the environment. EEFs and other product technology innovations may be an important addition to a system of conservation practices that help reduce the impacts from row crop agriculture on the environment, while maintaining or increasing agricultural productivity and profitability.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	03-22-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Solvers of the EEFs: Environmental and Agronomic Challenge will receive scientific evaluation from the panel of experts. Winners will also receive recognition from EPA, United States Department of Agriculture (USDA), and other collaborators and Solvers; advancement to a greenhouse trial (Stage 2); and, pending greenhouse trial results and available funds, advancement to field trials (Stage 3). Winners of Stage 1 also will be invited to a virtual showcasing event held on February 8, 2022.

Participants:

FY19: Not applicable

FY20: 40 team(s)

Intended Participants: Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-24-2020	10-30-2020	01-31-2021	40

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from

vendors/contractors; Posted on Challenge.gov; Other (Agency web page with information, informational webinar after launch)

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object

Submissions: Submissions should be in PDF format (ten pages or fewer, excluding references), including the following sections: Executive Summary, detailed description of the proposed solution, environmental performance, agronomic performance, compatibility with existing farming machinery and practices, and any confidential business information.

Evaluation of Submissions: A panel of subject matter experts selected by EPA, USDA and the Challenge collaborators will judge submissions based on pre-defined scoring criteria. Judges will be selected based on several criteria, including their technical expertise (e.g. chemistry, agronomy, microbiology, biogeochemistry, ecology), geography (e.g. Midwest, South, etc.), associations with land grant universities, sectoral experience (e.g. farming, academia, government, industry), and diversity. Submissions will be judged based on environmental performance, agronomic performance, other performance criteria (see Challenge.gov), and expert discretion points.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
USDA	Federal Agency or Office	Not applicable	$100,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Database development; Discovery and design support; Operations or administrative support; Solution acceleration
The Fertilizer Institute	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$40,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support; Solution acceleration

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
The International Fertilizer Development Center	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$15,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support; Solution acceleration
The Nature Conservancy	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$5,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support; Solution acceleration
The National Corn Growers Association	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$5,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support; Solution acceleration

Advancement of Agency Mission: Clean Air and Water are central to EPA's Mission. If successful, recent peer reviewed estimates on increasing EEF in the U.S. suggest that environmental benefits range from $5-8 billion (mostly from improvements to water quality but also air quality), benefits to farmers range from $180-300 million, and benefits to the fertilizer industry range from $100-160 million.

Plan for Upcoming Two Fiscal Years: Submissions are due October 30, 2020, with selection of winners (advance to the greenhouse trials) occurring in early 2021.

B.9.2. Next Gen Fertilizer Innovations Challenge[82]

Sponsoring Agency and Office: Office of Research and Development (ORD)

Authority: America COMPETES Reauthorization Act of 2010

Status:

[82] The website for Next Gen Fertilizer Innovations Challenge is accessible at https://www.challenge.gov/challenge/next-gen-fertilizer-innovations-challenge/.

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: Nitrogen and phosphorus fertilizers facilitate the growth of crops, including corn, at yields that provide sustained global food production. However, fertilizers applied without consideration of the appropriate rate, timing, source, and method, can have harmful effects on the environment and human health. Enhanced Efficiency Fertilizer (EEF) is a term for new formulations that control fertilizer release or alter reactions that reduce nutrient losses to the environment. EEFs and other next generation product technology innovations may be an important addition to a system of conservation practices that help reduce the impacts from row crop agriculture on the environment, while maintaining or increasing agricultural productivity and profitability. This challenge aims to identify concepts for novel technologies for fertilizers and other product technology innovations that can reduce the environmental effects from modern agriculture while maintaining or increasing crop yields. Submissions to the Next Gen Fertilizer Innovation Challenge may include technologies that are not currently on the market or technology concepts that are not traditional EEFs and not in commercial use as a fertilizer.

Budget and Resources: Agency funds were used for contractor support with Innocentive to run the Challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	Discovery and design support; Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	0.5
Funding Estimate	$25,000

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Nitrogen and phosphorus fertilizers facilitate the growth of crops, including corn, at yields that provide sustained global food production. However, fertilizers applied without consideration of the appropriate rate, timing, source, and method, can have harmful effects on the environment and human health. Enhanced Efficiency Fertilizer (EEF) is a term for new formulations that control fertilizer release or alter reactions that reduce nutrient losses to the environment. EEFs and other next generation product technology innovations may be an important addition to a system of conservation practices that help reduce the impacts from row crop agriculture on the environment, while maintaining or increasing agricultural productivity and profitability.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Less burdensome to design and execute than alternatives; Identify and work with

new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$65,000	6	None reported	10-19-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$65,000	$0

Non-Cash Prizes Include: Finalists were invited to present their technologies at a showcasing event held on February 8, 2022. Promising submissions may also be advanced to greenhouse or field testing at the conclusion of the competition.

Participants:

FY19: Not applicable

FY20: No teams reported

Intended Participants: Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
08-24-2020	11-30-2020	76

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on Challenge.gov; Other (Agency web page with information, informational webinar after launch)

Submission Types: Proposal or concept

Submissions: Submissions should be in PDF format (ten pages or fewer excluding references), including the following sections: Executive Summary, detailed description of the proposed solution, environmental performance, agronomic performance, compatibility with existing farming machinery and practices, any confidential business information, and the trajectory to market.

Evaluation of Submissions: A panel of subject matter experts selected by EPA, USDA, and the Challenge collaborators will judge submissions based on pre-defined scoring criteria. Judges will be selected based on several criteria, including their technical expertise (e.g. chemistry, agronomy, microbiology, biogeochemistry, ecology), geography (e.g. Midwest, South, etc.), associations with land grant universities, sectoral experience (e.g. farming, academia, government, industry), and diversity.

Submissions will be judged based on environmental performance, agronomic performance, other performance criteria (see Challenge.gov), and expert discretion points.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
USDA	Federal Agency or Office	Not applicable	$50,000	Prize purse; Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and Design support; Solution acceleration
The Fertilizer Institute	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$40,000	Prize purse; Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
The International Fertilizer Development Center	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$10,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
The Nature Conservancy	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$5,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration
The National Corn Growers Association	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$5,000	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Discovery and design support; Solution acceleration

Advancement of Agency Mission: Clean Air and Water are central to EPA's Mission. If successful, recent peer reviewed estimates on increasing EEF in the U.S. suggest that environmental benefits range from $5-8 billion (mostly from improvements to water quality but also air quality), benefits to farmers range from $180-300 million, and benefits to the fertilizer industry range from $100-160 million.

Plan for Upcoming Two Fiscal Years: The Challenge closed November 30, 2020.

B.9.3. Nutrient Sensor Action Challenge Stage II[83]

Sponsoring Agency and Office: Office of Research and Development (ORD)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The Nutrient Sensor Action Challenge was a technology-accelerating water quality challenge launched in 2017 to demonstrate how nutrient sensors can be used by states and local communities to help manage nutrient pollution.

Budget and Resources: FTE support were utilized to design and manage the Challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	0.3
Funding Estimate	None reported

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The Challenge was designed to identify innovative strategies for the collection, management, and application of nutrient monitoring information to help inform and address a local nutrient pollution issue.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

[83] The website for Nutrient Sensor Action Challenge Stage II is accessible at https://www.epa.gov/innovation/nutrient-sensor-action-challenge#:~:text=Nutrient%20Sensor%20Action%20Challenge%201%20Stage%20II.%20In,sensors%20to%20...%203%20Partners%20and%20Collaborators.%20.

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$150,000	3	3	08-21-2019

Non-Cash Prizes Include: Exposure, press events, and social media networking are considered non-cash prizes.

Participants:

FY19: 7 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	None reported	None reported	None reported	None reported
2	03-01-2018	02-28-2019	08-21-2019	8

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on Challenge.gov

Submission Types:

Phase	Submission Type
1	None reported
2	Proposal or concept; Analysis or visualization of data

Submissions: Submissions were to demonstrate effective deployment, data collection and analysis of nutrient levels in water, and how the information was applied to address a specific nutrient issue in a local waterway.

Evaluation of Submissions: A panel of judges evaluated the submissions. Judges were from a mix of Federal agencies and academia.

Partnerships: The prize competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
USGS	State or Local Government	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Cleveland Water Authority	None reported	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support
USDA	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support
NIST	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support

Advancement of Agency Mission: Excess nutrients and the resulting risk to human health and the environment is a priority for EPA. This challenge helped to advance EPA's mission by empowering local communities and organizations with tools and technology to help address local nutrient issues.

Plan for Upcoming Two Fiscal Years: EPA continues to conduct nutrient related Challenges such as the EEF challenges.

B.10. General Services Administration (GSA)

B.10.1. GEAR Center Challenge[84]

Sponsoring Agency and Office: Office of Government-wide Policy (Office of Shared Solutions and Performance Improvement)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Completed

Competition Summary: The Federal Government is exploring how to better connect to the public, academia, and private industry to solve federal management challenges. One potential path in that pursuit is through a Government Effectiveness Advanced Research (GEAR) Center that uses applied research to improve mission delivery, citizen services, and stewardship of public resources, as proposed in Delivering Government Solutions for the 21st Century: Reform Plan and Reorganization Recommendations. Over the summer of 2019, the General Services Administration (GSA) and the Office of Management and Budget (OMB) ran a GEAR Center prize competition on Challenge.gov. The competition challenged problem solvers from the public, academia, and industry to build cross-sector, multidisciplinary teams to demonstrate the potential of the GEAR Center. Teams described how they would tackle challenges facing the government as outlined in the President's Management Agenda (PMA).

[84] The website for GEAR Center Challenge is accessible at https://www.challenge.gov/challenge/gear-center-challenge/.

Budget and Resources: The Office of Shared Solutions and Performance Improvement at the General Services Administration (GSA) partnered with GSA's Challenge.gov team and the Office of Management and Budget (OMB) to design and execute the GEAR Center Challenge. GSA also engaged cross-agency staff during each of the three evaluation phases and the advice of subject matter experts along the way to help inform evaluations. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	None reported
FTEs	1	0.1
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: This competition challenged solver teams to demonstrate the usefulness of a GEAR Center model by describing how this model would tackle the major challenges facing government as described in the President's Management Agenda (PMA). For example, how should the government approach the introduction of artificial intelligence into operations? How can Federal agencies better prepare and recruit the Federal workforce? Before the government invests in a future GEAR Center, it is important to first explore the feasibility of creating these types of partnerships and if they can produce the kinds of quality approaches to problem solving the government needs. This competition was designed to reward the top models and execution strategies that can demonstrate a use case of a potential GEAR Center project by building on existing similar efforts.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	0	0	2019-06-03
2	$0	0	0	2019-07-15
3	$900,000	3	3	2019-09-10

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$900,000	$900,000
FY20	$0	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: 49 team(s)

FY20: No teams reported

Intended Participants: Small businesses; Large businesses; Other (private sector, think tanks, academia, etc.)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2019-05-02	05-24-2019	06-03-2019	49
2	2019-05-25	06-28-2019	07-15-2019	20
3	2019-07-12	07-26-2019	09-10-2019	10

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept; Business or commercial development plan
3	Other

Submissions: For Phase 1, GSA received two-page concept proposals. GSA then invited the top 20 teams to submit a ten-page project and GEAR Center plan for Phase 2. In phase 3, GSA invited the top ten teams to provide a 60-minute presentation to a panel of judges.

Evaluation of Submissions: The challenge was run through three evaluation phases. As solver teams progressed through the evaluation process, they provided more detail on their project ideas. For Phase 1, GSA evaluated two-page concept proposals. GSA then invited the top 20 teams to submit a ten-page project and GEAR Center plan for Phase 2. In phase 3, GSA invited the top ten teams to provide a 60-minute presentation to a panel of judges. GSA chose three grand prize winners (each receiving $300,000 in cash awards) and five honorable mentions (with no cash awards). Each phase included rating criteria and a panel of cross-agency judges. The panels of judges also consulted with subject matter experts to help inform their evaluations of solver team submissions.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The GEAR Center was conceived as a way to promote innovation in support of the President's Management Agenda. The GEAR Center Challenge submissions are promising examples of how innovative public-private partnerships can transform government mission delivery, service to citizens, and stewardship. The challenge engaged the U.S. research and development community to help government adapt and improve in a rapidly changing world. It also helped form new partnerships between different sectors. These winning teams will bring innovation led by world class universities and enterprises to influence and improve Federal Government operations.

Plan for Upcoming Two Fiscal Years: None reported

B.10.2. GSA Hackathon 2019[85]

Sponsoring Agency and Office: GSA IT

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: GSA held a coast-to-coast Hackathon on Wednesday, June 19, 2019, aimed at bettering the customer experience of products in government. Throughout the Federal Government, as described in the President's Management Agenda, improving customer experience is a top priority. Customer experience can refer to the external customers and internal customers. For this Hackathon, GSA focused on both. The participants included the newly-released Government Web Design Standards in their solutions. Through this all-day Hackathon, which took place simultaneously at eight GSA locations nationwide, participants evaluated real-world products and iterated on ideas for making customer experience better for GSA applications that are customer experience focused. GSA sought application developers interested in user experience to participate.

Budget and Resources: Funds were used to purchase equipment for the identified locations, such as webcams, tripods, and USB cables. The Office of the Chief Technology Officer (CTO) prepared and submitted all purchase requests and worked with the location point-of-contact (POC). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award); Purchase or rental of equipment	Not applicable
FTEs	1	Not applicable
Funding Estimate	$1,053	Not applicable

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community

Problem or Opportunity Addressed: GSA identified the following applications for this challenge: GSA IT Service Desk, Federal Real Property Profile Management System (FRPP MS), Acquisition Gateway, and HR Links. For GSA IT Service Desk, the ServiceNow self-service portal is not easily navigable or aesthetically appealing. Overall, the customer experience is lackluster. Users are reluctant to use the portal. For the FRPP application, the task is to make the 300,000+ datasets that feed the application easy to visualize and analyze on a map. For Acquisition Gateway, GSA solicited contestants to provide a "chatbot" or other automated response solution which efficiently answers user inquiries related to how to best utilize the Gateway and/or direct users to information/applications most useful to their query. HR Links is a commercial off-the-shelf (COTS) system based on PeopleSoft. Due to the drastic change in user interface and workflow, GSA employees have expressed frustration in completing various tasks in the system.

[85] The website for GSA Hackathon 2019 is accessible at https://www.challenge.gov/challenge/gsa-hackathon-2019/.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$20,000	4	4	06-19-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$20,000	$20,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 16 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
05-20-2019	06-19-2019	16

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal or concept; Prototype device or object; Software or computer code; Creative media; Analysis or visualization of data; Other (Customer Experience - Internal and External)

Submissions: Participants were given maximum flexibility in their selection of submission format and mediums. Submissions ranged from wireframes with written descriptions to fully operational web-based solutions.

Evaluation of Submissions: Twelve judges formed the Sub-Panel from GSA and other Federal agencies. The final judges panel consisted of four individuals from GSA, Defense Digital Service (DDS), and OMB. Criteria used to evaluate the submissions consisted of Usability, Emotional Response, and Two-Way Feedback. Each team presented their solution to a judging panel for up to three minutes. In Round 1, each pool of competitors presented and was judged against the same problem set. The judges evaluated each solution as if they were the application user. The round will be judged based on Usability, Emotional Response, and Two-Way Feedback, with each judge independently scoring the solution on a scale of 1 to 5.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The recommendations received from the Hackathon teams for each application have provided GSA with a direct path to improve their customers' experience. The concepts

and visually appealing design recommendations received will allow GSA to make the improvements needed to increase the user experience with the applications.

Plan for Upcoming Two Fiscal Years: None reported

B.11. Department of Health and Human Services (HHS)

B.11.1. $100,000 for Start a SUD Startup - Spring 2020[86]

Sponsoring Agency and Office: National Institutes of Health (National Institute on Drug Abuse)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The National Institute on Drug Abuse (NIDA), one of the components of the National Institutes of Health (NIH), announces the 5th annual $100,000 for Start a SUD Startup Challenge. The Challenge goal is to support research ideas that would further an understanding of Substance Use Disorders (SUDs) and that are intended to be the foundation for the development of successful new startups. NIDA expects that the contest will enable participants to test the premise that their research idea can be fostered into a biotech startup, and that eventually the newly created startups will contribute to the pool of innovative small business companies that can successfully compete for NIDA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funding. The Challenge will offer up to ten awards of $10,000 each and technical expertise and mentoring from NIDA scientific research entrepreneurship experts.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award)
FTEs	Not applicable	1
Funding Estimate	Not applicable	$0

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The Challenge is a competition for participants with research ideas that would further an understanding of SUD and that are intended to be the foundation for the development of new successful startups. NIDA offers $100,000, technical expertise, and mentoring from scientific research entrepreneurship experts and expects that the contest will enable participants to test the premise that their research idea can be fostered into a biotech startup. This Challenge is unique because NIDA intends to provide the prize money and scientific research-based

[86] The website for $100,000 for Start a SUD Startup - Spring 2020 is accessible at https://www.challenge.gov/challenge/2020-1000000-start-a-sud-startup-challenge/.

entrepreneurial assistance to the would-be startup founders much earlier than most investors, incubators, or traditional models of research funding (e.g. small business grants). However, NIDA anticipates that, eventually, the newly created startups will contribute to the pool of innovative small business companies that can successfully compete for NIDA's small business funding.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$120,000	10	12	06-22-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$100,000	$120,000

Non-Cash Prizes Include: Entrepreneurial training to assist in developing a minimum viable product.

Participants:

FY19: Not applicable

FY20: 64 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Small businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
01-21-2020	05-26-2020	64

Solicitation of Submissions: Social media; Email; Posted on challenge.gov; Other

Submission Types: Proposal or concept; Business or commercial development plan

Submissions: Participants must submit a four-page written proposal describing how their research idea would further an understanding of SUDs and be the foundation for a successful startup idea, as well as a 5-minute video introducing the individual participant or the team.

Evaluation of Submissions: Submissions were evaluated by a panel of Federal judges who were NIDA staff and who possessed multidisciplinary expertise from different offices and divisions. The judging panel made recommendations to the award-approving official based upon the following five criteria: Significance and Unmet Needs; Innovation; Approach; Team/Founder Aptitudes; and Commercialization.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The general purpose of NIDA is to conduct and support biomedical and behavioral research, health services research, research training, and health information dissemination with respect to the prevention of drug abuse and the treatment of drug abusers. This Challenge is consistent with and advances the mission of NIDA as described in 42 U.S.C. 285o in that it supports new and potential biotech startups in the development of research ideas that would further an understanding and management of SUDs.

Plan for Upcoming Two Fiscal Years: NIDA intends to reissue this Challenge on an annual basis.

B.11.2. $100,000 for Start a SUD Startup 2018[87]

Sponsoring Agency and Office: National Institutes of Health (National Institute on Drug Abuse)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: NIDA, one of the components of NIH, announced the 3rd annual $100,000 for Start a SUD Startup Challenge. The Challenge goal is to support research ideas that would further an understanding of SUDs and that are intended to be the foundation for the development of successful new startups. NIDA expects that the contest will enable participants to test the premise that their research idea can be fostered into a biotech startup, and that eventually the newly created startups will contribute to the pool of innovative small business companies that can successfully compete for NIDA's SBIR and STTR funding. The Challenge will offer up to ten awards of $10,000 each and technical expertise and mentoring from NIDA scientific research entrepreneurship experts.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The Challenge is a competition for participants with research ideas that would further an understanding of SUDs and that are intended to be the foundation for the development of new successful startups. NIDA offers $100,000, technical expertise, and mentoring from scientific research entrepreneurship experts and expects that the contest will enable participants to test the premise that their research idea can be fostered into a biotech startup. This Challenge is unique because NIDA intends to provide the prize money and scientific research-based entrepreneurial assistance to the would-be startup founders much earlier than most investors,

[87] The website for $100,000 for Start a SUD Startup 2018 is accessible at https://www.challenge.gov/challenge/2018-100000-for-start-a-sud-startup-challenge/.

incubators, or traditional models of research funding (e.g. small business grants). However, NIDA anticipates that, eventually, the newly created startups will contribute to the pool of innovative small business companies that can successfully compete for NIDA's small business funding.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$100,000	10	10	03-01-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$100,000	$100,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Entrepreneurial training to assist in developing a minimum viable product.

Participants:

FY19: 19 team(s)

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Small businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-10-2018	01-15-2019	19

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Proposal or concept; Business or commercial development plan

Submissions: Participants must submit a four-page written proposal describing how their research idea would further an understanding of SUDs and be the foundation for a successful startup idea, as well as a 5-minute video introducing the individual participant or the team.

Evaluation of Submissions: Submissions were evaluated by a panel of Federal judges who were NIDA staff and who possessed multidisciplinary expertise from different offices and divisions. The judging panel made recommendations to the award-approving official based upon the following five criteria: Significance and Unmet Needs; Innovation; Approach; Team/Founder Aptitudes; and Commercialization.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The general purpose of NIDA is to conduct and support biomedical and behavioral research, health services research, research training, and health information

dissemination with respect to the prevention of drug abuse and the treatment of drug abusers. This Challenge is consistent with and advances the mission of NIDA as described in 42 U.S.C. 285o in that it supports new and potential biotech startups in the development of research ideas that would further an understanding and management of SUDs.

Plan for Upcoming Two Fiscal Years: NIDA intends to reissue this Challenge on an annual basis.

B.11.3. $100,000 for Start a SUD Startup 2019[88]

Sponsoring Agency and Office: National Institutes of Health (National Institute on Drug Abuse)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: NIDA, one of the components of NIH, announces the 4th annual $100,000 for Start a SUD Startup Challenge. The Challenge goal is to support research ideas that would further an understanding of SUDs and that are intended to be the foundation for the development of successful new startups. NIDA expects that the contest will enable participants to test the premise that their research idea can be fostered into a biotech startup, and that eventually the newly created startups will contribute to the pool of innovative small business companies that can successfully compete for NIDA's SBIR and STTR funding. The Challenge will offer up to ten awards of $10,000 each as well as technical expertise and mentoring from NIDA scientific research entrepreneurship experts.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The Challenge is a competition for participants with research ideas that would further an understanding of SUDs and that are intended to be the foundation for the development of new successful startups. NIDA offers $100,000, technical expertise, and mentoring from scientific research entrepreneurship experts and expects that the contest will enable participants to test the premise that their research idea can be fostered into a biotech startup. This Challenge is unique because NIDA intends to provide the prize money and scientific research-based entrepreneurial assistance to the would-be startup founders much earlier than most investors, incubators, or traditional models of research funding (e.g. small business grants). However, NIDA

[88] The website for $100,000 for Start a SUD Startup 2019 is accessible at https://www.challenge.gov/challenge/100000-for-start-a-sud-startup-2019-challenge-/.

anticipates that, eventually, the newly created startups will contribute to the pool of innovative small business companies that can successfully compete for NIDA's small business funding.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$90,000	10	9	06-07-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$100,000	$90,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Entrepreneurial training to assist in developing a minimum viable product.

Participants:

FY19: 12 team(s)

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Small businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
04-01-2019	05-10-2019	12

Solicitation of Submissions: Social media; Email; Posted on challenge.gov; Other

Submission Types: Proposal or concept; Business or commercial development plan

Submissions: Participants must submit a four-page written proposal describing how their research idea would further an understanding of SUDs and be the foundation for a successful startup idea, as well as a 5-minute video introducing the individual participant or the team.

Evaluation of Submissions: Submissions were evaluated by a panel of Federal judges who were NIDA staff and who possessed multidisciplinary expertise from different offices and divisions. The judging panel made recommendations to the award-approving official based upon the following five criteria: Significance and Unmet Needs; Innovation; Approach; Team/Founder Aptitudes; and Commercialization.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The general purpose of NIDA is to conduct and support biomedical and behavioral research, health services research, research training, and health information dissemination with respect to the prevention of drug abuse and the treatment of drug abusers. This

Challenge is consistent with and advances the mission of NIDA as described in 42 U.S.C. 285o in that it supports new and potential biotech startups in the development of research ideas that would further an understanding and management of SUDs.

Plan for Upcoming Two Fiscal Years: NIDA intends to reissue this Challenge on an annual basis.

B.11.4. 3-D Retina Organoid Challenge (3-D ROC) - Reduction to Practice[89]

Sponsoring Agency and Office: National Institutes of Health (National Eye Institute)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The 3-D Retina Organoid Challenge 2020 (3-D ROC 2020) is an implementation prize competition in which the National Eye Institute (NEI), part of NIH, is asking for 3-D human retina culture systems with maximal relevance to human physiology and disease. Current retina culture models require over six months to develop and still do not capture the complexities of the human retina. The goal of the Challenge is to use innovative approaches to develop new in vitro 3-D human retina models that recapitulate the organization and function of the human retina and can be used to examine biology and disease processes. This Challenge is a follow-on to the recent NEI 3-D Retina Organoid Ideation Challenge, and aims to invoke scientific and technological development of the model systems proposed during that ideation competition. Technological breakthroughs in this arena could allow researchers and physicians to better understand, diagnose, and treat retinal diseases.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, and to purchase advertisements to increase awareness of the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	1	1
Funding Estimate	$250	$200

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Around the world, an estimated 285 million people are visually impaired; of these, 39 million are blind. In many cases, blindness and vision loss are the result of retina-damaging diseases that, if better understood, could be treated or have interventions applied to

[89] The website for 3-D Retina Organoid Challenge (3-D ROC) - Reduction to Practice is accessible at https://www.challenge.gov/challenge/nei-3d-retina-organoid-challenge-2020-reduction-to-practice-3d-roc-2020/.

stop degeneration or provide protection to remaining viable cells. One limitation in furthering retinal research is that eye tissue is not readily available to study disease processes and test new therapies. However, retina biology researchers have developed methods to grow 3-D retina models in vitro from induced pluripotent stem cells (iPSCs) and human embryonic stem cells (hESCs). Current protocols vary in their strengths and limitations, but none can robustly recapitulate the complexity and functionality of the retina. In this Challenge, NEI seeks 3-D human retina organoid prototypes that are physiologically relevant. Such model systems could be transformational for vision research and regenerative medicine.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition; Required by executive policy or congressional legislation; Other

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$25,000	6	1	12-04-2018
2	$975,000	3	Not applicable	Not applicable

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$600,000	$25,000
FY20	$975,000	Not applicable

Non-Cash Prizes Include: During the 3-D ROC 2020, resources for solvers may be available from companies and organizations who have partnered with NEI to support the challenge. Partners will provide resources directly to solvers upon request and on an equitable basis. Resources may include: In-kind contributions (loaning of technology, early access to products, free consulting opportunities); Discounts on products, services, or reagents; In-kind or discounted consulting.

Participants:

FY19: 8 team(s)

FY20: 6 team(s)

Intended Participants: Small businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-04-2018	10-01-2018	12-04-2018	2
2	09-14-2020	10-01-2020	Not applicable	Not applicable

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Prototype device or object; Business or commercial development plan; Analysis or visualization of data
2	Prototype device or object; Business or commercial development plan; Analysis or visualization of data

Submissions: In this Challenge, NEI seeks 3-D human retina organoid prototypes that are physiologically relevant. Such model systems could be transformational for vision research and regenerative medicine. New models could be used for applications such as understanding eye development, studying retinal biology, modeling diseases, identifying and testing treatments, and serving as a tissue source to use in transplantation. In this Challenge, solutions should yield reproducible, retina organoid models that represent the complexity, structure, and function of the human retina and are amenable for use in either modeling diseases or high-content screening.

Evaluation of Submissions: A panel of non-Federal technical reviewers with expertise directly relevant to the Challenge will evaluate the solutions based on innovation and achievement of specific scientific criteria. The solutions and evaluation statements from the technical panel will then be reviewed by Federal employees serving as judges, who will select the Challenge winners. Solutions will be evaluated for the extent to which data and other included information indicate that the organoid system meet the scientific evaluation criteria.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The general purpose of the NEI is to conduct and support research, training, health information dissemination, and other programs with respect to blinding eye diseases, visual disorders, mechanisms of visual function, preservation of sight, and the special health problems and requirements of the blind. This Challenge will lead to innovative technology to accelerate vision research, generate new models for retinal diseases, and facilitate translation of basic research into better treatments.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.5. Addressing Opioid Use Disorder in Pregnant Women and New Moms[90]

Sponsoring Agency and Office: Health Resources and Services Administration (Maternal and Child Health)

Authority: America COMPETES Reauthorization Act of 2010

Status:

[90] The website for Addressing Opioid Use Disorder in Pregnant Women and New Moms is accessible at https://mchbgrandchallenges.hrsa.gov/challenges/addressing-opioid-use-disorder-pregnant-women-and-new-moms.

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Addressing Opioid Use Disorder in Pregnant Women and New Moms Challenge supports innovative technology-based solutions to improve access to quality health care for pregnant women and new mothers struggling with opioid use disorder (OUD).

Budget and Resources: In FY17, a contract was awarded to the Maternal and Child Health Bureau (MCHB) to support the planning, implementation, and prize purses for all MCHB Grand Challenges. As this allocated funding became no-year funding under the COMPETES Act, no additional FY19 or FY20 funds were allocated to support the challenges. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.5	0.25
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Women who are pregnant or new mothers and who also struggle with OUD face a variety of barriers in obtaining safe and effective care and treatment. Women and families in rural and under-resourced communities are particularly affected. Barriers may include: Limited access to local providers with both the training and capacity to meet patient treatment and recovery needs, family-centered, trauma-informed treatment and recovery approaches that include integrated supports, adequate care and long-term supports for infants born with neonatal abstinence syndrome; Significant stigma, prejudice, and discrimination that may hamper treatment; Interactions with the criminal justice system; Limited social supports such as transportation, safe housing and employment. The goal of this Challenge is to use technology to provide women access to treatment and recovery services to keep them and their children healthy and substance use disorder-free.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$100,000	10	10	02-04-2019

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$145,000	5	4	09-13-2019
3	$130,000	1	1	12-14-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$245,000	$245,000
FY20	$0	$0

Non-Cash Prizes Include: Participants in the Addressing Opioid Use Disorder in Pregnant Women and New Moms Challenge received multiple non-monetary incentives. Expert advisors were engaged at the beginning of the Challenge to provide expertise and input into the design of the Challenge. After the initial Phase 1 winners were selected, each was paired to one advisor, who provided mentoring and critical feedback on development of the team's innovation during the remainder of the Challenge. MCHB provided multiple incentives as well, such as hosting webinars for Phase 1 winners on crafting pitches and for Phase 2 winners on commercialization strategies to take their innovations to market. An in-person Demo Days event held at the end of Phase 2 brought together teams from across the Grand Challenges, and provided access to panels featuring leaders in government and the commercial sector, opportunities to network with other teams and federal staff, and increased visibility of their innovation among participants.

Participants:

FY19: 10 team(s)

FY20: 4 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-10-2018	12-03-2018	02-04-2019	79
2	02-19-2019	09-13-2019	09-13-2019	9
3	11-01-2019	12-09-2019	12-14-2020	4

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Phase	Submission Type
3	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: This challenge supports innovative technology-based solutions to improve access to quality health care for pregnant and new mothers struggling with OUD. Solutions should aim to increase access to: Substance use disorder treatment; Recovery support; Other support services for women with OUD, their infants and their families, especially those in rural and geographically isolated areas.

Evaluation of Submissions: For all of the MCHB Grand Challenges, a panel of external expert advisors have been engaged from the beginning of the Challenge. For Phase 1, submissions are scored by the advisors and then submissions and scores are sent to the Federal judges for official review. Federal judges include a mix of individuals from inside and outside the Administration. Federal judges evaluate and select winners for each phase. Submissions are evaluated by numeric scores aligned to the evaluation criteria developed for each phase prior to challenge launch and listed on the website.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Health Resources and Services Administration's (HRSA) mission is to improve health outcomes and address health disparities through access to quality services, a skilled health workforce, and innovative, high-value programs. MCHB's mission is to improve the health and well-being of America's mothers, children, and families. The Addressing Opioid Use Disorder in Pregnant Women and New Moms Challenge has advanced these missions by supporting access to quality health care for all pregnant women and new moms, particularly those who live in rural and medically underserved areas who may have limited access to health care and other services. Solutions will increase access to substance use disorder treatment, recovery support, and other support services for women with OUD, their infants and their families.

Plan for Upcoming Two Fiscal Years: This Competition is one of four MCHB Grand Challenges, all of which will conclude in FY21. HRSA's MCHB is launching a new challenge in FY21, the Promoting Pediatric Primary Prevention (P4) Challenge. The Challenge will incentivize innovations in pediatric primary care to improve child health. The Challenge will be implemented in two phases, with final awards made in FY22.

B.11.6. AHRQ Step Up App Challenge: Advancing Care Through Patient Assessments[91]

Sponsoring Agency and Office: Agency for Healthcare Research and Quality

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

[91] The website for AHRQ Step Up App Challenge: Advancing Care Through Patient Assessments is accessible at https://www.ahrq.gov/stepupappchallenge/index.html.

Competition Summary: The AHRQ Step Up App Challenge encouraged participants to create an app that used technical specifications provided by the Agency for Healthcare Research and Quality (AHRQ) to digitize the collection of standardized Patient-Reported Outcome (PRO) data in ambulatory care settings.[92] Specifically, participants were asked to incorporate HL7 Fast Healthcare Interoperability Resources (FHIR) technical specifications when developing apps. The FHIR standard increases the liquidity of granular patient data. The FHIR technical specifications allow standardized PRO data to move between electronic health record (EHR) or health information technology (IT) systems both within and across different health systems. The Challenge was designed with a multiphase format where the top ten Phase 1 winners were selected to build a mobile app prototype and compete in Phase 2. The grand prize winner from Phase 2 proceeded to Phase 3 which was a pilot test of their winning app. The grand prize winner was required to collaborate with a health system that AHRQ selected to carry out the pilot test. A total of 54 applications were received in Phase 1. A multi-disciplinary expert judging panel scored the applications and apps in Phases 1 and 2. The grand prize winner application, PRISM, was pilot tested in nine ambulatory care practices affiliated with MedStar Health. The AHRQ Step Up App Challenge successfully engaged the software developers, health IT professionals, and clinical care community to advance the state of PRO data collection and use via user-friendly mobile apps.

Budget and Resources: Agency funds were used to hire a contractor to help manage the Challenge. The contractor helped design the structure and prize amount for the Challenge. The contractor posted information about the Challenge on challenge.gov. The contractor also helped draft Challenge-related content to be posted on AHRQ's website. For operations and administrative support, the contractor managed submissions including providing responses to participants' questions as well as handling the judging processes. AHRQ separately awarded a contract to pilot test the grand prize winning app from the Challenge. The pilot test demonstrated that the app can be implemented in ambulatory care practices and yielded many lessons learned for stakeholders who are interested in using the app. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Operations or administrative support; Prize purse (monetary award); Software development; Web portal or app development and support	Operations or administrative support; Prize purse (monetary award); Software development; Solution acceleration
FTEs	0.5	0.5
Funding Estimate	$164,000	$88,800

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

[92] The U.S. Food and Drug Administration defines a PRO as “a measurement based on a report that comes directly from the patient about the status of a patient’s health condition without amendment or interpretation of the patient’s response by a clinician or anyone else.” (https://www.fda.gov/media/124063/download)

Problem or Opportunity Addressed: PRO data are vital to understanding the complex needs of individual patients. Patients, researchers, and providers are not fully satisfied with the current state of PRO data collection. While PRO data have proven useful to healthcare providers, they are not widely used in clinical settings. Most PRO data are collected via pen and paper, which is inconvenient and difficult for patients and providers to access and use. Researchers who want to analyze PRO data across different practices or health systems would benefit from a more standardized approach to collecting data. Recently, some digital tools have been developed to streamline the collection of PRO data. However, those digital tools are not widely adopted due to problems related to workflow integration and a lack of data standards. This Challenge was designed to help advance the use of valuable PRO data by digitizing the process of collecting, aggregating, and sharing standardized PRO data.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$12,000	10	10	10-29-2018
2	$90,000	3	3	03-05-2019
3	$40,000	1	1	Not applicable

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$90,000	$90,000
FY20	$40,000	$40,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 10 team(s)

FY20: 1 team(s)

Intended Participants: Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-13-2018	09-24-2018	10-29-2018	54
2	10-29-2018	02-15-2019	03-05-2019	10
3	Not applicable	Not applicable	Not applicable	1

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Software or computer code; Creative media
3	Software or computer code; Creative media; Analysis or visualization of data

Submissions: In the development phase (Phase 2), winning participants used their Phase 1 prize funds to develop and demo a PRO app. Finalists were required to showcase a patient-facing app compliant with technical specifications and PROMIS physical functioning measures provided by AHRQ to encourage patients to enter PRO data. Additionally, the app was required to perform computer adaptive tests on various devices, such as mobile phones, tablets, and kiosks. The apps developed in Phase 2 were to be pilot-test-ready and able to export and integrate data into an EHR or another IT system for clinical and research purposes. After presenting their applications and submitting an implementation plan, three semi-finalists were selected based on the performance of their apps and the viability of their implementation plans.

Evaluation of Submissions: The AHRQ Step Up App Challenge recruited judges who had expertise in digital product design, PRO implementation, health IT research, and clinical practice. The judging process lifecycle included identifying and recruiting judges, onboarding judges to the evaluation criteria and scorecard via webinar, screening submissions, assigning judges to a number of applications, aggregating and normalizing scores, finalizing the ranking, and communicating the results to all challenge participants. In the AHRQ Step Up App Challenge, six judges were recruited. Judges included an HHS open innovation specialist, the principal architect of PROMIS, a clinical informatics developer, a patient-centered outcomes researcher, and two senior advisors for health information technology. The judges delivered their scores and comments, helping AHRQ select the submissions that warranted advancement into the later stages of the Challenge.

Partnerships: The Prize Competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
ONC	Federal Agency or Office	None reported	None reported	Publicity, advertising, outreach, or/and communications; Software development
NIH	Federal Agency or Office	None reported	None reported	Other
Northwestern University	Academic Institution	None reported	None reported	Software development; Discovery and design support

Advancement of Agency Mission: AHRQs mission is to produce evidence to make health care safer, higher quality, more accessible, equitable, and affordable, and to work within HHS and with other partners to make sure that the evidence is understood and used. Standardized and interoperable PRO data can be shared among providers so that patients do not need to complete duplicate surveys during different clinic visits. Its potential to improve whole-person care with a 360-degree view of the patient is enormous. In this COVID-19 age, it is critical that patients communicate all of their relevant health data to clinicians in a timely, usable fashion so they can be treated appropriately. The grand prize winning application, PRISM, is an example of a digital solution for how PRO data can be used to improve quality and care delivery and can empower patients to better manage their health.

Plan for Upcoming Two Fiscal Years: None reported

B.11.7. Antimicrobial Resistance, Rapid, Point-of-Need Diagnostic Test Challenge[93]

Sponsoring Agency and Office: National Institutes of Health (Office of the Director)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: NIH and the Biomedical Advanced Research and Development Authority (BARDA), part of the HHS Office of the Assistant Secretary for Preparedness and Response (ASPR), are searching for novel and innovative in vitro diagnostic tests that would rapidly inform clinical treatment decisions and be of potential significant clinical and public health utility to combat the development and spread of antibiotic resistant bacteria. Tests of interest will provide novel, innovative solutions for use in inpatient and/or outpatient settings. The goal of the Challenge is to identify a diagnostic test that, when utilized, would lead to more rapid clinical decision making such that antibiotic use and/or outcomes of patients infected with resistant pathogens are fundamentally improved compared to current standards of care, and/or reduce transmission of resistant pathogens such that population infection rates significantly decrease. The Challenge seeks to incentivize a broad range of scientists, engineers, and innovators to develop diagnostic tests that would enable health care providers to make more informed decisions on appropriate antibiotic use and infection prevention. This Challenge, structured in three steps, will complement existing BARDA and NIH research portfolios. NIH and BARDA believe this Challenge will stimulate investment from both public and private sectors in rapid, point-of-need in vitro diagnostic assay research and product development that could lead to the development of more sensitive, accurate, robust, and cost-effective assay approaches and devices for clinical diagnosis.

Budget and Resources: In FY20, funds were used to support independent laboratory evaluation of prototype performance. In previous fiscal years, funds were used to procure a logistical support contractor and for meetings of a Technical Evaluation Panel (TEP). The following table indicates the budget and resources to support the activity.

[93] The website for Antimicrobial Resistance, Rapid, Point-of-Need Diagnostic Test Challenge is accessible at https://dpcpsi.nih.gov/AMRChallenge.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	Federal personnel (FTE); Prize purse (monetary award)
FTEs	0.55	0.55
Funding Estimate	$0	$267,777

Goal Types: Develop/demonstrate technology

Problem or Opportunity Addressed: The goal of the Challenge is to identify an innovative, rapid, point-of-need diagnostic test that, when utilized, would lead to more rapid clinical decision making such that antibiotic use and/or outcomes of patients infected with resistant pathogens are fundamentally improved compared to current standards of care, and/or reduce transmission of resistant pathogens such that population infection rates significantly decrease. The diagnostic must either: 1) differentiate between a viral or bacterial infection; 2) identify/detect and characterize antibiotic susceptibility of at least one or more of the 18 drug resistant bacteria of highest concern referenced in Table 3 of the National Action Plan for Combating Antibiotic Resistant Bacteria 2015-2020; or 3) detect biomarkers that would inform patient management decisions, such as need for antibiotics or severity of infection.

Justification for Using Prizes and Challenges: Required by executive policy or congressional legislation

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
3	$19,000,000	3	1	08-05-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$19,000,000	$19,000,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 5 team(s)

FY20: 5 team(s)

Intended Participants: Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	Not applicable	Not applicable	Not applicable	Not applicable

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
2	Not applicable	Not applicable	Not applicable	Not applicable
3	01-09-2019	01-03-2020	08-05-2020	3

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	None reported
2	None reported
3	Prototype device or object; Analysis or visualization of data

Submissions: The goal of the Challenge is to identify an innovative, rapid, point-of-need diagnostic test that, when utilized, would lead to more rapid clinical decision making such that antibiotic use and/or outcomes of patients infected with resistant pathogens are fundamentally improved compared to current standards of care, and/or reduce transmission of resistant pathogens such that population infection rates significantly decrease. The diagnostic must either: 1) differentiate between a viral or bacterial infection; 2) identify/detect and characterize antibiotic susceptibility of at least one or more of the 18 drug resistant bacteria of highest concern referenced in Table 3 of the National Action Plan for Combating Antibiotic Resistant Bacteria or 3) detect biomarkers that would inform patient management decisions, such as need for antibiotics or severity of infection.

Evaluation of Submissions: Step 3 prototype submissions will be evaluated by 2 independent Clinical Laboratory Improvement Amendments (CLIA)-certified laboratories for usability, stated time to result, analytical sensitivity/specificity, as well as confirmation of analytical performance as stated in the Step 2 data submitted by the solver. The results of the CLIA laboratory testing, along with the data provided for Step 3, will be submitted to the Technical Evaluation Panel (TEP) followed by review by the Programmatic Assessment Panel (PAP), and finally submitted to the Judging Panel (JP) for selection of up to three winner(s). The TEP, convened by the NIH Center for Scientific Review, includes non-governmental scientific experts and a limited number of government scientific experts. The PAP included NIH, BARDA, Centers for Disease Control and Prevention (CDC), and Food and Drug Administration (FDA) scientific staff. The JP consisted of three senior leadership members from NIH and BARDA.

Partnerships: The Challenge involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
BARDA	Federal Agency or Office	$0	$9,500,000	Prize purse; Other (Scientific and technical advice)

Advancement of Agency Mission: NIH's mission is to seek fundamental knowledge about the nature and behavior of living systems and to apply that knowledge to enhance health, lengthen life, and reduce illness and disability. NIH's goals are: to foster fundamental creative discoveries, innovative research strategies, and their applications as a basis for ultimately protecting and improving health; to develop, maintain, and renew scientific human and physical resources that will ensure the nation's capability to prevent disease; and to promote the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science. NIH and BARDA are utilizing the Antimicrobial Resistance, Rapid, Point-of-Need Diagnostic Test Challenge to identify novel and innovative in vitro diagnostic tests that would rapidly inform clinical treatment decisions and be of potential significant clinical and public health utility to combat the development and spread of antibiotic resistant bacteria. The Challenge is successfully attracting submissions outside of the usual NIH grantee/contractor pool. Thus, the Challenge mechanism is attracting potential new Principal Investigators (PIs) to more traditional NIH funding mechanisms.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.8. ASPIRE Design Challenge 1: Integrated Chemistry Database for Translational Innovation in Pain, Opioid Use Disorder and Overdose[94]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH), is inviting novel design solutions for A Specialized Platform for Innovative Research Exploration (NCATS ASPIRE) Challenges as part of the NCATS ASPIRE Program. The goal of the NCATS ASPIRE Design Challenges is to reward and spur innovative and catalytic approaches towards solving the opioid crisis through development of: (1) novel chemistries; (2) data-mining and analysis tools and technologies; and (3) biological assays that will revolutionize discovery, development and pre-clinical testing of next generation, safer and non-addictive analgesics to treat pain, as well as new treatments for opioid use disorder (OUD) and overdose. Phase 1 of these challenges is implemented through a suite of concurrent companion Design Challenges that comprises a separate challenge for each of four areas: chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays; and an additional challenge for a combined solution to at least two challenge areas. Challenge 1 aims to address the need for an open source, controlled access database that incorporates all currently available chemical, biological and clinical data of known opioid and non-opioid based analgesics, drugs of abuse, and drugs used to treat drug abuse.

[94] The website for ASPIRE Design Challenge 1: Integrated Chemistry Database for Translational Innovation in Pain, Opioid Use Disorder and Overdose is accessible at https://www.challenge.gov/challenge/ncats-aspire-design-challenge-1/.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as to transport winning team leads to the awards ceremony. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Transportation of participants	Not applicable
FTEs	1	Not applicable
Funding Estimate	$49,000	Not applicable

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Over 25 million people in the United States experience pain every day and need safe, addiction-free treatments to alleviate their suffering. This clinical demand is of tremendous importance given that overprescribing of opioids for managing acute and chronic pain has fueled the current epidemic of OUD and overdose deaths, and the effectiveness of opioids for long-term pain management is being questioned. Safe, effective and non-addictive drugs (small molecules and biologics) to treat pain, mitigate addiction and reverse overdose are key to addressing the opioid crisis. Given failures and limitations of previous drug development efforts, drugs that recognize novel targets, have novel structures and can be identified in human-based, physiologically relevant in vitro systems are needed.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$400,000	5	4	10-28-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$500,000	$400,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 5 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-31-2018	05-31-2019	5

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: This Challenge rewards and spurs solutions that work to develop an open-source, controlled-access database that will contain extensive chemical, biological and clinical data on currently available pain drugs, opioids and treatments for addiction and overdose. The database should include but is not limited to the structures of known analgesics and opioids; information on the corresponding drug targets and, if available, known/predicted mechanisms of action; information on structure and chemical synthesis; available in vitro and in vivo biological screening data; and any clinical data relevant to the effectiveness, as well as side effects, including risk of addiction.

Evaluation of Submissions: The evaluation panels were made up of Federal and non-Federal technical consultants with expertise directly relevant to the challenge area. They evaluated the submissions based on feasibility and ability to meet the specified criteria. The submissions and evaluation statements from the technical panel were then reviewed by Federal employees who served as judges to select the winners.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The general purpose of NCATS is to coordinate and develop resources that leverage basic research in support of translational science and to develop partnerships and work cooperatively to foster synergy in ways that do not create duplication, redundancy and competition with industry activities (42 U.S.C. 287(a)). In order to fulfill its mission, NCATS supports projects that will transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process in order to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. This Challenge will lead to innovative designs for developing technology to revolutionize discovery, development and preclinical testing of new and safer treatments of pain, OUD, and overdose. The result will be generalizable tools that will be widely available to fill longstanding gaps that have impeded the marriage of basic and translational sciences.

Plan for Upcoming Two Fiscal Years: NCATS envisions following these Design Challenges with a follow-on, but distinct, final Reduction-to-Practice Challenge, which will aim to invoke further scientific and technological development of the model system. Winners of the Design Challenges will be invited to present their designs so that, in the envisioned follow-up Reduction-to-Practice Challenge, an open competition, teams will be able to form multi-disciplinary collaborations to advance and integrate the most feasible and promising approaches to the multiple Design Challenges into a single integrative platform. Innovators will be invited to demonstrate final solutions.

B.11.9. ASPIRE Design Challenge 2: Electronic Synthetic Chemistry Portal for Translational Innovation in Pain, Opioid Use Disorder and Overdose[95]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH) is inviting novel design solutions for A Specialized Platform for Innovative Research Exploration (NCATS ASPIRE) Challenges as part of the NCATS ASPIRE Program. The goal of the NCATS ASPIRE Design Challenges is to reward and spur innovative and catalytic approaches towards solving the opioid crisis through development of: (1) novel chemistries; (2) data-mining and analysis tools and technologies; and (3) biological assays that will revolutionize discovery, development and pre-clinical testing of next generation, safer and non-addictive analgesics to treat pain, as well as new treatments for opioid use disorder (OUD) and overdose. The first phase of these prize competitions is implemented through a suite of concurrent companion Design Challenges that comprises a separate challenge for each of four areas: chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays; and an additional challenge for a combined solution to at least two challenge areas. Challenge 2 aims to address the need for a next-generation open source electronic lab notebook (eLN) that collects, organizes and analyzes data relevant to the chemical synthesis and analyses of known opioid and non-opioid-based analgesics, drugs of abuse and molecules used to treat drug abuse into an electronic laboratory knowledge portal for synthetic chemistry (electronic synthetic chemistry portal; eSCP).

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as to transport winning team leads to the awards ceremony. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Transportation of participants	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Over 25 million people in the United States experience pain every day and need safe, addiction-free treatments to alleviate their suffering. This clinical demand is of tremendous importance given that overprescribing of opioids for managing acute and chronic pain

[95] The website for ASPIRE Design Challenge 2: Electronic Synthetic Chemistry Portal for Translational Innovation in Pain, Opioid Use Disorder and Overdose is accessible at https://www.challenge.gov/challenge/ncats-aspire-design-challenge-2/.

has fueled the current epidemic of opioid use disorder and overdose deaths, and the effectiveness of opioids for long-term pain management is being questioned. Safe, effective and non-addictive drugs (small molecules and biologics) to treat pain, mitigate addiction and reverse overdose are key to addressing the opioid crisis. Given failures and limitations of previous drug development efforts, drugs that recognize novel targets, have novel structures and can be identified in human-based, physiologically relevant in vitro systems are needed.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$100,000	5	1	10-28-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$500,000	$100,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 4 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-31-2018	05-31-2019	4

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: In order to enable further access to the currently unexplored biological space relevant to treatment of pain and/or drug addiction and overdose, this second Challenge rewards and spurs solutions that work to develop a next-generation, open source eLN that would serve as an eSCP and allow for real-time molecular design hypothesis generation and unbiased data collection during the synthesis planning, execution and analysis while providing a strong and comprehensive contextual analysis to biological testing data of experimental targets and currently known pain drug comparators.

Evaluation of Submissions: The evaluation panels were made up of Federal and non-Federal technical consultants with expertise directly relevant to the challenge area. They evaluated the submissions

based on feasibility and ability to meet the specified criteria. The submissions and evaluation statements from the technical panel were then reviewed by Federal employees who served as judges to select the winners.

Partnerships: No partners were reported.

Advancement of Agency Mission: The general purpose of NCATS is to coordinate and develop resources that leverage basic research in support of translational science and to develop partnerships and work cooperatively to foster synergy in ways that do not create duplication, redundancy and competition with industry activities (42 U.S.C. 287(a)). In order to fulfill its mission, NCATS supports projects that will transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process in order to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. This Challenge will lead to innovative designs for developing technology to revolutionize discovery, development and preclinical testing of new and safer treatments of pain, OUD, and overdose. The result will be generalizable tools that will be widely available to fill longstanding gaps that have impeded the marriage of basic and translational sciences.

Plan for Upcoming Two Fiscal Years: NCATS envisions following these Design Challenges with a follow-on, but distinct, final Reduction-to-Practice Challenge, which will aim to invoke further scientific and technological development of the model system. Winners of the design challenges will be invited to present their designs so that, in the envisioned follow-up Reduction-to-Practice Challenge, an open competition, teams will be able to form multi-disciplinary collaborations to advance and integrate the most feasible and promising approaches to the multiple challenges into a single integrative platform. Innovators will be invited to demonstrate final solutions.

B.11.10. ASPIRE Design Challenge 3: Predictive Algorithms for Translational Innovation in Pain, Opioid Use Disorder and Overdose[96]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH) is inviting novel design solutions for A Specialized Platform for Innovative Research Exploration (NCATS ASPIRE) Challenges as part of the NCATS ASPIRE Program. The goal of the NCATS ASPIRE Design Challenges is to reward and spur innovative and catalytic approaches towards solving the opioid crisis through development of: (1) novel chemistries; (2) data-mining and analysis tools and technologies; and (3) biological assays that will revolutionize discovery, development and pre-clinical testing of next generation, safer and non-addictive analgesics to treat pain, as well as new treatments for opioid use disorder (OUD) and overdose. The first phase of these prize competitions is implemented through a suite of concurrent companion Design Challenges that

[96] The website for ASPIRE Design Challenge 3: Predictive Algorithms for Translational Innovation in Pain, Opioid Use Disorder and Overdose is accessible at https://www.challenge.gov/challenge/ncats-aspire-design-challenge-3/.

comprises a separate challenge for each of four areas: chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays; and an additional challenge for a combined solution to at least two challenge areas. Challenge 3 aims to address the need for open-source, advanced machine learning algorithms that would facilitate the discovery of novel, efficacious and non-addictive analgesics and/or treatments for drug abuse.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as to transport winning team leads to the awards ceremony. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Transportation of participants	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Over 25 million people in the United States experience pain every day and need safe, addiction-free treatments to alleviate their suffering. This clinical demand is of tremendous importance given that overprescribing of opioids for managing acute and chronic pain has fueled the current epidemic of opioid use disorder and overdose deaths, and the effectiveness of opioids for long-term pain management is being questioned. Safe, effective and non-addictive drugs (small molecules and biologics) to treat pain, mitigate addiction and reverse overdose are key to addressing the opioid crisis. Given failures and limitations of previous drug development efforts, drugs that recognize novel targets, have novel structures and can be identified in human-based, physiologically relevant in vitro systems are needed.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$500,000	5	5	10-28-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$500,000	$500,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 8 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-31-2018	05-31-2019	8

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: This Challenge aims to reward and spur innovative solutions that work to develop machine learning algorithms that would aid the discovery of novel analgesics and/or treatments for opioid addiction and overdoses. For example, an algorithm can be developed to identify side groups and/or include ratio of bond types or atom types in a molecule in order to identify signatures that are less likely to trigger addiction. This Challenge requires submission of only a detailed description of the design of the algorithms, not the final working versions.

Evaluation of Submissions: The evaluation panels were made up of Federal and non-Federal technical consultants with expertise directly relevant to the challenge area. They evaluated the submissions based on feasibility and ability to meet the specified criteria. The submissions and evaluation statements from the technical panel were then reviewed by Federal employees who served as judges to select the winners.

Partnerships: No partners were reported.

Advancement of Agency Mission: The general purpose of NCATS is to coordinate and develop resources that leverage basic research in support of translational science and to develop partnerships and work cooperatively to foster synergy in ways that do not create duplication, redundancy and competition with industry activities (42 U.S.C. 287(a)). In order to fulfill its mission, NCATS supports projects that will transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process in order to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. This Challenge will lead to innovative designs for developing technology to revolutionize discovery, development and preclinical testing of new and safer treatments of pain, opioid use disorder (OUD), and overdose. The result will be generalizable tools that will be widely available to fill longstanding gaps that have impeded the marriage of basic and translational sciences.

Plan for Upcoming Two Fiscal Years: NCATS envisions following these Design Challenges with a follow-on, but distinct, final Reduction-to-Practice Challenge, which will aim to invoke further scientific and technological development of the model system. Winners of the design challenges will be invited to present their designs so that, in the envisioned follow-up Reduction-to-Practice Challenge, an open competition, teams will be able to form multi-disciplinary collaborations to advance and integrate the most feasible and promising approaches to the multiple challenges into a single integrative platform. Innovators will be invited to demonstrate final solutions.

B.11.11. ASPIRE Design Challenge 4: Biological Assays for Translational Innovation in Pain, Opioid Use Disorder and Overdose[97]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH) is inviting novel design solutions for A Specialized Platform for Innovative Research Exploration (NCATS ASPIRE) Challenges as part of the NCATS ASPIRE Program. The goal of the NCATS ASPIRE Design Challenges is to reward and spur innovative and catalytic approaches towards solving the opioid crisis through development of: (1) novel chemistries; (2) data-mining and analysis tools and technologies; and (3) biological assays that will revolutionize discovery, development and pre-clinical testing of next generation, safer and non-addictive analgesics to treat pain, as well as new treatments for opioid use disorder (OUD) and overdose. The first phase of these prize competitions is implemented through a suite of concurrent companion Design Challenges that comprises a separate challenge for each of four areas: chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays; and an additional challenge for a combined solution to at least two challenge areas. Challenge 4 aims to address the need for novel, physiologically relevant biological assays that can accurately replicate the safety profile and effectiveness of existing drugs to treat addiction and/or overdose and that can be reliably used in predictive assessments of new analgesics or drugs to treat addiction and/or overdose and/or be able to anticipate the degree of addictiveness of an analgesic prior to clinical testing.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as to transport winning team leads to the awards ceremony. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Transportation of participants	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Over 25 million people in the United States experience pain every day and need safe, addiction-free treatments to alleviate their suffering. This clinical demand is of tremendous importance given that overprescribing of opioids for managing acute and chronic pain

[97] The website for ASPIRE Design Challenge 4: Biological Assays for Translational Innovation in Pain, Opioid Use Disorder and Overdose is accessible at https://www.challenge.gov/challenge/ncats-aspire-design-challenge-4/.

has fueled the current epidemic of opioid use disorder and overdose deaths, and the effectiveness of opioids for long-term pain management is being questioned. Safe, effective and non-addictive drugs (small molecules and biologics) to treat pain, mitigate addiction and reverse overdose are key to addressing the opioid crisis. Given failures and limitations of previous drug development efforts, drugs that recognize novel targets, have novel structures and can be identified in human-based, physiologically relevant in vitro systems are needed.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$500,000	5	5	10-28-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$500,000	$500,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 8 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-31-2018	05-31-2019	8

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: This Challenge aims to reward and spur innovative solutions that work to develop a novel physiologically relevant biological assay to advance preclinical discovery and development of non-addictive treatments for pain, drug addiction or overdoses. This Challenge requires submission of only a detailed description of the design of the assay(s), not the final working assay(s). NCATS is inviting innovators to propose and develop novel disease-in-a-dish assays of pain perception, addiction or overdose that advance the understanding of different types of pain, identify differences in inter- and intra-individual pain and the associated risk of developing chronic pain and/or addiction and make possible the development of improved, non-addictive drugs to treat these conditions.

Evaluation of Submissions: The evaluation panels were made up of Federal and non-Federal technical consultants with expertise directly relevant to the challenge area. They evaluated the submissions based on feasibility and ability to meet the specified criteria. The submissions and evaluation statements from the technical panel were then reviewed by Federal employees who served as judges to select the winners.

Partnerships: No partners were reported.

Advancement of Agency Mission: The general purpose of NCATS is to coordinate and develop resources that leverage basic research in support of translational science and to develop partnerships and work cooperatively to foster synergy in ways that do not create duplication, redundancy and competition with industry activities (42 U.S.C. 287(a)). In order to fulfill its mission, NCATS supports projects that will transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process in order to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. This Challenge will lead to innovative designs for developing technology to revolutionize discovery, development and preclinical testing of new and safer treatments of pain, opioid use disorder (OUD), and overdose. The result will be generalizable tools that will be widely available to fill longstanding gaps that have impeded the marriage of basic and translational sciences.

Plan for Upcoming Two Fiscal Years: NCATS envisions following these Design Challenges with a follow-on, but distinct, final Reduction-to-Practice Challenge, which will aim to invoke further scientific and technological development of the model system. Winners of the design challenges will be invited to present their designs so that, in the envisioned follow-up Reduction-to-Practice Challenge, an open competition, teams will be able to form multi-disciplinary collaborations to advance and integrate the most feasible and promising approaches to the multiple challenges into a single integrative platform. Innovators will be invited to demonstrate final solutions.

B.11.12. ASPIRE Design Challenge 5: Integrated Solution for Translational Innovation in Pain, Opioid Use Disorder and Overdose[98]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH), is inviting novel design solutions for A Specialized Platform for Innovative Research Exploration (NCATS ASPIRE) Challenges as part of the NCATS ASPIRE Program. The goal of the NCATS ASPIRE Design Challenges is to reward and spur innovative and catalytic approaches towards solving the opioid crisis through development of: (1) novel chemistries; (2) data-mining and analysis tools and technologies; and (3) biological assays that will revolutionize discovery, development and pre-clinical testing of next generation, safer and non-addictive analgesics to treat

[98] The website for ASPIRE Design Challenge 5: Integrated Solution for Translational Innovation in Pain, Opioid Use Disorder and Overdose is accessible at https://www.challenge.gov/challenge/ncats-aspire-design-challenge-5/.

pain, as well as new treatments for opioid use disorder (OUD) and overdose. Phase 1 of these Challenges is implemented through a suite of concurrent companion Design Challenges that comprises a separate challenge for each of four areas: chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays; and an additional challenge for a combined solution to at least two challenge areas. Challenge 5 aims to reward and spur the design of innovative, comprehensive solutions to the opioid crisis through innovative approaches that integrate solutions to at least two challenge areas (Challenges 1-4: Integrated Database, Electronic Synthetic Chemistry Portal, Predictive Algorithms and Biological Assays, respectively) into a single platform.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as to transport winning team leads to the awards ceremony. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Transportation of participants	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Over 25 million people in the United States experience pain every day and need safe, addiction-free treatments to alleviate their suffering. This clinical demand is of tremendous importance given that overprescribing of opioids for managing acute and chronic pain has fueled the current epidemic of opioid use disorder and overdose deaths, and the effectiveness of opioids for long-term pain management is being questioned. Safe, effective and non-addictive drugs (small molecules and biologics) to treat pain, mitigate addiction and reverse overdose are key to addressing the opioid crisis. Given failures and limitations of previous drug development efforts, drugs that recognize novel targets, have novel structures and can be identified in human-based, physiologically relevant in vitro systems are needed.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$250,000	2	1	10-28-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$500,000	$250,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 3 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-31-2018	05-31-2019	3

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: The goal of this Challenge is to converge solutions to at least two component Challenge areas (Challenges 1-4: Integrated Database, Electronic Synthetic Chemistry Portal, Predictive Algorithms and/or Biological Assays, respectively) from the very beginning into an Integrated Solution. As with the individual NCATS ASPIRE Design Challenges, an Integrated Solution is expected to incorporate each of the requirements and desired features as detailed in the individual Challenge areas. In addition, while individual components may be operating from different locations, the functionality and degree of integration of the components in the Integrated Solution will be evaluated.

Evaluation of Submissions: The evaluation panels were made up of Federal and non-Federal technical consultants with expertise directly relevant to the challenge area. They evaluated the submissions based on feasibility and ability to meet the specified criteria. The submissions and evaluation statements from the technical panel were then reviewed by Federal employees who served as judges to select the winners.

Partnerships: No partners were reported.

Advancement of Agency Mission: The general purpose of NCATS is to coordinate and develop resources that leverage basic research in support of translational science and to develop partnerships and work cooperatively to foster synergy in ways that do not create duplication, redundancy and competition with industry activities (42 U.S.C. 287(a)). In order to fulfill its mission, NCATS supports projects that will transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process in order to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. This Challenge will lead to innovative designs for developing technology to revolutionize discovery, development and preclinical testing of new and safer treatments of pain, opioid use disorder (OUD), and overdose. The result will be generalizable tools that will be widely available to fill longstanding gaps that have impeded the marriage of basic and translational sciences.

Plan for Upcoming Two Fiscal Years: NCATS envisions following these Design Challenges with a follow-on, but distinct, final Reduction-to-Practice Challenge, which will aim to invoke further scientific and technological development of the model system. Winners of the Design Challenges will be invited to present their designs so that, in the envisioned follow-up Reduction-to-Practice Challenge, an open competition, teams will be able to form multi-disciplinary collaborations to advance and integrate the

most feasible and promising approaches to the multiple challenges into a single integrative platform. Innovators will be invited to demonstrate final solutions.

B.11.13. ASPIRE Reduction-to-Practice Challenge[99]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH), is inviting novel solutions for the Reduction-to-Practice Challenge for the NCATS A Specialized Platform for Innovative Research Exploration (ASPIRE) Program. The overall goal of the NCATS ASPIRE Challenges is to reward and spur innovative and catalytic approaches towards solving the opioid crisis through development of: (1) novel chemistries; (2) data-mining and analysis tools and technologies; and (3) biological assays that will revolutionize discovery, development and pre-clinical testing of next generation, safer and non-addictive analgesics to treat pain, as well as new treatments for opioid use disorder (OUD) and overdose. The first phase of these prize competitions was implemented through a suite of concurrent companion Design Challenges that comprised a separate challenge in each of four areas: chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays; and an additional challenge for a combined solution to at least two challenge areas. In this second phase, the follow-up Reduction-to-Practice Challenge, the goal is for an open competition to integrate the best designs for a chemistry database, electronic laboratory knowledge portal for synthetic chemistry, algorithms, and biological assays into a single comprehensive platform. Innovators should invoke further scientific and technological development of a comprehensive and integrated solution for the development of new treatments for pain, opioid use disorder and overdose. Innovators design and then demonstrate their integrated solutions and working prototypes, from which winners will be selected.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award)
FTEs	Not applicable	0.1
Funding Estimate	Not applicable	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

[99] The website for ASPIRE Reduction-to-Practice Challenge is accessible at https://ncats.nih.gov/aspire/2020Challenge.

Problem or Opportunity Addressed: Over 25 million people in the United States experience pain every day and need safe, addiction-free treatments to alleviate their suffering. This clinical demand is of tremendous importance given that overprescribing of opioids for managing acute and chronic pain has fueled the current epidemic of opioid use disorder and overdose deaths, and the effectiveness of opioids for long-term pain management is being questioned. Safe, effective and non-addictive drugs (small molecules and biologics) to treat pain, mitigate addiction and reverse overdose are key to addressing the opioid crisis. Given failures and limitations of previous drug development efforts, drugs that recognize novel targets, have novel structures and can be identified in human-based, physiologically relevant in vitro systems are needed.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$600,000	5	Not applicable	04-15-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$2,875,000	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	11-30-2020	02-28-2021	04-15-2021	Not applicable

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept

Submissions: The goal of Stage 1 of the Challenge is to design a solution that integrates the four component areas (Integrated Database, Electronic Synthetic Chemistry Portal, Predictive Algorithms and Biological Assays) that can be elaborated into a working prototype in the second stage of the

Challenge. This integrated solution is expected to incorporate each of the requirements and desired features as detailed in the individual component areas.

Evaluation of Submissions: Submissions will be evaluated based upon the following criteria: overall impact and innovation; design of individual components; and integration, adaptability, user-friendliness and accessibility. A panel of technical experts with subject matter expertise directly relevant to each of the four component areas will evaluate the Stage 1 designs based on ability to fulfill the criteria listed below. The Stage 1 winners will be selected by a panel of Federal judges, which may include program staff, subject to the final decision by the Award Approving Official.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The main mission of NCATS is to coordinate and develop resources that leverage basic research in support of translational science and to develop partnerships and work cooperatively to foster synergy in ways that do not create duplication, redundancy, and competition with industry activities (42 U.S.C. 287(a)). In order to fulfill its mission, the NCATS supports projects that will transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process in order to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. In line with these authorities, this Challenge will lead to innovative prototypes for developing technology to revolutionize discovery, development and pre-clinical testing of new and safer treatments of pain, OUD, and overdose. The result will be generalizable tools that will be widely available to fill longstanding gaps that have impeded the marriage of basic and translational sciences, especially in the field of automated and synthetic chemistry.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.14. Big Data Analysis Challenge: Creating New Paradigms for Heart Failure Research[100]

Sponsoring Agency and Office: National Institutes of Health (National Heart, Lung, and Blood Institute)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The National Heart, Lung, and Blood Institute (NHLBI), part of the National Institutes of Health (NIH), is inviting novel Solutions for the NHLBI Big Data Analysis Challenge: Creating New Paradigms for Heart Failure Research. The goal of the Challenge is to foster innovation in computational analysis and machine learning approaches utilizing large-scale NHLBI-funded datasets to identify new paradigms in heart failure research. The challenge aims to address the need for new open-source disease models that can define sub-phenotypes of heart failure to serve as a springboard for new research hypotheses and tool development in areas of heart failure research from basic to clinical settings.

[100] The website for Big Data Analysis Challenge: Creating New Paradigms for Heart Failure Research is accessible at https://www.challenge.gov/challenge/heart-failure-big-data-analysis-challenge/.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as for challenge advertising and outreach. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	Not applicable	0.5
Funding Estimate	Not applicable	$350

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination

Problem or Opportunity Addressed: Adult heart failure is a chronic, progressive disorder in which the heart is unable to efficiently pump blood, and more than 6.5 million Americans suffer from this condition. It is currently often categorized by a single-metric left-ventricular ejection fraction, but is known to be a multi-organ, systemic syndrome with many related but seemingly disparate phenotypes. Additionally, social, behavioral, environmental, and genetic determinants often captured in study data have a considerable influence on outcomes but are not well understood. The field of heart failure research currently lacks a systematic framework that incorporates these many factors in a comprehensive disease model. An adult heart failure sub-phenotyping scheme incorporating many disease-associated factors would provide a new paradigm that will benefit investigations into the mechanism of disease, diagnosis, and, ultimately, prevention and treatment.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$250,000	5	5	11-30-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$250,000	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: 12 team(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-28-2020	08-28-2020	12

Solicitation of Submissions: Social media; Email; Posted on challenge.gov; Other

Submission Types: Analysis or visualization of data

Submissions: This Challenge aims to reward innovative, computational solutions utilizing large health datasets to develop a schema for the sub-phenotyping of adult heart failure that facilitates basic and/or clinical heart failure research objectives. A successful adult heart failure sub-phenotyping solution will be a novel, pragmatic, accessible research tool for a spectrum of heart failure researchers. Successful solutions will also be free and openly available to the research community. Participants are strongly encouraged to take advantage of NHLBI-funded datasets in the development of their solution and are also welcome to bring other relevant data to their analyses.

Evaluation of Submissions: Technical reviewers with expertise relevant to the Challenge will evaluate the solutions based on their ability to achieve the following criteria: impact and innovation; functionality and implementation; and applied expertise. The solutions and evaluation statements from the technical panel will then be reviewed by Federal employees serving as judges, who will select up to five Challenge winners, subject to a final decision by the Award Approving Official.

Partnerships: No partners were indicated

Advancement of Agency Mission: The National Heart, Lung, and Blood Institute (NHLBI), part of the NIH, is inviting novel solutions for the NHLBI Big Data Analysis Challenge: Creating New Paradigms for Heart Failure Research. The goal of the Challenge is to foster innovation in computational analysis and machine learning approaches utilizing large-scale NHLBI-funded datasets to identify new paradigms in heart failure research. The Challenge aims to address the need for new, open-source disease models that can define sub-categorizations of adult heart failure to serve as a springboard for new research hypotheses and tool development in areas of heart failure research from basic to clinical settings.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.15. Brain Cancer Predictive Modeling precisionFDA Challenge[101]

Sponsoring Agency and Office: Food and Drug Administration (Office of Health Informatics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred in FY19

FY20: Completed

Competition Summary: An estimated 86,970 new cases of primary brain and other central nervous system tumors are expected to be diagnosed in the US in 2019. Brain tumors comprise a particularly

[101] The website for Brain Cancer Predictive Modeling precisionFDA Challenge is accessible at https://precision.fda.gov/challenges/8/view/results.

deadly subset of all cancers due to limited treatment options and the high cost of care. Clinical investigators at Georgetown University are seeking to advance precision medicine techniques for the prognosis and treatment of brain tumors through the identification of novel multi-omics biomarkers. In support of this goal, precisionFDA and the Georgetown Lombardi Comprehensive Cancer Center and the Innovation Center for Biomedical Informatics at Georgetown University Medical Center (Georgetown-ICBI) launched the Brain Cancer Predictive Modeling and Biomarker Discovery Challenge. This challenge asks participants to develop machine learning and/or artificial intelligence models to identify biomarkers and predict patient outcomes using gene expression, DNA copy number, and clinical data.

Budget and Resources: Agency funds were used to support Federal and contractor FTEs in building a community of experts, developing training for users, and outreach activities such as scientific challenges and scientific papers. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Software development; Web portal or app development and support
FTEs	None	0.1
Funding Estimate	None reported	$50,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: To advance precision medicine techniques for the prognosis and treatment of brain tumors through the identification of novel multi-omics biomarkers, participants will develop artificial intelligence and machine learning models to identify biomarkers and predict patient outcomes using clinical, DNA copy number alterations, and gene expression data.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	5	5	05-29-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	None reported	None reported

Non-Cash Prizes Include: 1) Public recognition as a Top Performer on the web site; 2) Presentation at Health Informatics and Data Science Symposium.

Participants:

FY19: Not applicable

FY20: 22 team(s)

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	11-01-2019	02-14-2020	05-29-2020	30

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Analysis or visualization of data

Submissions: In this challenge, participants received a data set with brain tumor information and submitted algorithms to use this information to predict brain cancer outcomes. Participants were first given the opportunity to train on a portion of the full dataset and then asked to make predictions on the remaining portion of the set.

Evaluation of Submissions: Algorithms were evaluated using metrics such as sensitivity, specificity and positive predictive value.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Georgetown University	University	None reported	$15,000	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other

Advancement of Agency Mission: This challenge supported both FDA's public health mission and Georgetown's education and research mission by identifying techniques for understanding brain cancer biomarker development.

Plan for Upcoming Two Fiscal Years: FDA will be doing scientific challenges (both internal and external) in order to further the goals of the science-based organization and to provide insight into new and evolving science and technologies.

B.11.16. BRAIN Initiative Challenge: Considering Ethics During Brain Technology Development[102]

Sponsoring Agency and Office: National Institutes of Health (National Institute of Neurological Disorders and Stroke)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: Science seeks to answer questions about ourselves and the world around us. Many times, the most important discoveries are completely unexpected, like when a moldy dish left out during vacation leads to the discovery of a vital medicine, penicillin! But, if something is unexpected, how can we prepare for positive and/or negative outcomes? When it comes to understanding the brain, enter: Neuroethics! Careful scientists must consider ethics during their research, including preparing for unanticipated consequences of exciting scientific advances. At the NIH, the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative is funding researchers to revolutionize our understanding of the human brain, including the development of devices to study the human brain and to treat brain disorders. While these devices are opening doors to new discoveries, they also raise potentially new ethical questions. This challenge is seeking creative essays or videos from currently enrolled U.S. high school students that describe a teen's perspective on the ethics, limitations, and implications of emerging technology to study and treat disorders of the human brain.

Budget and Resources: Agency funds were used to develop a web portal to receive submissions. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award); Web portal or app development and support
FTEs	Not applicable	0.2
Funding Estimate	Not applicable	$1,700

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Currently, BRAIN Initiative researchers are developing a variety of devices to study the human brain and to treat brain disorders, such as Parkinson's disease, epilepsy, depression, etc. Some of these devices are implanted directly into the brain, while others can operate without needing to physically access the brain. Some of these devices can be used to stimulate

[102] The website for BRAIN Initiative Challenge: Considering Ethics During Brain Technology Development is accessible at https://www.challenge.gov/challenge/brain-initiative-challenge/.

activity in specific brain regions for treatment purposes, while others are used to record brain activity. While these devices are opening doors to new discoveries, they also raise potentially new ethical questions. The field that studies the ethical, legal, and societal implications of neuroscience is called neuroethics, and this Challenge is seeking creative essays or videos from currently enrolled U.S. high school students that describe a teen's perspective on the ethics, limitations, and implications of emerging technology to study and treat disorders of the human brain.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$3,500	6	Not applicable	03-18-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$3,500	Not applicable

Non-Cash Prizes Include: Essays and videos will be assessed and awarded separately, with non-monetary awards for essay submissions and non-monetary awards for video submissions, paired with cash prizes for the top three winners in each category. First Place winner: certificate, publication on NIH BRAIN Initiative website, invitation to participate and be recognized at the annual BRAIN Initiative Investigators Meeting with one parent/guardian. Second Place winner: certificate, publication on NIH BRAIN Initiative website. Third Place winner: certificate, publication on NIH BRAIN Initiative website. Finalists will be recognized with a certificate and honorable mention on the NIH BRAIN Initiative website. The number of finalists will be determined based on the number of entries received for each category, essay and video.

Participants:

FY19: Not applicable

FY20: Not applicable

Intended Participants: 9th-12th grade students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
10-01-2020	11-04-2020	123

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Creative media

Submissions: This Challenge is seeking creative essays or videos from currently enrolled U.S. high school students that describe a teen's perspective on the ethics, limitations, and implications of

emerging technology to study and treat disorders of the human brain. The submissions will be evaluated on the extent to which they: 1) identify/introduce a neuroethics topic 2) express a point of view 3) convey original thinking and creativity 4) strength of writing or media production.

Evaluation of Submissions: The judging panel will be comprised of three individuals hired as Directors of institutes, centers, offices, and/or trans-agency initiatives at NIH. The judges will identify the winners. The reviewers will be members of the BRAIN Initiative Community and Partners who have programmatic expertise and will evaluate eligible submissions based on the evaluation criteria identified below. The submissions will be evaluated on the extent to which they 1) identify/introduce a neuroethics topic 2) express a point of view 3) convey original thinking and creativity 4) strength of writing or media production.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This Challenge is being conducted to advance the mission of the NIH BRAIN Initiative, hosted by the National Institute of Neurological Disorders and Stroke, and collaboratively with the partnering Institutes and Centers (ICs), to transform the understanding of innovative neurotechnology research and its application to the treatment of neurological disorders through the youth's perspective on neuroethics. The goal is to gain an increased understanding of the public's perspective of neurotechnology and neuroethics, as well as enhance engagement with students for scientific workforce development.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.17. Care Coordination for Children with Special Health Care Needs Challenge[103]

Sponsoring Agency and Office: Health Resources and Services Administration (Maternal and Child Health Bureau)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Care Coordination for Children with Special Health Care Needs Challenge supports innovative technology-based solutions that improve the quality of care, enhance family engagement, and positively impact health outcomes for families of children with special health care needs.

Budget and Resources: For all MCHB Grand Challenges, a contract was awarded in FY17 to support planning, implementation, and awards of the prize purses. As this allocated funding became no-year funding under the COMPETES Act, no additional FY19 or 20 funds were allocated to support the challenges. The following table indicates the budget and resources to support the activity.

[103] The website for Care Coordination for Children with Special Health Care Needs Challenge is accessible at https://mchbgrandchallenges.hrsa.gov/challenges/care-coordination-cshcn.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.5	0.25
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Children with Special Health Care Needs (CSHCN) have or are at risk for chronic physical, developmental, behavioral, or emotional conditions. They need a complex array of health and related services beyond what a typical child needs. For CSHCNs, coordinated care by their care team, including family members, and primary, specialty, and service providers, is essential to their health and well-being. Unfortunately, communication and coordination across systems of care is often fragmented. Too often, family members of CSHCN must bear the burden of collecting and sharing health information with different providers and settings all in addition to caring for their child. Families deserve complete, comprehensive, and easily accessible information about their children's health and care plans to ensure the best quality of care for their children.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$100,000	10	7	01-25-2019
2	$145,000	5	4	09-13-2019
3	$130,000	1	1	12-14-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$245,000	$245,000
FY20	None reported	None reported

Non-Cash Prizes Include: Participants received multiple non-monetary incentives. Expert advisors were engaged at the beginning of the challenge to provide expertise and input into the design of the challenge. After the initial Phase 1 winners were selected, each was paired to one advisor, who

provided mentoring and critical feedback on development of the team's innovation during the remainder of the challenge. MCHB provided multiple incentives as well, such as hosting webinars for Phase 1 winners on crafting pitches, and for Phase 2 winners on commercialization strategies to take their innovations to market. An in-person Demo Days event, held at the end of Phase 2, brought together teams from across the Grand Challenges, and provided access to panels featuring leaders in government and the commercial sector, opportunities to network with other teams and Federal staff, and increased visibility of their innovation among participants.

Participants:

FY19: 7 team(s)

FY20: 4 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-30-2018	11-09-2018	01-25-2019	60
2	02-01-2019	09-13-2019	09-13-2019	7
3	11-01-2019	12-07-2020	12-14-2020	4

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Prototype device or object; Software or computer code; Creative media; Analysis or visualization of data
3	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: This Challenge supports innovative technology-based solutions that improve the quality of care, enhance family engagement, and positively impact health outcomes for families of children with special health care needs. The Challenge sought technology-based solutions to organize data from different sources into a cohesive patient/family-centered record that would facilitate care coordination and planning for CSHCNs and their families.

Evaluation of Submissions: For all of the MCHB Grand Challenges, a panel of external expert advisors have been engaged from the beginning of the Challenge. For Phase 1, submissions are scored by the advisors and then submissions and scores are sent to the Federal judges for official review. Federal judges include a mix of individuals from within and outside the Administration. Federal judges evaluate and select winners for each phase. Submissions are evaluated by numeric scores aligned to the evaluation criteria developed for each phase prior to the challenge's launch and listed on the website.

Partnerships: No partners were indicated

Advancement of Agency Mission: HRSA's mission is to improve health outcomes and address health disparities through access to quality services, a skilled health workforce, and innovative, high-value programs, and MCHB's mission is to improve the health and well-being of America's mothers, children, and families. This Challenge supports innovative technology-based solutions that improve the quality of care, enhance family engagement, and positively impact health outcomes for families of children with special health care needs.

Plan for Upcoming Two Fiscal Years: This Competition is one of four MCHB Grand Challenges, all of which will conclude in FY21. HRSA's Maternal and Child Health Bureau is launching a new challenge in FY21, the Promoting Pediatric Primary Prevention (P4) Challenge. The Challenge will incentivize innovations in pediatric primary care to improve child health. The Challenge will be implemented in two phases, with final awards made in FY22.

B.11.18. Design by Biomedical Undergraduate Teams (DEBUT) - 2019[104]

Sponsoring Agency and Office: National Institutes of Health (National Institute of Biomedical Imaging and Bioengineering)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Institute of Biomedical Imaging and Bioengineering (NIBIB) Design by Biomedical Undergraduate Teams (DEBUT) Challenge is open to teams of undergraduate students working on projects that develop innovative solutions to unmet health and clinical problems. NIBIB's mission is to improve health by leading the development and accelerating the application of biomedical technologies. The goals of the DEBUT Challenge are 1) to provide undergraduate students valuable experiences working in teams, identifying unmet clinical needs, and designing, building and debugging solutions for those open-ended problems; 2) to generate novel, innovative tools to improve healthcare, consistent with NIBIB's purpose to support research, training, and the dissemination of health information, and to generate other programs related to biomedical imaging, engineering and associated technologies and modalities with biomedical applications; and 3) to highlight and acknowledge the contributions and accomplishments of undergraduate students.

Budget and Resources: Federal funds were used to procure services from an external contractor for inputting, prescreening, and providing initial technical evaluation of applications, and outreach efforts. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Data entry/analysis; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable

[104] The website for Design by Biomedical Undergraduate Teams (DEBUT) - 2019 is accessible at https://www.challenge.gov/challenge/debut-design-by-biomedical-undergraduate-teams-challenge-2019/.

Funding	FY19	FY20
FTEs	0.15	Not applicable
Funding Estimate	$36,900	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: Engaging undergraduate students to work in teams to design, build and debug solutions to real-world problems and needs in healthcare not only prepares them to function effectively in their future work environment, but also yields novel, innovative biomedical tools that can transform healthcare.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$80,000	11	11	08-27-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$80,000	$80,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Winning student teams will be honored at the NIBIB DEBUT Award Ceremony during the 2019 Annual Meeting of the Biomedical Engineering Society.

Participants:

FY19: 52 team(s)

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-01-2019	05-31-2019	52

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept; Prototype device or object

Submissions: The NIBIB DEBUT Challenge solicits design projects that develop innovative solutions to unmet health and clinical problems. Areas of interest for the biomedical engineering projects include, but are not limited to: diagnostics, therapeutics, technologies for underserved populations and low resource settings, point-of-care systems, precision medicine, preventive medicine, technologies to aid individuals with disabilities, and HIV/AIDS prevention and care. Student teams participating in capstone design projects are especially encouraged to enter the Challenge.

Evaluation of Submissions: Applications were screened for completeness and pre-evaluation was conducted by VentureWell using subject-matter experts from academia. A committee of NIH staff made final recommendations to the NIBIB director, who made all final decisions.

Partnerships: The Prize Competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
NIH Office of AIDS Research	Federal Agency or Office	$15,000	Not applicable	Prize purse
VentureWell	Nonprofit Organization (excluding Academic Institutions)	$20,000	Not applicable	Prize purse; Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Database development; Data entry/analysis; Operations or administrative support

Advancement of Agency Mission: The general purpose of NIBIB is to conduct and support research, training, the dissemination of health information, and other programs related to biomedical imaging, biomedical engineering, and associated technologies and modalities with biomedical applications. By challenging undergraduate students to identify unmet clinical needs and develop innovative solutions for them, NIBIB targets the education of biomedical engineers who have the background, skills, and confidence to make outstanding contributions to biomedical technologies.

Plan for Upcoming Two Fiscal Years: NIBIB will consider continuing to offer this Challenge on a semi-annual basis, dependent upon appropriations.

B.11.19. Design by Biomedical Undergraduate Teams (DEBUT) - 2020[105]

Sponsoring Agency and Office: National Institutes of Health (National Institute of Biomedical Imaging and Bioengineering)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

[105] The website for Design by Biomedical Undergraduate Teams (DEBUT) 2020 is accessible at https://www.challenge.gov/challenge/2020-debut-challenge/.

FY20: Completed

Competition Summary: The National Institute of Biomedical Imaging and Bioengineering (NIBIB) Design by Biomedical Undergraduate Teams (DEBUT) Challenge is open to teams of undergraduate students working on projects that develop innovative solutions to unmet health and clinical problems. NIBIB's mission is to improve health by leading the development and accelerating the application of biomedical technologies. The goals of the DEBUT Challenge are 1) to provide undergraduate students valuable experiences working in teams, identifying unmet clinical needs, and designing, building and debugging solutions for those open-ended problems; 2) to generate novel, innovative tools to improve healthcare, consistent with NIBIB's purpose to support research, training, and the dissemination of health information, and to generate other programs related to biomedical imaging, engineering and associated technologies and modalities with biomedical applications; and 3) to highlight and acknowledge the contributions and accomplishments of undergraduate students.

Budget and Resources: Federal funds were used to procure services from an external contractor for inputting, pre-screening, and providing initial technical evaluation of applications, and outreach efforts. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	0.15
Funding Estimate	Not applicable	$38,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: Engaging undergraduate students to work in teams to design, build and debug solutions to real-world problems and needs in healthcare not only prepares them to function effectively in their future work environment, but also yields novel, innovative biomedical tools that can transform healthcare.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$100,000	12	12	08-25-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$100,000	$100,000

Non-Cash Prizes Include: Winning student teams will be honored at the NIBIB DEBUT Award Ceremony during the 2020 Annual Meeting of the Biomedical Engineering Society.

Participants:

FY19: Not applicable

FY20: 86 team(s)

Intended Participants: Undergraduate College/University/Technical students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
01-09-2020	06-01-2020	86

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept; Prototype device or object

Submissions: The NIBIB DEBUT Challenge solicits design projects that develop innovative solutions to unmet health and clinical problems. Areas of interest for the biomedical engineering projects include, but are not limited to: diagnostics, therapeutics, technologies for underserved populations and low resource settings, point-of-care systems, precision medicine, preventive medicine, technologies to aid individuals with disabilities, and HIV/AIDS prevention and care.

Evaluation of Submissions: Applications were screened for completeness and pre-evaluation was conducted by VentureWell using subject-matter experts from academia. A committee of NIH staff made final recommendations to the NIBIB director, who made all final decisions.

Partnerships: The Prize Competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
NIH Office of AIDS Research	Federal Agency or Office	Not applicable	$15,000	prize purse
National Institute on Minority Health and Health Disparities	Federal Agency or Office	Not applicable	$15,000	prize purse

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
VentureWell	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$20,000	Prize purse; Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Database development; Data entry/analysis; Operations or administrative support

Advancement of Agency Mission: The general purpose of NIBIB is to conduct and support research, training, the dissemination of health information, and other programs related to biomedical imaging, biomedical engineering, and associated technologies and modalities with biomedical applications. By challenging undergraduate students to identify unmet clinical needs and develop innovative solutions for them, NIBIB targets the education of biomedical engineers who have the background, skills, and confidence to make outstanding contributions to biomedical technologies.

Plan for Upcoming Two Fiscal Years: NIBIB will consider continuing to offer this Challenge on a semi-annual basis, dependent upon appropriations.

B.11.20. FDA BioCompute Objects precisionFDA Challenge[106]

Sponsoring Agency and Office: Food and Drug Administration (Office of Health Informatics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Like scientific laboratory experiments, bioinformatics analysis results and interpretations are faced with reproducibility challenges due to the variability in multiple computational parameters. This includes input format, prerequisites, platform dependencies, and more. Even small changes in these computational parameters may have a large impact on the results and carry big implications for their scientific validity. Without standardized schemas for reporting computational scientific workflows and parameters together with their results, reporting of these workflows can be highly variable, incomplete, and difficult or impossible to reproduce. BioCompute refers to a schema developed by the US Food and Drug Administration (FDA) Center for Biologics Evaluation and Research (CBER) and George Washington University (GW) to help address these inconsistencies in reporting. The BioCompute Objects precisionFDA Challenge was held to raise awareness of BioCompute Objects and to develop tools that facilitate their use.

Budget and Resources: Agency funds were used to support Federal and contractor FTEs in building a community of experts, developing training for users, and outreach activities such as scientific

[106] The website for FDA BioCompute Objects precisionFDA Challenge is accessible at https://precision.fda.gov/challenges/7/view/results.

challenges and scientific papers. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Software development; Web portal or app development and support
FTEs	0.1	None Reported
Funding Estimate	None reported	$50,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Highlight new BioCompute Objects, an evolving standard that provides identification and operational information about bioinformatics pipelines and how they are used and develop tools to enable use of BioCompute Objects.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	4	4	03-20-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	None reported	None reported

Non-Cash Prizes Include: Public recognition as a Top Performer on the web site.

Participants:

FY19: 28 team(s)

FY20: Not applicable

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	05-14-2019	10-18-2019	03-20-2020	31

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Analysis or visualization of data and tool development

Submissions: Participants provided a BCO and/or developed software that creates, displays and certifies a BCO in order to enhance BioCompute Object (BCO) standards for computational pipeline reproducibility and documentation.

Evaluation of Submissions: Beginner and Advanced tracks were evaluated separately. Each submission was blindly distributed to reviewers with criteria such as inclusion of provenance, prerequisites, and scripts; alignment with specification; and creativity and usability.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
George Washington University	Academic Institution	$10,000	None Reported	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other

Advancement of Agency Mission: This challenge supported FDA's safety and efficacy of regulated products mission by encouraging the use of a standard for bioinformatics pipelines to ensure that they can be used appropriately and as intended.

Plan for Upcoming Two Fiscal Years: FDA will be doing scientific challenges (both internal and external) in order to further the goals of the science-based organization and to provide insight into new and evolving science and technologies.

B.11.21. Gaining New Insights by Detecting Adverse Event Anomalies Using FDA Open Data[107]

Sponsoring Agency and Office: Food and Drug Administration (Office of Health Informatics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred in FY19

[107] The website for Gaining New Insights by Detecting Adverse Event Anomalies Using FDA Open Data Challenge is accessible at https://precision.fda.gov/challenges/9/view/results.

FY20: Completed

Competition Summary: During the life-cycle of FDA regulated products, FDA collects data from a diversity of sources including voluntary reports from healthcare providers and patients. While cause and effect are not always conclusive or relevant in these reports, valuable insights into the impact of regulated products on public health have been found in individual reports and in evaluation of reported data. This challenge engaged data scientists to use evolving data science techniques to identify anomalies that may lead to valuable public health information.

Budget and Resources: Agency funds were used to support Federal and contractor FTEs in building a community of experts, developing training for users, and outreach activities such as scientific challenges and scientific papers. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Software development; Web portal or app development and support
FTEs	None reported	0.1
Funding Estimate	None reported	$50,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Innovative analytic approaches can help us look at adverse event data in a new and unexpected way. Synergistic approaches can allow reviewers augment their current processes in an automated fashion. In addition, as a part of an FDA public meeting to modernize FDA's Data Strategy it informed and stimulated these public discussions.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	2	2	06-30-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$0	$0

FY	Prize Purse Offered	Prize Purse Awarded
FY20	None reported	None reported

Non-Cash Prizes Include: 1) Public recognition as a Top Performer on the web site; 2) Ability to move on to a second phase which utilizes non-synthetic data.

Participants:

FY19: Not applicable

FY20: 6 team(s)

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	11-17-2019	05-18-2020	06-30-2020	6

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Analysis and visualization of data

Submissions: In this Challenge, data scientists used evolving data science techniques to identify anomalies in adverse event reports, enabling detection of possible safety issues in regulated products.

Evaluation of Submissions: Submission evaluation was carried out by a team of experts from diverse backgrounds including computer science, biostatistics, chemistry, epidemiology, medical science, pharmacovigilance, and biology. The team developed an evaluation rubric with scores based on participant algorithm methodologies, and anomalies detected. Specifically, methods were scored based on assessments of quality, usefulness, innovation, and reproducibility for a total of 6 points. Each of the submitters' specific anomalies was scored (out of 24 points) based on (1) impact - applicability to FDA review or data processing efforts, (2) surprise - an anomaly's statistically disproportionate or unexpected nature, and (3) innovation - novelty and complexity. Top submissions were further analyzed by a team of medical officers, pharmacists, and physicians from FDA's Center for Biologics Evaluation and Research (CBER) and Center for Drug Evaluation and Research (CDER).

Partnerships: No partners were indicated.

Advancement of Agency Mission: This challenge directly supported FDA's safety and efficacy of regulated products mission.

Plan for Upcoming Two Fiscal Years: FDA will be doing scientific challenges (both internal and external) in order to further the goals of the science-based organization and to provide insight into new and evolving science and technologies. While FDA does not offer monetary prizes, enough innovators participate to make this a valuable science incubator.

B.11.22. Health+ Sickle Cell Disease Hackathon[108]

Sponsoring Agency and Office: Department of Health and Human Services, Office of the Chief Technology Officer

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: Health+ Sickle Cell Disease Healthathon (September 2020) - HHS partnered with Howard University's 1867 Health Innovations Project to host a Healthathon innovation contest in September 2020. The event invited problem solvers to co-develop solutions to improve the quality of life for people living with sickle cell disease. Throughout the September Sickle Cell Awareness Month, twelve teams participated in creating solutions that improve the quality of life for people living with sickle cell disease. On September 25th, HHS, in partnership with Howard University's 1867 Health Innovations Project and the Center for Sickle Cell Disease (SCD), celebrated the progress made by all teams and announced three winners during the Healthathon Finale.

Budget and Resources: Agency funds were used for Contract support to administer and manage the innovation contest, collect entries, judge entries, make recommendations on winners, and host public events. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Non-monetary award(s); Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Discovery and design support; Solution acceleration
FTEs	Not applicable	0.25
Funding Estimate	Not applicable	$50,000

Goal Types: Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: Improving the continuity of care for SCD patients in the transition from pediatric to adult care; Improving the experience in the emergency department; Assessing care and treatment options and improving sustainable treatment

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	3	3	09-25-2020

[108] The website for Health+ Sickle Cell Disease Healthathon is accessible at https://data4scd.crowdicity.com.

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	None reported	None reported

Non-Cash Prizes Include: Three winners were awarded opportunities in innovation and clinical validation, mentorship programs, policy whitepaper publication, and marketing spotlights sponsored by Howard University, AARP, Healthbox, and other organizations.

Participants:

FY19: Not applicable

FY20: 12 team(s)

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-07-2020	09-18-2020	14

Solicitation of Submissions: Social media; Email; Press release; Live event(s) prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept; Software and computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: During the two-week-long collaborative Healthathon execution period, individuals and cross-disciplinary teams worked to draft solutions within the identified problem areas using background materials provided and their own ingenuity. Solutions can range from prototypes of an SCD 101 communications plan to prototypes of an emergency room policy, taking the form of technology, payment structures, process solutions, and more.

Evaluation of Submissions: Entries were evaluated by a panel of esteemed judges. Selected entries will be awarded opportunities to participate in programs and promotions sponsored by Howard University, AARP, Healthbox, and other partner organizations. These opportunities include innovation and clinical validation, membership in mentorship programs, policy solution whitepaper publication, marketing spotlights, and more. The following judges evaluated the submissions: Michael Crawford MBA, MHL, Associate Dean for Strategy, Outreach, and Innovation at Howard University; Stephen Konya, Senior Innovation Strategist at HHS Office of the National Coordinator for Health IT; Jonathan Jackson, Founder and Chief Executive Officer at Dimagi; Nigel Smith, Director, Innovation Labs at AARP; Neil Patel, President at Healthbox, a HIMSS Solution; Kevin Larsen, SVP, Clinical Innovation and Translation at Optum Labs; Ashleigh Axios, Chief Experience Officer and Partner at &Partners; Gregory Papas, Associate Director for National Device Surveillance, Center for Devices and Radiological Health at FDA at Food and Drug Administration; Allison Oelschlaeger, Chief Data Officer and Director, Office of Enterprise Data & Analytics at Centers for Medicare & Medicaid Services; Shamonica Wiggina, Media-Marketing Intern Sickle Cell Community Consortium; and Misu Tasnim,

Director at US Digital Service.

Partnerships: The Prize Competition involved one partner. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Howard University's 1867 Health Innovations Project and the Center for Sickle Cell Disease (SCD)	Academic Institutions	None reported	$0	Non-monetary award(s); Publicity, advertising, outreach, or/and communications

Advancement of Agency Mission: The Health+ Sickle Cell Disease Healthathon advanced the agency's mission to enhance the health and well-being of all Americans by utilizing research findings, data, collaboration, design, technology, and creative problem solving to craft solutions to the most pressing care-related challenges those with Sickle Cell Disease face today.

Plan for Upcoming Two Fiscal Years: Not applicable

B.11.23. Hope for Sickle Cell Disease Challenge[109]

Sponsoring Agency and Office: National Institutes of Health (National Heart, Lung, and Blood Institute)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The National Heart, Lung, and Blood Institute (NHLBI), an institute of the National Institutes of Health (NIH), announces the NHLBI Hope for Sickle Cell Disease Challenge to help increase awareness about sickle cell disease and its associated complications. Sickle cell disease (SCD), also known as sickle cell anemia, is the most common genetic disorder in the United States. About 100,000 Americans are thought to be living with SCD and each year another 1,000 babies are born with it. The NHLBI is seeking to foster improved awareness about SCD and address associated myths and stigmas by launching the NHLBI Hope for Sickle Cell Disease Challenge. This Challenge incentivizes college and graduate students to develop innovative tools that build awareness of evidence-based information about SCD.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award)

[109] The website for Hope for Sickle Cell Disease Challenge is accessible at https://www.challenge.gov/challenge/NHLBI-hope-for-sickle-cell-disease-challenge/.

Funding	FY19	FY20
FTEs	Not applicable	0.3
Funding Estimate	Not applicable	$0

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Sickle cell disease (SCD), also known as sickle cell anemia, is the most common genetic disorder in the United States. About 100,000 Americans are thought to be living with SCD and each year another 1,000 babies are born with it. A lack of awareness about SCD and its associated complications among the public and affected communities can contribute to stigmas associated with SCD, a lack of understanding of how the disease affects individuals and families, and to less than optimal care experienced by many patients. The NHLBI supports innovative research activities for SCD and is seeking to foster improved awareness about SCD and address associated myths and stigmas by launching the NHLBI Hope for Sickle Cell Disease Challenge. This Challenge incentivizes college and graduate students to develop innovative tools that build awareness of evidence-based information about SCD.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$50,000	3	Not applicable	06-30-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$50,000	Not applicable

Non-Cash Prizes Include: NHLBI will publicly display the winning submissions.

Participants:

FY19: Not applicable

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-01-2020	03-26-2021	Not applicable

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Creative media; Other

Submissions: This Challenge incentivizes college and graduate students to develop innovative tools that build awareness of evidence-based information about SCD. Examples of such tools include, but are not limited to, a video (documentaries, testimonials, etc.), a software application, a game (board, computer, interactive, etc.), a website, a book (children's books, K-12 learning tools, etc.), a marketing campaign, a social media campaign, music or a song, a grassroots campaign, or an exhibit. The tools created for this Challenge should undergo pilot testing and be evaluated using a rigorous scientific assessment.

Evaluation of Submissions: Submissions will be evaluated based on the following criteria: significance; innovation; design, affordability, and usability; approach and quality of tool testing and outcomes; and feasibility, which includes the plan for outreach, communications, and dissemination. Federal employees serving as judges will select up to three Challenge winners, subject to a final decision by the Award Approving Official.

Partnerships: No partners were indicated

Advancement of Agency Mission: The Challenge is in line with the NHLBI Center for Translation Research and Implementation Science (CTRIS) roadmap to build capacity and increase awareness of sickle cell disease. This Challenge also encourages team science by providing students valuable experiences to pursue science collectively as they engage in complex problem solving to improve outcomes.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.24. Improving Care for People with Alzheimers Disease and Related Dementias Using Technology (iCare-AD/ADRD) Challenge[110]

Sponsoring Agency and Office: National Institutes of Health (National Institute on Aging)

Authority: America COMPETES Reauthorization Act of 2010; Other authority (Section 2002 of the 21st Century Cures Act, 42 U.S.C. 283q)

Status:

FY19: Completed

FY20: Completed

Competition Summary: Navigating the U.S. health care system can be especially difficult for the millions of people with dementia (PWD) and for their caregivers. The iCare-AD/ADRD Challenge sought to address some of those difficulties by encouraging the development of computer or mobile applications that can make care coordination or navigation easier and more effective for PWD and their caregivers, including family members, health professionals or other service providers. Managing dementia care effectively can reduce the clinical symptoms of dementia and improve health outcomes by reducing behavioral and psychological symptoms of dementia. Improved care management can also reduce health care costs by cutting down on unnecessary emergency

[110] The website for Improving Care for People with Alzheimers Disease and Related Dementias Using Technology (iCare-AD/ADRD) Challenge is accessible at https://www.challenge.gov/challenge/iCARE-AD-ADRD/ , https://www.nia.nih.gov/challenge-prize.

department visits, inpatient hospitalizations, and readmissions. This challenge encouraged connections and collaborations between stakeholders by leveraging technology to turn these connections into more effective care for PWD. Utilizing the Eureka Prize format can help foster these innovations more quickly than traditional NIH funding mechanisms such as grants or contracts. The Prize competition also provided an incentive for disparate entities to come together to collaborate and apply for funding.

Budget and Resources: Agency funds were used for federal personnel full time employee (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE)	Federal personnel (FTE); Prize purse (monetary award)
FTEs	0.1	0.1
Funding Estimate	$0	$0

Goal Types: Develop/demonstrate technology

Problem or Opportunity Addressed: Navigating the complex U.S. healthcare system can be challenging for PWD and their caregivers. They must pursue an uncertain course of care, of unknown duration, across different care settings and interact with many different types of care providers and interventions. Models of dementia care have evolved in recent years and have the potential to improve outcomes. Barriers to adoption, however, include workforce limitations, the cost of practice redesign, and limited uptake by insurers and health systems. Effective dementia care management has been shown to improve outcomes such as reducing behavioral and psychological symptoms of dementia and lower health care costs by reducing emergency department visits, inpatient hospitalizations, and some readmissions. This competition is intended to stimulate innovation in use of technology to improve care coordination and/or navigation and/or aid with the care experience so that overall dementia care quality is improved.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Required by executive policy or congressional legislation

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$400,000	3	3	10-07-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$400,000	Not applicable
FY20	Not applicable	$400,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 33 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
10-01-2018	06-30-2019	33

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Posted on challenge.gov; Other (dissemination at meetings/conferences)

Submission Types: Software or computer code

Submissions: This challenge sought the development of solutions for a technology-based application, fostering connections between relevant stakeholders to use technology, or the development of new technology applications to improve dementia care coordination and/or care navigation.

Evaluation of Submissions: A panel of federal employees serving as judges reviewed and ranked the Challenge submissions using the following criteria: Creativity & Innovation - 20%; Rationale and Potential Impact - 20%; Value to relevant stakeholders - 20%; Usability - 20%; and Functional Product Feasibility - 20%.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: Per 42 U.S.C. 285e, the mission of the National Institute on Aging (NIA) is to conduct and support biomedical, social, and behavioral research, training, health information dissemination, and other programs with respect to the aging process and the diseases and other special problems and needs of the aged. As many as 5.6 million Americans age 65 and older are estimated to be living with Alzheimers disease, the most common form of dementia. Many more under age 65 are also affected. In addition, many thousands more have Alzheimers disease-related dementias. Effective dementia care management has been shown to improve outcomes such as reducing behavioral and psychological symptoms of dementia and lower health care costs by reducing emergency department visits, inpatient hospitalizations, and some readmissions. Research based models of dementia care have evolved in recent years and have the potential to improve outcomes. This competition was intended to stimulate innovation in the use of technology to improve care coordination and/or navigation so that overall dementia care quality is improved, thus advancing the NIA mission described above.

Plan for Upcoming Two Fiscal Years: In the next two fiscal years, the field of Alzheimers disease and related dementias will continue to present opportunities for prize competitions. NIA will gauge the benefits of utilizing this mechanism and more traditional funding sources (e.g. grants and contracts) when setting priorities and helping to spur innovation in the field.

B.11.25. Innovative Technology Solutions for Social Care Referrals[111]

Sponsoring Agency and Office: Administration for Community Living

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: In March 2020, the Administration for Community Living (ACL), a part of the U.S. Department of Health and Human Services (HHS), launched a competition for state and community leaders in the aging and disability network, health care systems, health plans, and health IT vendors to cultivate care coordination by developing and optimizing interoperable and scalable technology solutions that demonstrate seamless network integration. Technology-based platforms that enable linkages between healthcare providers and the existing ecosystem of community-based, social service organizations are challenged to support more efficient referral processes and better informed decision making, ensuring that individuals are seamlessly connected to resources that address their preferences, goals, values, and social determinants in ways that promote independence in the community for as long as possible. Participants should work collaboratively on enhancing scalable approaches to securely share standardized data on social determinants of health and person-centered plans through the use of open-resource directories. This Challenge includes developing prototypes and implementing technical solutions that track referral patterns and gaps in service that visibly display social service and health-related outcomes overtime. Critical partners for designing solutions to this Challenge include state leaders across aging, disability and Medicaid programs, community-based organizations in the aging and disability networks, health IT developers, health care providers, health plans, and others with expertise in technical standards, interoperability and data analysis. The Challenge will compete in three phases, with cash prizes awarded in each phase. The total prize award available is $500,000.

Budget and Resources: Agency funds to support the Social Care Referrals Challenge were used for contractual support. The contractor is providing program and project management support services and guidance required to stand up and execute the Challenge. The contractor's key tasks included project management; judge recruitment and planning; provision of technical guidance on submission and judging criteria; design and execution of communication and marketing campaigns; design and management of an online platform for application submissions and judging; coordination of judging panel roles; end-user technical support; and transition activities. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Discovery and design support; Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support

[111] The website for Innovative Technology Solutions for Social Care Referrals is accessible at https://acl.gov/socialcarereferrals and https://www.challenge.gov/challenge/innovative-technology-solutions-for-social-care-referrals/.

Funding	FY19	FY20
FTEs	Not applicable	1.5
Funding Estimate	Not applicable	$191,251

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Individual health plans and health systems are implementing technology approaches to refer people to community resources in order to address their social needs. However, the existing technology solutions lack interoperability and scalability across communities. In addition, states have invested in resource directory and referral management systems for streamlining access to long-term services and support for older adults and people with disabilities. This siloed development is creating inefficiency in managing referrals for social services, leading to duplicative workflows and impeding opportunities for better support and care. Opportunities for continuum of care are limited when individuals seek care from providers with differing platforms that lack seamless connections to critical health and social care. Optimizing the use of data related to social determinants of health can also help individuals understand economic and social factors that influence health and well-being.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$360,000	12	12	03-26-2021
2	$120,000	3	Not applicable	Not applicable
3	$140,000	1	Not applicable	Not applicable

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$360,000	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: 12 team(s)

Intended Participants: Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	07-13-2020	01-06-2021	03-26-2021	40
2	04-2021	08-2021	Not applicable	Not applicable
3	10-2021	03-2022	Not applicable	Not applicable

None reported

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other

Submission Types: None reported

Submissions: A successful submission will be an interoperable, referral, and analytics technology solution developed by multi-stakeholder teams that streamline efforts across health and human services and that 1) more efficiently shares data to enable standardized referral processes and better informed decision making, 2) incorporates closed-loop referral and follow-up protocols to track and support individuals when they obtain services from any organization or health care provider within the network, 3) produces data at the individual, organizational, and regional levels about referrals, the prevalence of social determinants of health, service utilization, and outcomes, which can be used to guarantee opportunities to strengthen coordinated referral networks across communities, states, and the health care system, and 4) tracks referral patterns and gaps in service that visibly display social service and health-related outcomes over time.

Evaluation of Submissions: Judging of Challenge submissions for all three Phases will occur through a panel of external judges with expertise in one or more of the following areas: health IT, user centered design, web design, accessibility, social determinants of health and person-centered assessments, business expertise in health and social care integration, state and federal program interventions (i.e. Aging and Disability Resource Center/No Wrong Door (ADRC/NWD)), technical standards, interoperability or data analysis. Phase 1 submissions will be evaluated for 1) level of innovation and value to stakeholders, 2) strength of the team and innovation in collaborative approaches, 3) scalability and feasibility of implementation, 4) product functionality and usability, and 5) identification and mitigation of business and technical risk. Phase 2 and Phase 3 submissions will include demonstrations and proof that the proposed solutions can be implemented. These phases will be judged by a subset of judges from Phase 1 and also by external individuals that represent key stakeholders.

Partnerships: No partners were indicated

Advancement of Agency Mission: The ACL mission is to maximize the independence, well-being, and health of older adults, people with disabilities, and their families and caregivers. Through the Social Care Referrals Challenge, ACL aims to support increased access to social services through referrals from healthcare providers. By enhancing technology solutions that enable linkages between healthcare providers and the existing ecosystem of community-based, social service organizations

that more efficiently share standardized data to support referral processes and better informed decision making, ACL can ensure that individuals, whether older adults, people with disabilities, or their families and caregivers, are seamlessly connected to resources that address their preferences, goals, values, and social determinants in ways that promote independence in the community for as long as possible.

Plan for Upcoming Two Fiscal Years: ACL anticipates additional prize competitions in FY21 and FY22; there are some plans being pursued. However, specific agency-wide plans have not been determined. In FY21, ACL will manage and execute Phase 2 and Phase 3 for this Social Care Referrals Challenge, which includes implementing and testing solutions.

B.11.26. KidneyX Redesign Dialysis[112]

Sponsoring Agency and Office: Department of Health and Human Services, Office of the Chief Technology Officer

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Completed

Competition Summary: KidneyX's inaugural prize competition, Redesign Dialysis, asked innovators to accelerate the development and commercialization of next-generation dialysis products. Redesign Dialysis was a two-phase prize: Phase 1 asked participants to design possible solutions or solution components that can replicate normal kidney functions and improve patient quality of life. For Phase 1, we awarded up to 15 prizes and $1.125M in total. Phase 2 opened in late April 2019 and asked participants to develop and demonstrate prototype solutions. Phase 2 awarded six prizes of $500,000 each. You could participate in Phase II even if you didn't participate in Phase 1.

Budget and Resources: Contract support to administer and manage the innovation contest, collect entries, judge entries, make recommendations on winners, and host public events. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award); Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Discovery and design support	Prize purse (monetary award); Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Discovery and design support
FTEs	1.5	1.5
Funding Estimate	None reported	$1,047,403

[112] The website for KidneyX Redesign Dialysis is accessible at https://www.kidneyx.org/PrizeCompetitions/PastCompetitions/redesigndialysisphase1 and https://www.kidneyx.org/prizecompetitions/RedesignDialysisPhaseII.

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: In Phase 1, HHS sought designs of solutions that will address at least one of the following areas: Replicating Kidney Functions (Blood Filtration, Electrolyte Homeostasis, Fluid Regulation, Toxin Removal and Secretion, and/or Filtrate Drainage and Connectivity); Improving Patient Quality of Life (e.g., minimizing burden on the family and care partner(s), reducing disease and treatment complications, increasing mobility and physical activity); Improved renal replacement therapy access (vascular or peritoneal access); Addressing engineering challenges (e.g., preventing clotting, bleeding, and infection in vascular circuit and associated devices); Ancillary technologies; Biomaterials development; Biological and Immunological modulation; and/or Biosensor development and other safety monitoring functions. In phase 2, HHS sought prototype solutions that address any of these categories: Blood Filtration (filtering blood to remove waste and excess fluid); Electrolyte Homeostasis (maintaining appropriate levels of key minerals in the blood); Volume Regulation (regulating the amount of and/or removing excess fluid); Toxin Removal and Secretion (removing, limiting or preventing toxins in the bloodstream); Filtrate Drainage and Connectivity (removing excess filtrate after processing; connectivity issues for filtration, processing, and exterior drainage); or Dialysis Access (vascular, peritoneal, blood circuit, or alternative (e.g., GI tract) access).

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$1,125,000	15	15	04-30-2019
2	$3,000,000	6	6	07-22-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$100,000	$120,000

Non-Cash Prizes Include: Not applicable

Participants:

FY19: 165 team(s)

FY20: 71 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	10-25-2018	02-28-2019	04-30-2019	165
2	11-11-2019	01-31-2020	12-15-2020	71

Solicitation of Submissions: Social media; Email; Press release; Live event(s) prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept; Business or commercial development plan

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Business or commercial development plan
2	Prototype device or object

Submissions: The "KidneyX: Redesign Dialysis" prize competition seeks solutions or components of solutions that offer patients significant alternatives to dialysis as it is generally practiced today. The competition is intended to attract a wide range of ideas and participants and thus to catalyze development of new, improved classes of renal replacement therapeutic options. Phase 1 is a design phase that asks participants to submit their ideas and solutions related to renal replacement therapy. Judges will review submissions, and an authorized official will select up to 15 Phase l winners from the submissions received. Phase 2 of the prize competition asks participants to build their proposed solution into a prototype. Participants may also submit a prototype solution in Phase 2 even if they have not submitted a design solution in Phase 1.

Evaluation of Submissions: A multi-disciplinary judging panel reviewed submissions for Phase 1 of "KidneyX: Redesign Dialysis," and an authorized official selected the winners from the submissions received. Phase 1 evaluation criteria: Potential to significantly improve or add to the landscape of solutions to manage kidney failure; Nature and extent of anticipated benefit(s) to patients; Feasibility of producing a functional prototype (including scientific and technological rigor); Quality of evidence supporting the design. Phase 2: A multi-disciplinary judging panel reviewed submissions for "KjdneyX: Redesign Dialysis" and an authorized official selected the winners from the submissions received using the following criteria: Demonstration of at least the first iteration of a prototype solution whose function addresses one or more elements of the prize competition scope; Demonstration of patient input in the design of the prototype; Degree of innovation from past approaches or solutions; Potential for prototype to significantly advance towards readiness for animal or human studies (if applicable).

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
American Society of Nephrology (ASN)	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported	Publicity, advertising, outreach, or/and communications; Software development

Advancement of Agency Mission: The KidneyX Redesign Dialysis advanced the agency's mission to enhance the health and well-being of all Americans by challenging participants to build and test prototype solutions, or components of solutions, that can replicate normal kidney functions or improve dialysis access.

Plan for Upcoming Two Fiscal Years: The Artificial Kidney Prize is a competition to accelerate the development of continuous kidney replacement therapies that provide transformational treatment options beyond current dialysis methods. For this competition, artificial kidneys may be wearable, implantable, bioengineered, developed as a xenotransplant or chimera organ, or other approaches not yet conceived. Phase 1 seeks component or integrated prototype solutions that enable and advance the functionality, effectiveness, and/or reliability of artificial kidneys. Phase 1 will close March 24 2021 and winners will be announced in July 2021. Phase 2 will focus on initial integration of prototype solutions into an artificial kidney, or advancement of already integrated prototype solutions. Phase 2 submissions will be due in the summer of 2022 and the winners announced Fall 2022. Up to $10 million in total prizes will be awarded for phase 1 and 2 of the Artificial Kidney Prize. The $300,000 KidneyX COVID-19 Kidney Care Challenge sought solutions that reduce the transmission of the coronavirus among people with kidney diseases and/or reduce the risk of kidney damage among people who contract the virus. The challenge encouraged healthcare providers, staff, patients, and caregivers on the front lines to share demonstrated solutions — particularly those implemented during the pandemic.

B.11.27. MENTAL Health Challenge[113]

Sponsoring Agency and Office: Administration for Community Living

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The Administration for Community Living and Office for the Assistant Secretary for Health at the U.S. Department of Health and Human Services, with the U.S. Department of Veterans Affairs, Federal Communications Commission, and Consumer Technology Association Foundation as partners, launched the Mobilizing and Empowering the Nation and Technology to Address Loneliness & social isolation (MENTAL) Health Innovation Challenge. The goal of this

[113] The website for MENTAL Health Challenge is accessible at https://acl.gov/MENTAL; https://www.challenge.gov/challenge/MENTAL-health-social-isolation-challenge/.

Challenge is to increase consumer awareness and use of technology tools that would help older adults and people with disabilities stay socially engaged with friends, families, communities, and activities of interest. The Challenge seeks solutions that assess socially-isolated individuals and matches them with appropriate technology tools and social engagement programs that best meet their needs. Successful solutions will build from existing assessments and technology tools, and use state-of-the-art matching algorithms to increase awareness and use of technology and social engagement programming to create an accessible Social Engagement Clearinghouse. The Challenge also seeks solutions using legacy technology (i.e. telephone, television, radio, etc.) for areas that lack access to broadband. The grand-prize winning solution will become part of a public-private campaign to reach up to 10 million socially-isolated older adults, people with disabilities, and veterans. The Challenge will occur in two phases, with cash prizes awarded in each phase. The total prize purse is $750,000. For Phase 1, up to $150,000 in prize funds will be awarded. For Phase 2, a first-place prize of $450,000 and a second-place prize of $100,000 will be awarded.

Budget and Resources: Funds to support the MENTAL Health Challenge were from two Federal agencies: the Administration for Community Living (ACL) and the Office of the Assistant Secretary of Health (OASH). A contractor provided program and project management support services and guidance required to stand up and execute the Challenge. The contractor key tasks included project management; judge recruitment and planning; provision of technical guidance on submission and judging criteria; design and execution of communication and marketing campaigns; design and management of online platform for submission and judging; coordination of applications and judges; end-user technical support; and transition activities. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	1.5
Funding Estimate	Not applicable	$231,936

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Build or strengthen a community; Other

Problem or Opportunity Addressed: Approximately 25 percent of older adults in the US are socially isolated and 43 percent of older adults report feeling lonely. Research has found harmful health outcomes associated with isolation/loneliness, including premature mortality, increased risk of hospitalization, and increased risk for dementia, heart failure, and stroke. Analyses of Medicare spending found that $6.7 billion is spent on enrollees who are socially isolated. The COVID-19 pandemic has exacerbated social isolation/loneliness due to adherence to public health recommendations for social distancing to protect at-risk populations (older adults, people with disabilities, and people living in nursing and group homes, including veterans). Although there are technologies and social engagement programs to help address social isolation and loneliness, gaps

exist in terms of awareness and accessibility of these technologies. There is untapped opportunity to increase access to and awareness of technologies and social engagement programs.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$150,000	3	2	10-14-2020
2	$550,000	2	2	12-15-2020
3	$50,000	2	Not applicable	Not applicable

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$150,000	$0

Non-Cash Prizes Include: The top two teams will present their solutions at CES 2021.

Participants:

FY19: Not applicable

FY20: 38 team(s)

Intended Participants: Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	06-23-2020	09-14-2020	10-14-2020	38
2	10-06-2020	12-04-2020	12-15-2020	2
3	01-14-2021	09-30-2021	Not applicable	Not applicable

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Proposal or concept

Phase	Submission Type
2	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data; Other

Submissions: A successful solution will be an accessible social engagement clearinghouse that includes (1) a user interface, and (2) an algorithm to match people's needs (including accessibility), interests, and preferences with available social engagement programs and technologies (hardware, software, and/or apps), and that (3) seamlessly enables the user to enroll in their selected social engagement program(s) and/or to acquire technology solutions that address social engagement. Successful solutions will include training videos, information, and user reviews of social engagement programs and technologies that address social isolation. The user interface will be usable by an older person or a person with a disability and will include the ability to screen and assess for social isolation.

Evaluation of Submissions: Evaluation will be done by a panel of external judges with expertise in: user-centered web design, accessibility, social isolation assessment and screening, social engagement programming, algorithm development and matching expertise, machine learning and artificial intelligence, web application design, business elements of the health care and social services ecosystem, government and Federal programs, and User Experience Design/Accessibility or Web Content Accessibility Guidelines (WCAG) 2.0. Phase 1 submissions will be evaluated on usability, user-centeredness, and technical approach that meet the goal of successfully getting individuals to solutions that meet their needs. Winning solutions will be feasible and have a high likelihood to succeed. Phase 2 submissions will be evaluated based on the results of pilot prototypes. The pilots should be conducted in collaboration with at least one ADRC and must include an in-person demonstration of user experience and a summary of results achieved during the pilot. Judges for Phase 2 include a subset of judges from Phase 1 and an external representative of users that will use the clearinghouse.

Partnerships: The Prize Competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Department of Health and Human Services Office of the Assistant Secretary of Health (OASH)	Federal Agency or Office	Not applicable	$600,000	Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
U.S. Department of Veteran Affairs (VA)	Federal Agency or Office	Not applicable	$0	Publicity, advertising, outreach, or/and communications

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Federal Communications Commission (FCC)	Federal Agency or Office	Not applicable	$0	Publicity, advertising, outreach, or/and communications
Consumer Technology Association Foundation (CTA)	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$0	Non-monetary award(s); publicity/advertising/outreach/communications
White House Office of Science and Technology	Federal Agency or Office	Not applicable	$0	Publicity, advertising, outreach, or/and communications

Advancement of Agency Mission: The ACL mission is to maximize the independence, well-being, and health of older adults, people with disabilities, and their families and caregivers. Through the MENTAL Health Challenge, ACL hopes to increase consumer awareness and use of social engagement programs and technology tools that help older adults and people with disabilities stay socially engaged with and connected to friends, families, communities, and activities of interest. Social isolation is recognized as a significant detriment to overall health on a global perspective. ACL seeks to advance the health and well-being of older adults, people with disabilities, and their caregivers and family members through this effort.

Plan for Upcoming Two Fiscal Years: ACL anticipates using prize competitions in FY21 and FY22; there are some specific plans already being pursued, and it is possible that there could be more in the next fiscal year. In FY21, the MENTAL Health Challenge will be continuing into the bonus Phase or Phase 3 of the challenge. This Phase will include implementing and scaling the solution and adopting a sustainability strategy.

B.11.28. Million Hearts Hospitals & Health Systems Recognition Program[114]

Sponsoring Agency and Office: Centers for Disease Control and Prevention

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Ongoing

Competition Summary: Heart disease and stroke are the first and fifth leading causes of death in the United States. The Million Hearts Hospitals & Health Systems Recognition Program acknowledges institutions working to systematically improve the cardiovascular health of the population and communities they serve. Designees are recognized for their work in priority areas of the Million Hearts initiative: 1) Keeping people healthy by creating a healthy environment for patients, staff, and visitors;

[114] The website for Million Hearts Hospitals & Health Systems Recognition Program is accessible at https://millionhearts.hhs.gov/partners-progress/hospitals-health-systems/index.html.

2) Optimizing care to help people prevent heart and kidney disease and stroke by achieving excellence in ABCS (aspirin, blood pressure, cholesterol, smoking cessation) and cardiac rehabilitation; 3) Improving outcomes for priority populations by focusing improvement efforts on specific subsets of the population with high disease burden and risk; 4) Innovating for health to improve cardiovascular outcomes through innovative approaches. Achieving a Million Hearts Hospitals & Health Systems designation signals an organization's commitment not only to clinical quality but also to population health overall. The Million Hearts Hospitals or Health Systems Recognition Program is open through December 2021 to hospitals and health systems. Applicants may range from health systems with multiple hospitals, hospitals with and without ambulatory medical practices, and medical practices not affiliated with hospitals. Any clinical entity whose leaders consider it eligible may apply. Applications will be reviewed and vetted, and award designations announced, on a quarterly basis.

Budget and Resources: Agency funds were used to develop the application, develop the application website, for the vetting and validation of applications, including background checks of applicants, and verification that applicants fulfilled the minimum requirements for recognition. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Discovery and design support; Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Data entry/analysis; Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.5	0.25
Funding Estimate	$140,000	$140,000

Goal Types: Outreach/information dissemination; Build or strengthen a community; Other

Problem or Opportunity Addressed: Heart disease, stroke, and other cardiovascular diseases account for one in every three deaths in the United States. Cardiovascular disease is the nation's leading cause of death among both men and women and the leading cause of health disparities. Hospitals and health systems are critical to the overall cardiovascular health of the population. Whether migrating toward value-based reimbursement or simply striving for a significant impact by reducing the devastating effects of heart attacks and strokes, hospitals and other clinical organizations can improve cardiovascular health by implementing high-impact, evidence-based strategies. The Million Hearts Hospitals & Health Systems Recognition Program identifies some of the highest-value strategies needed to prevent heart attacks and strokes and recognizes hospital commitments and outcomes. This designation is also intended to encourage recognized institutions to continue prioritizing lifesaving efforts to have the greatest sustained impact.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	100	2	09-21-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$0	$0

Non-Cash Prizes Include: Up to 100 designees will be recognized on the Million Hearts website and promoted nationally every year. The successes of health organizations that have achieved significant outcomes or results will be given additional dedicated emphasis in Million Hearts communications and other promotional materials (e.g., e-newsletter, website, press announcements). No cash prize will be awarded.

Participants:

FY19: No participants indicated

FY20: 4 team(s)

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-12-2020	12-31-2021	4

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types: Business or commercial development plan; Analysis or visualization of data; Other

Submissions: Organizations must apply one or more Million Hearts strategies in at least three of the four Million Hearts priority areas: Keeping people healthy; Optimizing care; Improving outcomes for priority populations; and Innovating for health. The Million Hearts Hospitals & Health Systems designation can be earned by institutions that are using Million Hearts strategies in one or more of the following ways: Committing to implement Million Hearts strategies; Currently implementing or already having implemented Million Hearts strategies; and Achieving outcomes or results from implementing Million Hearts strategies.

Evaluation of Submissions: The applicant is reviewed to ensure they meet the minimum eligibility requirements. The applicant is then vetted to ensure that recognized clinical entities are free from issues that might otherwise distract form the messages of the Million Hearts initiatives. The following resources may be used to confirm the applicant's attestation of passing the vetting process: HospitalInspections.org; statements of deficiency citations; Office of the Inspector General reports; Hospital Compare; and/or past media coverage. Following an initial review of the application, an interview is scheduled to gather additional information and/or clarity on the strategies that the hospital is committing to implement, implementing, and/or achieved results with. All applicants that meet the eligibility criteria, pass the vetting process, and fulfill all requirements are awarded the

Million Hearts Hospitals & Health Systems designation. External partners assist with conducting the interviews and ensuring the minimum requirements.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Association of Chronic Disease Directors	Nonprofit Organization (excluding Academic Institutions)	$0	$0	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Data entry/analysis; Discovery and design support; Operations or administrative support

Advancement of Agency Mission: The Million Hearts Hospitals & Health Systems Recognition Program recognizes institutions working to systematically improve the cardiovascular health of the population and communities they serve and fuel additional commitments and innovations from hospitals in preventing heart attacks and strokes as per the aim of Million Hearts. The application process makes high-value strategies easy for hospitals and health systems to understand, commit to, and implement. This compilation of strategies directly aligns with CDC's mission to conduct critical science and provide the information needed for hospitals and health systems to implement evidence-based and high-impact strategies to prevent heart disease and strokes, the first and fifth leading causes of death in the U.S.

Plan for Upcoming Two Fiscal Years: There are plans to continue this program through December 31, 2021 (FY21 and FY22).

B.11.29. Million Hearts Hypertension Control Challenge - 2019[115]

Sponsoring Agency and Office: Centers for Disease Control and Prevention

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Completed

Competition Summary: Heart disease and stroke are the first and fifth leading causes of death in the United States. Hypertension is a leading risk factor for heart disease and stroke and nearly half of adults in the U.S. have hypertension yet only one in four has his/her blood pressure controlled. To address this health crisis, the Million Hearts Hypertension Control Challenge identifies clinicians, healthcare practices, and health systems that have prioritized hypertension control and have demonstrated exceptional achievements in working with their patients to control hypertension among at least 80% of their patients with hypertension aged 18-85 years.

[115] The website for Million Hearts Hypertension Control Challenge - 2019 is accessible at https://millionhearts.hhs.gov/partners-progress/champions/challenge.html.

Budget and Resources: Agency funds were used to develop the Challenge application website, for the vetting and validation of applications, including background checks of applicants, for verification of hypertension control rates. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Data entry/analysis; Non-monetary award(s); Operations or administrative support; Web portal or app development and support	None reported
FTEs	0.5	None reported
Funding Estimate	$160,000	None reported

Goal Types: Other

Problem or Opportunity Addressed: Heart disease and stroke are the first and fifth leading causes of death in the United States. Hypertension is a leading risk factor for heart disease and stroke and nearly half of adults in the U.S. have hypertension yet only one in four has his/her blood pressure controlled. The Challenge seeks to identify clinicians, healthcare practices, and healthcare systems that excel in hypertension control in order to promote successful strategies for achieving high rates of hypertension control.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	35	17	11-19-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$0	$0

Non-Cash Prizes Include: Up to 35 Champions will be recognized. Champions of the Million Hearts Hypertension Control Challenge will receive recognition by the CDC by having the name of their practice listed on the Million Hearts website. No cash prize will be awarded.

Participants:

FY19: 37 team(s)

FY20: Not applicable

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-14-2019	04-01-2019	37

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Other

Submissions: Applicants submit an online application that attests that they have achieved 80% or better in hypertension control, and that asks for information about the medical practice or health system, contact information of the applicant, information about their patient population (demographics, rural or urban location, percentage with hypertension, hypertension control rate), strategies used to excel in hypertension control, and participation in organizations that focus on quality improvement for hypertension control.

Evaluation of Submissions: The hypertension control rates of the submission are validated by a contractor through a review of the applicant's electronic medical record system as well as through medical chart reviews. Control is determined as having a documented recent blood pressure reading of <140/<90 mm Hg. Applicants are also vetted with a background check. Applicants must be free from convictions or pending investigations of criminal and health care fraud offenses such as felony health care fraud, patient abuse, or neglect; felony convictions relating to controlled substances; and felony convictions for other health care-related fraud, theft, or other financial misconduct. After the validation of the hypertension control rate and background checks are completed for all applicants, the judges review the applicant data and information and determine whether all criteria are satisfied or not as specified in the Challenges rules and eligibility. Judges are internal to the Agency.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Association of Chronic Disease Directors	Nonprofit Organization (excluding Academic Institutions)	$0	None reported	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Data entry/analysis; Discovery and design support; Operations or administrative support

Advancement of Agency Mission: The Agency's Winnable Battles are public health priorities where CDC and its partners can make significant progress towards ending epidemics and eliminating diseases to help advance the CDC Strategic Framework in a relatively short timeframe. The Million Hearts initiative, co-led by CDC and the Centers for Medicare and Medicaid Services (CMS), is one of six CDC Winnable Battles. The goal of the Million Hearts initiative is to prevent 1 million heart attacks and strokes by 2022. To support this goal, the initiative has prioritized optimizing cardiovascular care, including increasing rates of hypertension control.

Plan for Upcoming Two Fiscal Years: There are current plans for FY21 and FY22 challenges.

B.11.30. Million Hearts Hypertension Control Challenge - 2020[116]

Sponsoring Agency and Office: Centers for Disease Control and Prevention

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: Heart disease and stroke are the first and fifth leading causes of death in the United States. Hypertension is a leading risk factor for heart disease and stroke and nearly half of adults in the U.S. have hypertension yet only one in four has his/her blood pressure controlled. To address this health crisis, the Million Hearts Hypertension Control Challenge identifies clinicians, healthcare practices, and health systems that have prioritized hypertension control and have demonstrated exceptional achievements in working with their patients to control hypertension among at least 80% of their patients with hypertension aged 18-85 years.

Budget and Resources: Agency funds were used to develop the Challenge application website, for the vetting and validation of applications, including background checks of applicants, and verification of hypertension control rates. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Data entry/analysis; Non-monetary award(s); Operations or administrative support; Web portal or app development and support
FTEs	Not applicable	0.5
Funding Estimate	Not applicable	$160,000

Goal Types: Other

Problem or Opportunity Addressed: Heart disease and stroke are the first and fifth leading causes of death in the United States. Hypertension is a leading risk factor for heart disease and stroke and nearly half of adults in the U.S. have hypertension yet only one in four has his/her blood pressure controlled. The Challenge seeks to identify clinicians, healthcare practices, and healthcare systems that excel in hypertension control in order to promote successful strategies for achieving high rates of hypertension control.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

[116] The website for Million Hearts Hypertension Control Challenge - 2020 is accessible at https://millionhearts.hhs.gov/partners-progress/champions/challenge.html.

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	35	15	10-29-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$0	$0

Non-Cash Prizes Include: Up to 35 Champions will be recognized. Champions of the Million Hearts Hypertension Control Challenge will receive recognition by the CDC by having the name of their practice listed on the Million Hearts website. No cash prize will be awarded.

Participants:

FY19: Not applicable

FY20: 28 team(s)

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2-21-2020	04-06-2020	28

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Other

Submissions: Applicants submit an online application that attests that they have achieved 80% or better hypertension control, and asks for information about the medical practice or health system, contact information of the applicant, information about their patient population (demographics, rural or urban location, percentage with hypertension, hypertension control rate), strategies used to excel in hypertension control, and participation in organizations that focus on quality improvement for hypertension control.

Evaluation of Submissions: The hypertension control rates of the submission are validated by a contractor through a review of the applicant's electronic medical record system as well as through medical chart reviews. Control is determined as having a documented recent blood pressure reading of <140/<90 mm Hg. Applicants are also vetted with a background check. Applicants must be free from convictions or pending investigations of criminal and health care fraud offenses such as felony health care fraud, patient abuse, or neglect; felony convictions relating to controlled substances; and felony convictions for other health care-related fraud, theft, or other financial misconduct. After the validation of the hypertension control rate and background checks are completed for all applicants, the judges review the applicant data and information and determine whether all criteria are satisfied or not as specified in the Challenges rules and eligibility. Judges are internal to the Agency.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Association of Chronic Disease Directors	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$0	Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Data entry/analysis; Discovery and design support; Operations or administrative support

Advancement of Agency Mission: The Agency's Winnable Battles are public health priorities where CDC and its partners can make significant progress towards ending epidemics and eliminating diseases to help advance the CDC Strategic Framework in a relatively short timeframe. The Million Hearts initiative, co-led by CDC and CMS, is one of six CDC Winnable Battles. The goal of the Million Hearts initiative is to prevent 1 million heart attacks and strokes by 2022. To support this goal, the initiative has prioritized optimizing cardiovascular care, including increasing rates of hypertension control.

Plan for Upcoming Two Fiscal Years: There are current plans for FY21 and FY22 challenges.

B.11.31. National Institutes of Health/National Cancer Institute/Cancer Proteomics Clinical Proteomics Tumor Analysis Research (CPTAC) precisionFDA Challenge[117]

Sponsoring Agency and Office: Food and Drug Administration (Office of Health Informatics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred in FY20

Competition Summary: Sample mislabeling (accidental swapping of patient samples) or data mislabeling (accidental swapping of patient omics data) is known to be one of the obstacles in basic and translational research because this accidental swapping contributes to irreproducible results and invalid conclusions. The objective of this challenge is to encourage development and evaluation of computational algorithms that can accurately detect and correct mislabeled samples using rich multi-omics datasets.

Budget and Resources: Agency funds were used to support Federal and contractor FTEs in building a community of experts, developing training for users, and outreach activities such as scientific challenges and scientific papers. The following table indicates the budget and resources to support the activity.

[117] The website for National Institutes of Health/National Cancer Institute/Cancer Proteomics Clinical Proteomics Tumor Analysis Research (CPTAC) precisionFDA Challenge is accessible at https://precision.fda.gov/challenges/4/view/results (Subchallenge 1) and https://precision.fda.gov/challenges/5/view/results) (Subchallenge 2).

Funding	FY19	FY20
Agency Fund Use	None reported	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Software development; Web portal or app development and support
FTEs	0.1	None Reported
Funding Estimate	None reported	$50,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: To address the frequent problem of mislabeling and accidental swapping of patient tumor samples contributing to irreproducible research results, the challenge had two parts, in which participants were asked to write software that (1) modelled the relationship between the data types and identify where there was mislabeling and (2) corrected the mislabeling problem.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	3	3	05-04-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	None reported	None reported

Non-Cash Prizes Include: Public recognition as a Top Performer on the web site.

Participants:

FY19: 84 team(s)

FY20: Not applicable

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-24-2018	10-31-2018	Not applicable	152
2	11-01-2018	12-18-2018	05-04-2019	87

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Analysis or visualization of data
2	Analysis or visualization of data

Submissions: In this Challenge, participants were provided with paired clinical, proteomics and mRNA profiling data for each of the 160 tumor samples. The 160 tumor samples contained labelling errors and were divided into training and test sets. Participants were asked to develop computational algorithms to model the relationship between clinical attributes, protein profiles, and mRNA profiles using the training data set, then apply the model to identify and correct mislabeled samples in the test data set that have one data type among the three mislabeled. Sample mislabeling patterns and rates were introduced based on observations in the TCGA data sets.

Evaluation of Submissions: Predictions were compared to known mislabeled samples. For this subchallenge, precision, recall, and F-score were computed by comparing the binary mismatch predictions, to the known mismatched samples. Precision is defined as True Positives / (True Positives + False Positive); Recall is defined as True Positives / (True Positives + False Negative); and F-score is defined as the harmonic mean of Precision and Recall. For the next phase, the evaluation team assessed the model performance at three different levels: (1) Sample level – measures model performance at the sample level. If any of the predicted labels of the three data types do not match the original sample label, it is considered an incorrect label at the sample level. (2) Sample-data level - measures model performance at the level of each individual data type of each sample. A prediction that correctly identifies a mislabeled data type of a sample is considered a true positive at this level, even if the mislabeling is not corrected. (3) Correction level – measures model performance at correcting sample mislabeling. At this level, only when a corrected label matches the true sample label will it be considered a true positive. The final ranking was computed by averaging the F-scores at the three levels. Finally, to determine significant performance differences between submissions, a bootstrapping approach was used to compute the confidence interval of the F-score of each submission. Rankings were generated based on: (1) method performance, by treating each submission as unique, and (2) submitter performance, by taking the median F-score of each participant's submissions.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
NCI	Federal Agency or Office	$10,000	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other

Advancement of Agency Mission: This challenge supported both FDA's safety and efficacy of regulated products mission by helping FDA scientists and regulators better understand the challenges of data moving from the wet lab to the virtual environment. In addition, the supported NIH/NCI's cancer research mission by providing tools that can be used to correct mislabeled sample data.

Plan for Upcoming Two Fiscal Years: FDA will be doing scientific challenges (both internal and external) in order to further the goals of the science-based organization and to provide insight into new and evolving science and technologies. While FDA does not offer monetary prizes, enough innovators participate to make this a valuable science incubator.

B.11.32. NIH Prize for Enhancing Faculty Gender Diversity in Biomedical and Behavioral Science[118]

Sponsoring Agency and Office: National Institutes of Health (Office of Research on Women's Health)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: Women continue to be underrepresented at nearly every institution of higher education in the United States in the fields of biomedical sciences, behavioral sciences, and engineering. This is particularly true among mid- to senior-level faculty ranks. The NIH Prize for Enhancing Faculty Gender Diversity seeks to recognize those institutions whose biomedical and behavioral science departments, centers, or divisions have achieved sustained improvement in gender diversity. Understanding that there is no one-size-fits-all solution to enhancing diversity in academia and that ideas based on evidence are necessary to achieve systemic change, this prize will acknowledge and recognize transformative approaches, systems, projects, programs, and processes that have successfully enhanced and sustained gender diversity within an institution. Critical to this Prize Competition is the identification of best practices, the sharing of lessons learned, and the delineation of evidence-based approaches that can be broadly translated to, and replicated by, other institutions vis-a-vis an NIH-supported national toolkit. Submissions to this Prize Competition may inform the development of the toolkit, which will be designed to assist other institutions or academic groups with issues of inclusion and help to create environments that facilitate achievement.

Budget and Resources: Agency funds were used to procure challenge operations, administration, and web portal support and development. The following table indicates the budget and resources to support the activity.

[118] The website for NIH Prize for Enhancing Faculty Gender Diversity in Biomedical and Behavioral Science is accessible at https://www.challenge.gov/challenge/nih-prize-for-enhancing-faculty-gender-diversity/.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	0.5
Funding Estimate	Not applicable	$250,000

Goal Types: Education/training; Outreach/information dissemination; Other

Problem or Opportunity Addressed: It is widely acknowledged that enhancing gender diversity is about more than just hiring a few more women. There are many different factors that contribute to a more diverse and balanced faculty such as an inclusive environment, better retention of diverse faculty, and equitable promotion and allocation of resources. Every institution has its own set of unique challenges and context so will likely have adapted and implemented a customized suite or set of approaches, different from other institutions. Critical to this Prize Competition is the identification of best practices, the sharing of lessons learned, and the delineation of evidence-based approaches that can be broadly translated to and adapted or replicated across a range of colleges and universities. The NIH Prize for Enhancing Faculty Gender Diversity seeks to recognize those institutions whose biomedical and behavioral science departments, centers, or divisions have achieved sustained improvement in gender diversity.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$500,000	10	Not applicable	08-20-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$500,000	Not applicable

Non-Cash Prizes Include: Winning participants and honorable mentions may be invited to present their approaches at an NIH Office of Research on Women's Health hosted scientific symposium.

Participants:

FY19: Not applicable

FY20: Not applicable

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-10-2020	04-16-2021	Not applicable

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Analysis or visualization of data; Other

Submissions: Critical to this Prize Competition is the identification of best practices, the sharing of lessons learned, and the delineation of evidence-based approaches that can be broadly translated to and adapted or replicated across a range of colleges and universities. Submissions may address any faculty stage, from junior faculty to senior leadership. Because this Prize Competition recognizes achievement through approaches that have already been applied, such approaches must have been implemented prior to the launch date of this Prize Competition. Complete submissions will include metrics that support the efficacy of the approaches taken. There are a number of qualitative and quantitative ways in which the impact of these approaches can be assessed. Conclusions, summary tables, and figures should be accompanied with supporting data that is traceable and labeled/categorized.

Evaluation of Submissions: A panel of Federal employees serving as judges will review the Prize Competition submissions based on the following criteria: Impact - the magnitude and extent of impact seen on improving gender diversity at an institution and/or department; Metrics - data will be evaluated for its quality and strength, synthesis and analysis in drawing specific conclusions, whether it supports multiple elements of impact, and its use to reveal gaps and potential areas for improvement in gender diversity; Sustainability - the extent to which effective efforts to enhance diversity at an institution can be regularly monitored, sustained, and are long-lasting; Scalability - the potential for approaches to be broadly implemented in other departments within the same institution, be scaled up, or be generalizable; and Lessons Learned - what challenges were faced and how they were addressed.

Partnerships: No partners were indicated

Advancement of Agency Mission: This Prize Competition is consistent with the Office of Research on Women's Health's (ORWH's) mission to improve the retention and advancement of women in biomedical careers, as described in 42 U.S.C. 287d, including efforts directed towards the representation of women among researchers. This Prize Competition is consistent with ORWH's charge to develop opportunities for, and to support recruitment, retention, reentry, and advancement of women in biomedical careers.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.33. NIH Technology Accelerator Challenge (NTAC): Noninvasive Diagnostics for Global Health Challenge[119]

Sponsoring Agency and Office: National Institutes of Health (National Institute of Biomedical Imaging and Bioengineering)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The National Institute of Biomedical Imaging and Bioengineering (NIBIB) of the National Institutes of Health supports and encourages the development of new diagnostic technologies important for global health. Through this Challenge, NIBIB will offer $1,000,000 in prizes to reward and spur the development of platform concepts and prototypes of non-invasive, multiplexed diagnostic technologies for sickle cell disease, malaria, and anemia - diseases with high global and public health impact. The Bill & Melinda Gates Foundation shares a commitment to global health and is cooperating with NIBIB to consider additional support for the Challenge winners and honorable mentions. The Gates Foundation, separately, will review the Challenge winners and honorable mentions selected by NIBIB for potential follow-on funding of up to $500,000 and in-kind support that can transform design concepts into products for global health on an accelerated timeframe.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge, as well as to procure contract services for a web portal to receive submissions. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award); Web portal or app development and support
FTEs	Not applicable	0.15
Funding Estimate	Not applicable	$10,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: Accessible diagnostic tools are essential for providing treatments and cures for some of the world's highest burden diseases. While diagnostics currently exist for sickle cell disease, malaria and anemia, they can be challenging to deliver in low-resource settings, particularly at the population level, due to cost, invasiveness, and the expertise required to administer the tests. The availability of a low-cost, rapid, reliable platform for blood-related diseases would enable unprecedented community-level screening, monitoring and treatment. Identification and

[119] The website for NIH Technology Accelerator Challenge (NTAC): Noninvasive Diagnostics for Global Health Challenge is accessible at https://www.challenge.gov/challenge/NIH-technology-accelerator-challenge-noninvasive-diagnostics-for-global-health/.

treatment of these disorders would be especially valuable for reducing the world-wide burden of these diseases.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$1,000,000	6	6	09-15-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$1,000,000	$1,000,000

Non-Cash Prizes Include: Following the NIH selection of winners, the Gates Foundation has indicated its intent to separately consider and assess the submissions of the Prize winners and honorable mentions for potential additional support from the Gates Foundation to develop the proposed technologies for global health applications. If selected by Gates Foundation after the Challenge, follow-on support from Gates Foundation may include grants of up to $500,000 and in-kind support in the form of consultations and partnerships for clinical data collection, software development, scale-up, and manufacturing.

Participants:

FY19: Not applicable

FY20: 23 team(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
03-02-2020	06-16-2020	23

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal or concept; Prototype device or object

Submissions: To be responsive to this Challenge, a submission should present two proposals: 1) A design with initial feasibility data for a diagnostic platform assessing two diseases in the vasculature, one of which must be sickle cell disease, malaria, or anemia; and 2) A robust description of the path for translation of the technology to global health use cases, and how the technology will need to develop further to reduce cost and be suitable for field use.

Evaluation of Submissions: Submissions were evaluated based upon: 1) Feasibility data demonstrating the utility of the technology across two diseases (criteria included: Platform approach; Analytic performance; Clinical utility; Detection and interpretation; and Safety), and 2) proposals for the utility of the device in global health contexts (criteria included: Time to results; Data capture; Components; Form factor; Cost; Target use case; Lifespan of device; Ease of use).

Partnerships: The Prize Competition involved six partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
NIH Office of the Director	Federal Agency or Office	Not applicable	$200,000	Prize purse
National Institute of Allergy and Infectious Diseases	Federal Agency or Office	Not applicable	$250,000	Prize purse
National Heart, Lung, and Blood Institute	Federal Agency or Office	Not applicable	$30,000	Prize purse
National Institute of Diabetes and Digestive and Kidney Diseases	Federal Agency or Office	Not applicable	$15,000	Prize purse
Fogarty International Center	Federal Agency or Office	Not applicable	$10,000	Prize purse
Bill & Melinda Gates Foundation	Nonprofit Organization	Not applicable	None reported	Discovery and design support; Solution acceleration

Advancement of Agency Mission: NIBIB, of the National Institutes of Health (NIH), supports and encourages the development of new diagnostic technologies important for global health. Through this Challenge, NIBIB will offer $1,000,000 in prizes to reward and spur the development of platform concepts and prototypes of non-invasive, multiplexed diagnostic technologies for sickle cell disease, malaria, and anemia - diseases with high global and public health impact.

Plan for Upcoming Two Fiscal Years: NIBIB will consider implementing the NIH Technology Accelerator Challenge on a semi-annual basis, pending appropriations.

B.11.34. Rare Diseases Are Not Rare! 2020 Challenge[120]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

[120] The website for Rare Diseases Are Not Rare! 2020 Challenge is accessible at https://www.challenge.gov/challenge/ncats-rare-diseases-are-not-rare-2020-challenge/ ; https://ncats.nih.gov/funding/challenges/rare-diseases-challenge-2020.

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH), continues to seek innovative ways to communicate with others and educate people about rare diseases through social media or art. The goal of this Challenge, which is being led by the NCATS Office of Rare Diseases Research (ORDR), is fourfold: first and foremost, it is to raise awareness for all rare diseases in a collective manner (e.g., drawing attention to common challenges, needs or potential solutions); second, it is intended to bring attention to the many people with rare diseases; third, it is to highlight the need for research and the development of new treatments; and, finally, through the process of creating an entry, it is to build and foster collaborations across the community.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Prize purse (monetary award)
FTEs	Not applicable	0.1
Funding Estimate	Not applicable	$0

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Rare Diseases Are Not Rare! If you know 10 people, chances are you know someone with a rare disease. There are about 7,000 different rare diseases that affect an estimated 30 million people in the United States. This is more than twice the number of people living with cancer, more than the number of people living with HIV and Alzheimer's disease combined, and more than the current population of Texas. Some difficulties with rare diseases are that they are hard to recognize, are often hidden conditions, and most do not currently have ongoing medical research. The goal of this Challenge, which is being led by NCATS-ORDR, is to bring attention to rare diseases so that they can gain more medical research interest, thereby improving the lives of people with rare diseases.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$5,000	3	3	08-31-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$5,000	$5,000

Non-Cash Prizes Include: Honorable mentions are posted on NCATS website.

Participants:

FY19: Not applicable

FY20: 26 team(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-29-2020	06-15-2020	26

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Posted on challenge.gov

Submission Types: Creative media

Submissions: This Challenge sought innovative ways to communicate with others and educate people about rare diseases through social media or art.

Evaluation of Submissions: A panel of Federal and non-Federal judges, with expertise directly relevant to this Challenge, evaluated the entries based on specified criteria and selected the Challenge winners. Entries received up to five points for each of the following criteria: How creative and original is the entry? To what extent does the entry address rare diseases collectively? How likely is it that the entry could be an effective communication vehicle? Will it appeal to a broad audience? Is it easy to disseminate? The percentages assigned to each set of evaluation criteria are guidelines from NCATS to suggest which features are of emphasis and interest to the Center.

Partnerships: No partners were indicated

Advancement of Agency Mission: The general purpose of NCATS is to transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. In line with NCATS's mission, this Challenge led by ORDR resulted in finding innovative ways to communicate with others and to educate people about rare diseases through social media and/or art, hence highlighting the need for research and the development of new treatments.

Plan for Upcoming Two Fiscal Years: NCATS may consider offering this challenge in the future, dependent upon appropriations.

B.11.35. Rare Diseases Are Not Rare! Challenge[121]

Sponsoring Agency and Office: National Institutes of Health (National Center for Advancing Translational Sciences)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health (NIH), is seeking innovative ways to communicate with others to educate people about rare diseases through social media or art. The goal of this Challenge, which is being led by the NCATS Office of Rare Diseases Research (ORDR), is threefold: First and foremost, it is to raise awareness for all rare diseases in a collective manner; Second, it is intended to bring attention to the many people with rare diseases; and, Finally, it is to highlight the need for research and the development of new treatments.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	Not applicable
FTEs	0.1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Rare Diseases Are Not Rare! If you know 10 people, chances are you know someone with a rare disease. There are about 7,000 different rare diseases that affect an estimated 30 million people in the United States. This is more than twice the number of people living with cancer, more than the number of people living with HIV and Alzheimer's disease combined, and more than the current population of Texas. Some difficulties with rare diseases are that they are hard to recognize, are often hidden conditions, and most do not currently have ongoing medical research. The goal of this Challenge, which is being led by NCATS-ORDR, is to bring attention to rare diseases so that they can gain more medical research interest, thereby improving the lives of people with rare diseases.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

[121] The website for Rare Diseases Are Not Rare! Challenge is accessible at https://www.challenge.gov/challenge/ncats-rare-diseases-are-not-rare-challenge/; https://ncats.nih.gov/funding/challenges/rare-diseases-challenge-2018.

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$5,000	3	3	01-30-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$5,000	$5,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Honorable mentions are posted on NCATS website.

Participants:

FY19: 46 team(s)

FY20: Not applicable

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-30-2018	10-28-2018	46

Solicitation of Submissions: Social media; Email; Posted on challenge.gov

Submission Types: Creative media

Submissions: This Challenge sought innovative ways to communicate with others and educate people about rare diseases through social media or art.

Evaluation of Submissions: A panel of Federal and non-Federal judges, with expertise directly relevant to this Challenge, evaluated the entries based on specified criteria and selected the Challenge winners. Entries received up to 5 points for each of the following criteria: How creative and original is the entry? To what extent does the entry address rare diseases collectively? How likely is it that the entry could be an effective communication vehicle? Will it appeal to a broad audience? Is it easy to disseminate? The percentages assigned to each set of evaluation criteria are guidelines from NCATS to suggest which features are of emphasis and interest to the Center.

Partnerships: No partners were indicated

Advancement of Agency Mission: The general purpose of NCATS is to transform the translational process so that new treatments and cures for diseases can be delivered to patients faster by understanding the translational process to create a basis for more science-driven, predictive and effective intervention development for the prevention and treatment of all diseases. In line with NCATS's mission, this Challenge led by ORDR resulted in finding innovative ways to communicate with others, to educate people about rare diseases through social media and/or art, and to highlight the need for research and the development of new treatments.

Plan for Upcoming Two Fiscal Years: NCATS may consider offering this challenge in the future, dependent upon appropriations.

B.11.36. REACH Lark Galloway-Gilliam Nomination for Advancing Health Equity (REACH Lark Award)[122]

Sponsoring Agency and Office: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The REACH Lark Award honors extraordinary individuals, organizations, or community coalitions associated with the Racial and Ethnic Approaches to Community Health (REACH) program for advancing the science and practice of improving health equity to eliminate health disparities at the national, state, or local level. The Lark Award Prize challenged organizations and individuals associated with the REACH program to document successful efforts to implement culturally tailored interventions that aim to reduce health disparities in chronic disease and their associated risk factors. The award is important because racial and ethnic disparities in health are widespread across the United States. Since 1999, REACH has been the only CDC program to explicitly focus on reducing chronic diseases for multiple racial and ethnic groups in communities with high rates of chronic disease. As REACH continues to focus on strengthening community health efforts to prevent disease and reduce racial and ethnic health disparities, the Lark Award highlights successful efforts associated with the REACH program that are empowering communities to create long-term, sustainable health solutions that break down barriers to health equity.

Budget and Resources: The Agency spent approximately 820 hours on this award. Hours were used for developing the concept, drafting the Federal Register notice and challenge terms for Challenge.gov, and promoting the Award through various channels to potential applicants. Hours were also used to determine applicant eligibility, to collect judge conflict of interest, for the multi-step judging/review process, and to calculate scores and determine a winner. Personnel time was also used to announce the recipient of the 2020 REACH Lark Award and to promote the recipient to REACH grantees, partners, and stakeholders. This promotion included partner emails, a press release, social media posts, and a highlight on the REACH Lark Award webpage. Fellows assisted with organizing meetings and other administrative tasks. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Non-monetary award(s); Publicity, advertising, outreach, or/and communications
FTEs	Not applicable	0.19
Funding Estimate	Not applicable	$150

Goal Types: Build or strengthen a community

[122] The website for REACH Lark Galloway-Gilliam Nomination for Advancing Health Equity (REACH Lark Award) is accessible at https://www.cdc.gov/nccdphp/dnpao/state-local-programs/reach/reach-lark-award/index.htm.

Problem or Opportunity Addressed: The problem the Prize Competition aims to solve is widespread health gaps that exist among racial and ethnic minority groups in the United States. Racial and ethnic disparities are complex and are affected by factors related to individuals, communities, society, culture, policies, and the environment. The complexity of addressing racial and ethnic health disparities requires innovation and community participation to ensure strategies and interventions are culturally tailored and relevant to the community.

Justification for Using Prizes and Challenges: Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	1	1	08-05-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$0	$0

Non-Cash Prizes Include: The agency offered a non-monetary prize to the winner. One applicant (individual or team) received a plaque (winner) and has been invited to attend a National Partner Meeting to be recognized and virtually receive their plaque. Additionally, the winner may be invited to additional meetings held by CDC or non-Federal individuals and organizations. Attendance at such events is not required as a condition of accepting the prize. No cash prize was offered. The winner was recognized on the Division of Nutrition, Physical Activity, and Obesity (DNPAO) website.

Participants:

FY19: Not applicable

FY20: 19 team(s)

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
12-01-2019	02-14-2020	19

Solicitation of Submissions: Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Other

Submissions: The objective of the REACH Lark Award was to recognize efforts made by individuals or teams that meaningfully engage communities to remove barriers to health care by addressing factors such as race, ethnicity, education, income, location, and other determinants of health. The Award honors extraordinary individuals, organizations, or community coalitions associated with the REACH program for advancing the science and practice of improving health equity to eliminate health disparities at the national, state, or local levels. To compete for this Award, individuals and entities had to submit an application form. In the form, applicants had to provide a written statement that described the nominee's innovative approach that led to reduced health disparities in chronic

disease. In addition to the written statement, applicants could also submit evidence that demonstrated that the criteria were met through publications, links to online content, and other forms of written material. The application was not to exceed 15 pages.

Evaluation of Submissions: CDC identified six people to serve as reviewers/judges (four internal to the Agency, two external). Judging criteria included having worked directly with the REACH program in some capacity and having health equity expertise. CDC assessed each judge for conflicts of interest and judges were recused from any applications for which they declared a conflict of interest. Teams of two judges independently reviewed six applications, scoring each based on the criteria identified in the Federal Register Notice. Scores were averaged and the two highest scoring applicants from each group advanced to the review panel. The six judges convened in a virtual meeting, facilitated by CDC. Each team of reviewers provided a summary of the highest scoring applications from their group and reported on strengths and weakness of these applications. The remaining four judges that did not originally score the applicants sent in the qualitative score based on the reports. CDC averaged scores and the highest average score was selected as a winner

Partnerships: The Prize Competition involved two partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**	**Partner Contribution Types**
Society for Public Health Education	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$0	operations or administrative support
Community Health Councils	Nonprofit Organization (excluding Academic Institutions)	Not applicable	$0	operations or administrative support

Advancement of Agency Mission: The Prize Competition contributes to advancing CDC's mission to increase the health security of everyone in our nation. The Prize also advances CDC's National Center for Chronic Disease Prevention and Health Promotions (NCCDPHP) Division of Nutrition, Physical Activity, and Obesity's (DNPAO's) mission of improving nutrition, increasing physical activity, reducing obesity, and reducing health disparities by highlighting the work that organizations and individuals are doing to advance health equity, especially related to risk factors associated with chronic conditions including hypertension, heart disease, type 2 diabetes, and obesity. The Prize will help the overall goals of the REACH program by documenting and further disseminating innovative, culturally tailored interventions that aim to reduce health disparities in chronic conditions nationwide.

Plan for Upcoming Two Fiscal Years: The Prize Competition will be recurring biennially. The 2022 Lark Award will be announced in FY21 (fall 2021). The promotion of the award will be done in FY21 and FY22 (fall 2021, and winter and spring 2022). The applications will open in FY22 (December 2021 - February 2022). The deadline for the applications will be in FY22. The review of the application will take place in FY22. The Award recipient will be announced in FY22. Promotion to REACH grantees, partners and stakeholders through partner emails, press releases, highlights on webpage, and social media posts will be in FY22.

B.11.37. Remote Pregnancy Monitoring Challenge[123]

Sponsoring Agency and Office: Health Resources and Services Administration (Maternal and Child Health Bureau)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Remote Pregnancy Monitoring Challenge supports innovative technology-based solutions that help providers remotely monitor the health of pregnant women, and empower women to make informed decisions about their own care.

Budget and Resources: For all MCHB Grand Challenges, a contract was awarded in FY17 to support planning, implementation, and awards of the prize purses. As this allocated funding became no-year funding under the COMPETES Act, no additional FY19 or FY20 funds were allocated to support the challenges. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.5	0.25
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Many women who are low-income in both rural and urban communities face barriers in accessing prenatal care, as well as postpartum care for up to three months post-birth. These barriers include: Personal barriers - work, childcare, transportation, education, culture, language; Health system barriers - limited hours of operation, lack of services; Environmental barriers - location and connectivity or cell phone coverage. The current paradigm for prenatal care includes 15 face-to-face visits with providers. The content of those visits includes critical medical services, risk assessments, patient education, and building of trusting patient-provider relationships. Women facing barriers miss out on these critical opportunities for monitoring and understanding their health and the health of their newborns. The goal of this Challenge is to use technology to allow women to experience the benefits of an ongoing relationship with a healthcare provider to keep them and their children healthy.

[123] The website for Remote Pregnancy Monitoring Challenge is accessible at https://mchbgrandchallenges.hrsa.gov/challenges/remote-pregnancy-monitoring.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$100,000	10	10	02-02-2019
2	$145,000	5	4	09-13-2019
3	$130,000	1	1	04-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$245,000	$245,000
FY20	$245,000	$245,000

Non-Cash Prizes Include: Participants received multiple non-monetary incentives. Expert advisors were engaged at the beginning of the challenge to provide expertise and input into the design of the Challenge. After the initial Phase 1 winners were selected, each was paired to one advisor, who provided mentoring and critical feedback on development of the team's innovation during the remainder of the Challenge. MCHB provided multiple incentives as well, such as hosting webinars for Phase 1 winners on crafting pitches, and for Phase 2 winners on commercialization strategies to take their innovations to market. An in-person Demo Days event held at the end of Phase 2 brought together teams from across the Grand Challenges, and provided access to panels featuring leaders in government and the commercial sector, opportunities to network with other teams and Federal staff, and increased visibility of their innovation among participants.

Participants:

FY19: 10 team(s)

FY20: 4 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-27-2018	12-07-2018	01-02-2019	76
2	02-01-2019	09-13-2019	09-13-2019	9
3	11-01-2019	03-31-2021	04-2021	4

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data
3	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: The Remote Pregnancy Monitoring Challenge supports innovative technology-based solutions that help providers remotely monitor the health of pregnant women, and empower women to make informed decisions about their own care. Solutions should aim to: increase remote and virtual access to quality care for low-income pregnant women; alleviate barriers to quality care; improve communications among patients, providers and/or broader support networks; empower pregnant women with knowledge and tools to monitor their health and care; benefit women who live in rural and medically underserved areas who have limited access to on-site prenatal care.

Evaluation of Submissions: For all of the MCHB Grand Challenges, a panel of external expert advisors have been engaged from the beginning of the Challenge. For Phase 1, submissions are scored by the advisors and then submissions and scores are sent to the Federal judges for official review. Federal judges include a mix of individuals from within and outside the Administration. Federal judges evaluate and select winners for each phase. Submissions are evaluated by numeric scores aligned to the evaluation criteria developed for each phase prior to the challenge's launch and listed on the website.

Partnerships: No partners were indicated

Advancement of Agency Mission: HRSA's mission is to improve health outcomes and address health disparities through access to quality services, a skilled health workforce, and innovative, high-value programs, and MCHB's mission is to improve the health and well-being of America's mothers, children, and families. The Remote Pregnancy Monitoring Challenge has advanced these missions by supporting access to quality health care for all women, particularly those who live in rural and medically underserved areas who have limited access to onsite prenatal care. Solutions will alleviate barriers to care, improve communication among patients, providers, and broader support networks, and empower pregnant women to monitor their health and care.

Plan for Upcoming Two Fiscal Years: This competition is one of four MCHB Grand Challenges, all of which will conclude in FY21. HRSA's Maternal and Child Health Bureau is launching a new challenge in FY21, the Promoting Pediatric Primary Prevention (P4) Challenge. The Challenge will incentivize innovations in pediatric primary care to improve child health. The Challenge will be implemented in two phases, with final awards made in FY22.

B.11.38. Shape of Health - An Obesity Prevention Game[124]

Sponsoring Agency and Office: Office of the Secretary (Office of the Assistant Secretary for Health, Office on Women's Health)

Authority: America COMPETES Reauthorization Act of 2010

[124] The website for Shape of Health - An Obesity Prevention Game is accessible at https://www.challenge.gov/challenge/shape-of-health-an-obesity-prevention-game/.

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The Office on Women's Health (OWH) used the Shape of Health Challenge to seek new ways to get weight control and obesity prevention health messages out to women and girls. Some examples of behaviors that affect weight include diet, physical activity, inactivity, and stress. Improving behaviors in these areas can help women and girls maintain a healthy weight. Video games are a unique medium to boost knowledge and skills and can lead to behavior change through exploration of cause and effect in a virtual environment. According to a Robert Wood Johnson project called Health Games Research, it was found that digital games can be effective in improving children's health in multiple health topics including physical fitness, health promotion, and disease management. Additional evidence suggests adult learning and behavior change is also possible through gaming. A study in the Journal of Medical Internet Research (JMIR) Serious Games found that women with a higher baseline readiness to change experienced improvement in body mass index (BMI) and nutrition with game play. The Shape of Health Challenge encouraged participants to create an interactive video game with focus on obesity prevention or weight control for women or girls. OWH selected two final entries: "Frolic: Activity Game" and "Well Spent!" The winners were selected following the conclusion of a three-phase evaluation process. These two games were made freely available to the public through the Apple App Store in August 2020.

Budget and Resources: Agency funds were used for FTEs, to provide transportation and lodging for judges for the in-person presentations, and to promote the challenge and winners of each phase. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Data entry/analysis; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications
FTEs	0.04	0.02
Funding Estimate	$5,000	$500

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Other

Problem or Opportunity Addressed: The Office on Women's Health (OWH) sought new ways to get health messages out to women and girls. According to the CDC, two out of every three women in the United States are overweight or obese. This extra weight can lead to many diseases, such as heart disease, diabetes, and many cancers. Obesity results from a combination of causes and contributing factors, including individual factors such as behavior and genetics. Some examples of behaviors that affect weight include diet, physical activity, inactivity, and stress. Improving behaviors in these areas can help women and girls maintain a healthy weight. Video games are a unique medium to boost knowledge and skills and can lead to behavior change through exploration of cause and effect in a virtual environment.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$20,000	10	10	07-12-2019
2	$65,000	6	5	12-12-2019
3	$110,000	2	2	08-15-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$90,000	$85,000
FY20	$110,000	$110,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 39 team(s)

FY20: 2 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	01-31-2019	04-08-2019	07-12-2019	39
2	07-12-2019	11-06-2019	12-12-2019	9
3	12-12-2019	08-15-2020	08-15-2020	2

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object
2	Creative media
3	Creative media

Submissions: Phase 1 of the Competition required the submission of storyboards of the proposed games along with the research supporting the approach to obesity prevention. Phase 2 of the Competition required the nine selected groups from Phase 1 to develop a functional prototype of the game, and present it to the judges in the OWH offices. Phase 3 of the Competition required the two finalists to develop, audience test, and debug a fully functional game to be made publicly available.

Evaluation of Submissions: A mix of judges comprised of OWH and CDC staff, and obesity prevention and educational gaming subject matter experts reviewed the submissions and scored them based on the parameters outlined on the challenge.gov site.

Partnerships: No partners were indicated

Advancement of Agency Mission: The Shape of Health Challenge supported the mission of HHS to improve the health and wellbeing of women and girls across the country by providing an innovative means to combat the growing problem of obesity and weight control.

Plan for Upcoming Two Fiscal Years: None reported

B.11.39. Speaking Up About Mental Health! This is My Story Challenge[125]

Sponsoring Agency and Office: National Institutes of Health (National Institute of Mental Health)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: This Challenge builds from the Healthy Mind Initiative (HMI). The HMI was established to create a collaboration across the Federal, state, county, and community sectors to improve mental health literacy in Asian American and Pacific Islander (AAPI) communities and to address the mental health stigma and cultural barriers to seeking mental health treatment faced by AAPI youth and communities. The founding members of the HMI include the U.S. Public Health Service Asian Pacific American Officers Committee as lead, working with the Substance Abuse and Mental Health Services Administration, the Montgomery County, Maryland, Department of Health and Human Services Asian American Health Initiative, and the National Institute on Minority Health and Health Disparities. The National Institute of Mental Health and the Calvin J. Li Memorial Foundation have joined some of the original partners in the HMI to promote the Challenge and are not limiting the Challenge to AAPI communities but are opening the Challenge to all high school youths nationwide.

Budget and Resources: Agency funds were used for Federal personnel (FTE) time to design, launch, and manage the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	Not applicable
FTEs	0.5	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The challenge of raising mental health awareness among AAPI communities is multifaceted but includes two key barriers: language issues and cultural barriers. To

[125] The website for Speaking Up About Mental Health! This is My Story Challenge is accessible at https://www.challenge.gov/challenge/speaking-up-about-mental-health-this-is-my-story/.

address these barriers, the HMI was established to create a collaboration across the Federal, state, county, and community sectors with two intents. The first aim is to improve mental health literacy in AAPI communities. The second aim is to address mental health stigma and cultural barriers to seeking mental health treatment faced by AAPI youth and communities. The Speaking Up About Mental Health! This Is My Story Challenge was initiated to address this second aim and then further expanded to include any youth from any culture that may view mental health negatively, lack of awareness and education, and differences in cultural conceptualization of mental health.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$7,000	10	10	09-30-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$7,000	$7,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 167 individual(s)

FY20: Not applicable

Intended Participants: 9th-12th grade students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
04-29-2019	05-31-2019	167

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Other

Submissions: In this Challenge, NIH is seeking insightful essays from U.S. high school students, aged 16-18, that describe a teen's understanding of a specific mental health issue and ideas that can promote better health and well-being in their communities with a particular emphasis on communicating with parents, peers, school leaders, policy makers, and health professionals.

Evaluation of Submissions: Judging was done in phases. The first phase had multiple evaluators give each essay a score. The top scoring essays were forwarded to the judging panel. The panel then

scored the essays and came together for a meeting to agree on the top scores. The award-approving officials made the final decision on the winners and the award amounts.

Partnerships: The Prize Competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Institute on Minority Health and Health Disparities	Federal Agency or Office	None reported	Not applicable	Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support
Calvin J. Li Memorial Foundation	Nonprofit Organization (excluding Academic Institutions)	$2,000	Not applicable	Prize purse; Publicity, advertising, outreach, or/and communications

Advancement of Agency Mission: This Challenge helped to advance the agency's mission by encouraging general outreach and promoting critical conversations. The requested essays described teens' understandings of mental health issues and ideas that could promote better health and wellbeing with particular emphasis on overcoming barriers and communicating with parents, peers, school leaders, policy makers, and health professionals. As part of the NIH's mission to apply knowledge about the nature and behavior of living systems to enhance health and lengthen life, this Challenge aimed de-stigmatize conversations about mental health.

Plan for Upcoming Two Fiscal Years: NIH will continue to evaluate and identify the best opportunities to use challenges and prize competitions to spark new ways of thinking, solve tough problems, stimulate innovation, and advance its core mission of turning discovery into health.

B.11.40. Truth Challenge V2: Calling Variants from Short and Long Reads in Difficult-to-Map Regions[126]

Sponsoring Agency and Office: Food and Drug Administration (Office of Health Informatics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: This Challenge calls on the public to assess variant calling pipeline performance on a common frame of reference, with a focus on benchmarking in difficult-to-map regions, segmental duplications, and the Major Histocompatibility Complex (MHC). In the context of whole human genome sequencing, software pipelines typically rely on mapping sequencing reads or

[126] The website for Truth Challenge V2: Calling Variants from Short and Long Reads in Difficult-to-Map Regions is accessible at https://precision.fda.gov/challenges/10/view/results.

assemblies to a reference genome and subsequently identifying variants (differences). One way of assessing the performance of such pipelines is by using well-characterized datasets such as Genome in a Bottle's seven human genome benchmarks. Two of these benchmarks were used in the first PrecisionFDA Truth Challenge in 2016. However, these benchmarks were limited to easier-to-map regions of the genome. New, long and linked read technologies along with new bioinformatics pipelines have enabled the characterization of increasingly challenging regions of the genome.

Budget and Resources: While no monetary prizes were given out, the team worked on initiation, planning, design, development and implementation of the Challenge within the PrecisionFDA framework. In addition, resources were used for advertising, communicating with participants, analyzing data and preparing a manuscript. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	0.2
Funding Estimate	Not applicable	$50,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: In the context of whole human genome sequencing, software pipelines typically rely on mapping sequencing reads or assemblies to a reference genome and subsequently identifying variants. One way of assessing the performance of such pipelines is by using well-characterized datasets such as Genome in a Bottle's seven human genome benchmarks. Two of these benchmarks were used in the first PrecisionFDA Truth Challenge in 2016. However, these benchmarks were limited to easier-to-map regions of the genome. New, long and linked read technologies along with new bioinformatics pipelines have enabled the characterization of increasingly challenging regions of the genome.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$0	14	14	08-03-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$0	$0

Non-Cash Prizes Include: Recognition and inclusion in the scientific manuscript.

Participants:

FY19: Not applicable

FY20: 21 team(s)

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
05-01-2020	06-15-2020	66

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Software or computer code; Analysis or visualization of data; Other

Submissions: Participants were asked to process the FASTQ datasets from one or more technologies through their variant calling pipeline and create Variant Calling Format (VCF) files.

Evaluation of Submissions: The PrecisionFDA team ran and published comparisons between each contestant's HG003 and HG004 VCF files and the Genome in a Bottle (GIAB) benchmarks. This revealed how similar each result is to the GIAB benchmarks in three categories: 1) The MHC; 2) Difficult-to-map regions and segmental duplications; and 3) Other easier-to-map benchmark regions not in the MHC, difficult-to-map regions, or segmental duplications. A modified version of the Global Alliance for Genomics and Health (GA4GH) benchmarking tool will be used to grade HG003 and HG004 submissions.

Partnerships: The Prize Competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
National Institute of Standards and Technology	Federal Agency or Office	Not applicable	None reported	Publicity, advertising, outreach, or/and communications; data entry/analysis; Discovery and design support; Other
Genome in a Bottle	Other	Not applicable	None reported	Publicity, advertising, outreach, or/and communications; Data entry/analysis; discovery and design support; Other

Advancement of Agency Mission: This effort informs FDA's Regulatory Science standards which supports the FDA product safety mission. In addition, it supports the National Institute of Standards and Technology's (NIST's) benchmarking activities as it relates to bioinformatics and NIST's mission to promote US innovation and standards.

Plan for Upcoming Two Fiscal Years: The intent is to continue to have approximately four scientific competitions per year over the next two years.

B.11.41. Using Technology to Prevent Childhood Obesity in Low-Income Families And Communities[127]

Sponsoring Agency and Office: Health Resources and Services Administration (Maternal and Child Health Bureau)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Using Technology to Prevent Childhood Obesity in Low-Income Families and Communities Challenge supports the creation of innovative solutions to empower low-income families to achieve healthy eating practices, healthy lifestyles, and sustainable changes within the home environment within the broader context of their community. It is one of four MCHB Grand Challenges.

Budget and Resources: For all MCHB Grand Challenges, a contract was awarded in FY17 to support planning, implementation, and awards of the prize purses. As this allocated funding became no-year funding under the COMPETES Act, no additional FY19 or FY20 funds were allocated to support the challenges. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Federal personnel (FTE); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.5	0.25
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Since 1980, childhood obesity rates for 2-19 year-olds have tripled, with rates of obesity in 6-11 year-olds more than doubling, and rates of obesity in 12 -19 year-olds quadrupling. While improved eating behaviors and increased physical activity play a large role in

[127] The website for Using Technology to Prevent Childhood Obesity in Low-Income Families And Communities is accessible at https://mchbgrandchallenges.hrsa.gov/challenges/preventing-childhood-obesity.

obesity prevention, additional public health factors such as limited access to affordable, healthy food options, social and cultural norms, and limited availability of safe places to play also impact childhood obesity rates. While existing apps and tools address individual behaviors, such as exercise and nutrition, their uptake in underserved communities is limited because they are not tailored to the needs, challenges, and barriers to healthy weights in these communities. The goal of this Challenge is to make technology work for the family as a unit within the reality of their larger community environment.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$100,000	10	10	12-02-2018
2	$150,000	5	5	09-13-2019
3	$125,000	1	1	04-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$250,000	$250,000
FY20	None reported	None reported

Non-Cash Prizes Include: Participants received multiple non-monetary incentives. Expert advisors were engaged at the beginning of the Challenge to provide expertise and input into the design of the Challenge. After the initial Phase 1 winners were selected, each was paired to one advisor, who provided mentoring and critical feedback on development of the team's innovation during the remainder of the Challenge. MCHB provided multiple incentives as well, such as hosting webinars for Phase 1 winners on crafting pitches, and for Phase 2 winners on commercialization strategies to take their innovations to market. An in-person Demo Days event held at the end of Phase 2 brought together teams from across the Grand Challenges, and provided access to panels featuring leaders in government and the commercial sector, opportunities to network with other teams and Federal staff, and increased visibility of their innovation among participants.

Participants:

FY19: 10 team(s)

FY20: 5 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	07-23-2018	09-28-2018	12-02-2018	76
2	01-01-2019	09-13-2019	09-13-2019	10
3	11-01-2019	03-31-2021	04-2021	5

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data
3	Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: This Challenge supports innovative technology-based solutions to empower low-income families to achieve and sustain healthy eating practices and healthy lifestyles. Solutions should aim to address issues such as: Promoting easier access to healthy, affordable food; Supporting community-owned solutions to broaden families knowledge and skills about nutrition and healthy eating; Increasing physical activity despite environmental barriers that affect underserved communities; and Empowering families to achieve healthy eating practices, health lifestyles, and sustainable changes in the home environment while accounting for limited access to healthy foods in under-resourced communities

Evaluation of Submissions: For all of the MCHB Grand Challenges, a panel of external expert advisors have been engaged from the beginning of the Challenge. For Phase 1, submissions are scored by the advisors and then submissions and scores are sent to the Federal judges for official review. Federal judges include a mix of individuals from within and outside the Administration. Federal judges evaluate and select winners for each phase. Submissions are evaluated by numeric scores aligned to the evaluation criteria developed for each phase prior to the challenge's launch and listed on the website.

Partnerships: No partners were indicated

Advancement of Agency Mission: HRSA's mission is to improve health outcomes and address health disparities through access to quality services, a skilled health workforce, and innovative, high-value programs, and MCHB's mission is to improve the health and well-being of America's mothers, children, and families. This challenge seeks innovative technology solutions to help families to achieve and sustain healthy eating practices and healthy lifestyles.

Plan for Upcoming Two Fiscal Years: This Competition is one of four MCHB Grand Challenges, all of which will conclude in FY21. HRSA's Maternal and Child Health Bureau is launching a new challenge in FY21, the Promoting Pediatric Primary Prevention (P4) Challenge. The Challenge will incentivize innovations in pediatric primary care to improve child health. The Challenge will be implemented in two phases, with final awards made in FY22.

B.11.42. Veterans' Health Administration (VHA) Innovation Ecosystem and precisionFDA COVID-19 Risk Factor Modeling Challenge[128]

Sponsoring Agency and Office: Food and Drug Administration (Office of Health Informatics)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The U.S. Department of Veterans Affairs (VA) has implemented several measures in response to the pandemic to protect and care for veterans, including developing a COVID-19 response plan, administering over 165,000 COVID-19 tests, implementing outreach, screening, and protective procedures to prevent transmission, and supporting non-VA health care facilities. These steps are crucial to protect the veteran population that has a higher prevalence of several of the known risk factors for severe COVID-19 illness, such as advanced age, heart disease, and diabetes. To better understand the risk and protective factors in the veteran population, the VHA Innovation Ecosystem and PrecisionFDA are calling upon the public to develop machine learning and artificial intelligence models to predict COVID-19 related health outcomes, including COVID-19 status, length of hospitalization, and mortality, using synthetic veteran health records. Through this Challenge, additional risk and protective factors will be investigated, including therapeutics prescribed for preexisting comorbidities, and treatment interactions.

Budget and Resources: Agency funds were used to support Federal and contractor FTEs in building a community of experts, developing training for users, and outreach activities such as scientific Challenges and scientific papers. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Software development; Web portal or app development and support
FTEs	Not applicable	0.2
Funding Estimate	Not applicable	$50,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: To better understand the risk and protective factors in the veteran population, the VHA Innovation Ecosystem and PrecisionFDA designed a challenge that asked the

[128] The website for VHA Innovation Ecosystem and PrecisionFDA COVID-19 Risk Factor Modeling Challenge is accessible at https://precision.fda.gov/challenges/11.

community to develop machine learning models to predict COVID-19 related health outcomes, including COVID-19 status, length of hospitalization, length of intensive care unit (ICU) stay, ventilation status, and mortality, using synthetic veteran health records. To protect patient identity, synthetic health record data was generated using the Synthea synthetic patient generator. A total of 147,451 synthetic patients were generated and split 80% into the training data set and 20% into the test data set that was used for evaluation.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	3	3	08-26-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$0	$0

Non-Cash Prizes Include: 1) Public recognition as a Top Performer on the web site; 2) Ability to move on to a second phase which utilizes non-synthetic data.

Participants:

FY19: Not applicable

FY20: 15 team(s)

Intended Participants: Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	06-02-2020	07-03-2020	08-26-2020	27

Solicitation of Submissions: Social media; Email; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov; Other

Submission Types:

Phase	Submission Type
1	Analysis or visualization of data

Submissions: In this Challenge, we will present participants with a training data set and a test data set consisting of synthetic veteran patient health records. Participants will develop computational algorithms to model the risk of SARS-CoV-2 infection and severe outcomes of COVID-19 illness in the

veteran population. The model will be used to predict COVID-19 status, days hospitalized, days in the ICU, controlled ventilation status, and mortality for each synthetic veteran in the test data set. We encourage participants to use demographic data and the presence of comorbidities when developing their model to help PrecisionFDA and the VHA Innovation Ecosystem better understand how race, ethnicity, age, and comorbidities can affect the progression of COVID-19.

Evaluation of Submissions: Model performance was evaluated separately for each of the five predicted outcomes. COVID-19 status, alive or deceased status, and ventilation status predictions were evaluated using the area under the receiver operating characteristic (AUROC) metric. Predictions of days hospitalized and days in the intensive care unit (ICU) were evaluated using root-mean-square error (RMSE) and concordance index (c-index). Overall evaluation and identification of top performers was determined by summing the ranks of each metric for each outcome where the average AUROC for COVID-19 status from all submissions was 0.516, with a maximum AUROC of 0.559, which indicates performance is not appreciably better than random chance. For this reason, COVID-19 status was excluded from the overall ranking.

Partnerships: The Prize Competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Veterans Health Administration (VHA)	Federal Agency or Office	Not applicable	$10,000	Publicity, advertising, outreach, or/and communications; Discovery and design support; Other

Advancement of Agency Mission: This challenge supported both FDA's safety and efficacy of regulated products mission and VHA's veteran health mission by providing insight into COVID-19 related health outcomes based upon product use and co-morbidities.

Plan for Upcoming Two Fiscal Years: We will be doing scientific challenges (both internal and external) in order to further the goals of our science-based organization and to provide insight into new and evolving science and technologies. While we do not offer monetary prizes, we find that enough innovators participate to make this a valuable science incubator.

B.12. National Aeronautics and Space Administration (NASA)

B.12.1. NASA Entrepreneurs Challenge[129]

Sponsoring Agency and Office: Science Mission Directorate

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

[129] The website for NASA Entrepreneurs Challenge is accessible at https://nasa-science-challenge.com.

Competition Summary: To increase participation of entrepreneurs in its technology portfolio, NASA's Science Mission Directorate (SMD) set up the NASA Entrepreneurs Challenge to award, through a three-staged process, up to $100,000 in prize funding to each finalist, along with education opportunities provided by the Agency's Small Business Innovative Research (SBIR) program, to those participants who can successfully contribute ideas that advance the state-the-art in three, broadly-defined science technology focus areas. The areas were (1) physics-based transfer learning, (2) advanced mass spectrometry for life-detection on other planets, and (3) quantum sensors.

Budget and Resources: Funding of $80,000 was used for a support contractor to host the event, including web site hosting, advertising of the challenge, and collection of statistics. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not Applicable	Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not Applicable	1
Funding Estimate	Not Applicable	$1,100,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: The Challenge addressed the problem of a lack of entrepreneurial startups in the Science Mission Directorate (SMD) technology portfolio. Startups are important because they bring fresh ideas and the agility to experiment with new approaches. However, they tend to be constrained by cash-flow concerns, and government procurements are too time-consuming for these startups. The challenge helped to bring in the best ideas without the need for a procurement process.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Develop solutions in a quick timeframe; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	15	15	07-14-2020
2	$200,000	10	10	07-29-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not Applicable	Not Applicable
FY20	$1,000,000	$200,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 74 team(s)

Intended Participants: Small businesses; Other (Startups)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	06-03-2020	07-14-2020	07-14-2020	74
2	07-29-2020	07-29-2020	07-29-2020	15

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept; Business or commercial development plan; Creative media

Submissions: Interested parties submit white papers in the specified topic areas that broadly describe the capability being offered, the capability's relevance to a specific technology area and science question, whether the idea represents an existing product or a concept to be matured over time, a brief description of the technology, and the company's overarching business model. A statement as to the idea's commercial potential, based on the idea being submitted, is required. White papers are not to exceed five pages in length, and may be submitted in any format desired. SMD will conduct a review of the white papers using the scoring criteria and down-select to the top 15-20 ideas. The selected companies will advance to the next round of the competition.

Evaluation of Submissions: A judging panel of subject matter experts was established and evaluated the white papers and oral presentations based on (1) significance and unmet needs, (2) innovation, (3) approach, (4) team/founder aptitudes, (5) commercialization potential. Judges were internal to Agency.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The challenge brought in new concepts in physics-based transfer learning, mass spectrometry, and quantum sensors in a way that few other procurement vehicles managed to do.

Plan for Upcoming Two Fiscal Years: None reported

B.12.2. SAND Challenge[130]

Sponsoring Agency and Office: Mission Support Directorate (Langley H1 OSACB)

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The Safeguard with Autonomous Navigation Demonstration (SAND) Challenge was an opportunity for small businesses to compete in an autonomous unmanned aerial vehicle (UAV) competition. The challenge addressed some of the safety critical risks associated with flying UAVs in the national airspace system: 1) flight outside of approved airspace; 2) unsafe proximity to people or property; and 3) critical system failure. The challenge followed the Federal Aviation Administration (FAA) Part 107 Small Unmanned Aircraft. NASA Langley's patented Safeguard technology, designed to address the aforementioned safety critical risks, would have flown onboard the competitor's vehicle while navigating the course. Safeguard is NASA's manned-aviation quality geofencing technology. Safeguard is a verified and validated independent system designed to supersede UAV guidance, navigation and control systems, and when necessary, physically prevent the vehicle from accessing restricted air space, assuring the UAV complies with regulatory property protection and safety requirements for people/property on the ground, for certain areas of operation. The SAND challenge would have demonstrated the successful surveillance of a post-natural disaster scenario with assured vehicle range containment. Unfortunately, the competition was halted and eventually ended due to COVID-19. There were no evaluations or awards.

Budget and Resources: Multiple funding sources contributed to the overall design, development and implementation of the competition. This included funding a third party to host a website, accept applications, promote the competition and serve as an interface between applicants. Additional funds were used to fund contractors for work on the scoring system and test flights for integration between Safeguard and Unmanned Aircraft Systems (UAS). Funds were used for FTE to lead and manage the project and develop technical aspects. Funds were used to purchase equipment and build Safeguard hardware. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Discovery and design support; Operations or administrative support; Purchase or rental of equipment; Web portal or app development and support	Federal personnel (FTE); Operations or administrative support; Purchase or rental of equipment; Software development

[130] The website for SAND Challenge is accessible at http://sand2020.nianet.org/.

Funding	FY19	FY20
FTEs	0	0.63
Funding Estimate	$228,090	$78,177

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community; Other

Problem or Opportunity Addressed: The primary objectives of the SAND Challenge are: To demonstrate assured autonomous vehicle range containment of Unmanned Aerial Vehicles (UAVs) without direct human intervention using NASA's Safeguard technology to stakeholders, the emerging UAV industry, and the public; to collect feedback from competitors and stakeholders to enable potential improvements and usages of Safeguard and enable further analysis that could inform new regulatory policies that support expanded use of commercial UAV systems; to inform regulatory stakeholders including Federal, state, and local governments on the potential operational benefits of integrating NASA's Safeguard technology to UAVs to aid first responders in natural disasters events; and to engage the emerging UAV operator market to the value proposition of NASA's Safeguard technology and its potential use cases for commercialization and licensing.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$20,000	10	0	01-01-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$20,000	$0

Non-Cash Prizes Include: Visibility plaques

Participants:

FY19: No teams reported

FY20: 2 team(s)

Intended Participants: Small businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
03-02-2020	04-15-2020	2

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (NASA SOLVE)

Submission Types: Proposal or concept; Prototype device or object

Submissions: The small business competitors developed their own autonomous logic implemented on their drones to provide surveillance and identification of key targets in a simulated post-natural disaster scene. A preliminary description of the SAND Competition Course was provided on the SAND website. The Langley patented Safeguard technology would have flown as fully integrated independent flight termination systems (IFTS) mounted on the UAV. Integration of the Safeguard system requires a mechanical interface to engage and sever power to the vehicle if that vehicle was in danger of leaving the defined operational area. Competitors were required to build their own interface box. Safeguard also would have been used to support competition scoring.

Evaluation of Submissions: Had we held the competition, applicants would have been vetted through an initial application down-selection process with staff internal to NASA with a directorate-level selected official. Once we chose the participants, they would have been required to pass several safety checks to actually participate, some of which required in-person demonstrations. At competition day, a mixture of internal and external judges would have been used in conjunction with a scientific scoring system algorithm tied to the competitors' vehicle interfaces.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: Provided an environment for interaction with outside technology users and to establish a bridge between NASA technology at mid Technology Readiness Levels (TRLs) to actual commercial products. This would also allow NASA to acquire industry feedback to support internal product improvements by collecting information from a diverse set of users with different commercialization perspectives; Socialized the use of non-traditional legal partnership mechanisms such as Competes Prize Authority; Established new processes for conducting flight competitions.

Plan for Upcoming Two Fiscal Years: None reported

B.13. Small Business Administration (SBA)

B.13.1. Growth Accelerator Fund Competition[131]

Sponsoring Agency and Office: Office of Investment and Innovation

Authority: America COMPETES Reauthorization Act of 2010

Status:

[131] The website for Growth Accelerator Fund Competition is accessible at www.sbir.gov/accelerators.

FY19: Launched

FY20: Ongoing

Competition Summary: The Growth Accelerator Fund Competition (GAFC) awards prize funds to accelerators and incubators with proposals detailing impactful assistance to entrepreneurs. GAFC ran each year from 2014-2017, funding 243 awards to a wide variety of accelerators and incubators across the country, many in the general technology sector. After a 2018 Library of Congress GAFC study highlighted the need to focus the competition, SBA aligned the competition to better support the growing Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. The 2019 GAFC competition sought to impact the quality and scope of training and support for small businesses and entrepreneurs who are potential SBIR/STTR applicants. The competition required prize applicants to put forth innovative approaches to reach at least one of four target groups: women entrepreneurs, socially/economically disadvantaged entrepreneurs, individuals from states or areas with low numbers of SBIR/STTR awards (includes rural areas), and entrepreneurs located in Opportunity Zones. Award winners included accelerators and incubators across 39 states and territories, and focused on a broad set of industries and sectors. The GAFC budget of $3 million was divided in 60 awards of $50,000, all impacting start-ups and entrepreneurs researching and developing STEM-related innovations.

Budget and Resources: Agency funds for GAFC were only used in the form of FTE support (in the Office of Investment and Innovation, the Office of the Chief Financial Officer, and the Office of Communications and Public Liaison). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE)	Federal personnel (FTE)
FTEs	1	0.3
Funding Estimate	$0	$0

Goal Types: Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: GAFC is designed to provide additional assistance to communities (populations or geographies) that do not have access to sufficient resources and training needed to grow high-risk STEM companies, and assist with the commercialization of their technologies.

Justification for Using Prizes and Challenges: Required by executive policy or Congressional legislation

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$3,000,000	60	60	2019-09-26

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$3,000,000	$3,000,000
FY20	$0	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: 60 team(s)

FY20: 0 team(s)

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-06-10	2019-06-20	199

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: Actual submissions included a 12-slide PowerPoint presentation/deck submitted as a PDF, addressing specific items for each slide. Optional videos (no longer than two minutes) were also allowed and basic contact details were collected in a short form on the submission site.

Evaluation of Submissions: There were two tiers of review. The first tier included a mix of judges from Federal agencies (both internal SBA and cross-agency) and non-Federal external judges. Judges submitted their reviews via an online submission form. The second tier was internal to SBA.

Partnerships: No partners were indicated.

Advancement of Agency Mission: SBA's mission is to help small businesses start and grow. GAFC fits among the agency's many entrepreneurial development programs that fund organizations to provide targeted assistance around the country. In an effort to avoid duplication of traditional small business assistance, GAFC awardees support the formation of high-growth companies transitioning high-risk technologies from laboratory to market.

Plan for Upcoming Two Fiscal Years: GAFC was appropriated $2 million in FY20, though no competition was held (they are two-year funds). SBA anticipates a GAFC competition in FY21, possibly combining FY21 appropriations should they be confirmed before the competition is announced.

B.13.2. Lab-to-Market (L2M) Inclusive Innovation Ecosystem Prize Competition[132]

Sponsoring Agency and Office: National Science and Technology Council, Administered by SBA Office of Investment and Innovation

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Not Applicable

FY20: Completed

Competition Summary: The Lab-to-Market (L2M) Inclusive Innovation Ecosystem Prize Competition was launched to recognize the most impactful organizations, programs, and ideas that support research and development (R&D) innovation ecosystems, particularly those focused on underrepresented communities and pandemic responses. The competition's goal is to encourage entrepreneurship and inclusive, sustainable growth by improving access to resources and capital so they are available to all Americans, and ensuring the benefits of entrepreneurship accrue across the nation.

Launched on September 30, 2020, the L2M prize competition accepted over 160 submissions from applicants across the U.S. 74 subject matter expert reviewers from across non-profit foundations, investment firms, Federal agencies and other organizations participated as judges in a multi-tiered review process. A total prize purse of $330,000 was divided among 18 awardees across three categories. Four $10,000 cash prizes were awarded in the "Super Connector" category to recognize current efforts to successfully attract and/or support networks of underrepresented communities in the R&D innovation ecosystem. Four $10,000 cash prizes were awarded in the "Ecosystem Responder" category to recognize innovative and effective responses to support the R&D ecosystem amidst the pandemic environment. Ten $25,000 cash prizes were awarded in the "Visionary" category for the most creative and actionable ideas for creating a more inclusive R&D innovation ecosystem for the future.

Budget and Resources: Agency funds were only used in the form of FTE support (in the Office of Investment and Innovation, the Office of the Chief Financial Officer, and the Office of Communications and Public Liaison). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE)	Federal personnel (FTE)
FTEs	0	1
Funding Estimate	$0	$0

Goal Types: Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

[132] The website for Lab-to-Market Inclusive Innovation Ecosystem Prize Competition is accessible at https://www.challenge.gov/?challenge=l2m-prize-competition and www.sbir.gov/l2m. The SBA Lab-to-Market Inclusive Innovation Ecosystem Prize Competition was received after the submission deadline for this report. Although it has been included in Appendix B for completion, it was not counted in analyses.

Problem or Opportunity Addressed: The L2M Inclusive Innovation Ecosystem Prize Competition was designed to highlight successful examples of R&D innovation ecosystems, particularly those that include underrepresented communities; to surface the most innovative practices or solutions to mitigate secondary impacts of COVID-19 on high growth startups; and to enhance the connection and integration of Federal resources that support innovation ecosystems.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Engage a specific community; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$330,000	18	18	2021-01-19

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$325,000	$330,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 0 team(s)

FY20: 160 team(s)

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2020-09-30	2020-10-14	160

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on Challenge.gov

Submission Types: Proposal or concept

Submissions: Actual submissions included a ten-slide presentation addressing specific items for each slide, a video narrative no longer than 90 seconds to describe the impact of the competitor's work, and optional letters of commitment or support.

Evaluation of Submissions: There were two tiers of review. The first tier included a mix of judges from Federal agencies (both internal SBA and cross-agency) and non-Federal external judges. Judges submitted their reviews via an online submission form. The second tier was an interagency working group chaired by SBA.

Partnerships: National Science and Technology Council, Federal Laboratory Consortium for Technology Transfer

Advancement of Agency Mission: SBA's mission is to help small businesses start and grow. The L2M Inclusive Innovation Ecosystem prize competition advanced the President's Management Agenda Cross-Agency Priority to improve the transition of Federally-funded research and development from the laboratory to the marketplace through entrepreneurship by highlighting entrepreneur support organizations and the resources they provide.

Plan for Upcoming Two Fiscal Years: There are no plans for FY21 and FY22.

B.13.3. Makerspace Training, Collaboration and Hiring (MaTCH) Pilot Competition[133]

Sponsoring Agency and Office: Office of Entrepreneurial Development

Authority: America COMPETES Reauthorization Act of 2010

Status:

FY19: Launched

FY20: Not Applicable

Competition Summary: The MaTCH Pilot Competition seeks to address the job skills and placement gaps faced by U.S. businesses by providing funding to create or expand programs with job-specific and soft skills training within existing makerspaces. Uniquely positioned to help increase workforce development in U.S. cities, makerspaces:

- Embrace independent work and self-employment
- Focus on new paths for vocational education
- Generate new apprenticeship opportunities
- Build new job skills
- Boost jobs that provide a pathway into the middle class

The MaTCH Pilot Challenge: to create or expand programs that provide job-specific and soft skills training within existing makerspaces, including industry or trade certifications when feasible. The goal is to have all program graduates immediately placed in positions with previously identified employers that need skilled labor. The SBA will award up to $1 million total in prizes to fund winning proposals.

Budget and Resources: Agency funds for MaTCH were only used in the form of FTE support (in the Office of Entrepreneurial Development, the Office of the Chief Financial Officer, and the Office of Communications and Public Liaison). The following table indicates the budget and resources to support the activity.

[133] The website for Makerspace Training, Collaboration and Hiring (MaTCH) Pilot Competition was not provided. The SBA Makerspace Training, Collaboration and Hiring (MaTCH) Pilot Competition was received after the submission deadline for this report. Although it has been included in Appendix B for completion, it was not counted in analyses.

Funding	FY19	FY20
Agency Fund Use	Federal Personnel (FTE)	N/A
FTEs	1	N/A
Funding Estimate	$0	$0

Goal Types: To provide vocational training programs (including job specific skills and soft skills training) that meet the minimum standards of the specific trade and, to the extent feasible, any required industry or trade certifications, in addition to targeted job placement of program graduates in local businesses.

Problem or Opportunity Addressed: The MaTCH Pilot Competition seeks to address the job skills and placement gaps faced by U.S. businesses by providing funding to create or expand programs with job-specific and soft skills training within existing makerspaces. MaTCH is a space open to people looking to obtain new skills, including current and aspiring entrepreneurs. May offer a variety of maker tools such as 3D printers, laser cutters, woodworking machines, soldering irons and sewing machines.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition.

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$1,000,000	12	12	08-19-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$1,000,000	$1,000,000
FY20	$0	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: 12 team(s)

FY20: Not Applicable

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
05-21-2019	07-8-2019	37

Solicitation of Submissions: Social Media; Email; Press Release; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal

Submissions: A business plan detailing the contestant's qualifications, experience, resources, and the proposed training curriculum, including the nature and length of the training/certification program and the number of trainees that will be accommodated; Signed Certificates of Placement or other written evidence from one or more employers demonstrating reasonable commitments to place program graduates upon training completion, such that graduates will have a position waiting for them with a previously identified employer.

Evaluation of Submissions: a) Detailed description of the approach to training and the establishment of a training program that, among other things: (i) identifies the industry or trade sector that will be the focus of the training, describes the minimum standards to be met during the training, and the associated rationale; (ii) identifies the unemployed or underemployed population segments that were targeted for training, the methodology used to recruit the trainees, and the number of individuals that will be in the training class; (iii) identifies the methodology and process used to identify prospective employers and secure the required commitments from these businesses to hire the program graduates; and (iv) includes a detailed budget that describes the funds that will be required to accomplish the objectives of the training and placement program and precisely how those funds will be allocated and utilized (25%);

b) Certificates of Placement or other written evidence from one or more employers that, taken together, demonstrate a reasonable commitment to employ program graduates immediately upon completion of the program. Such commitments may be secured with the assistance of local or national trade associations or other organizations that can assist in identifying and securing a commitment from potential employers (25%);

c) Evidence that the Makerspace has the necessary experience, resources, and curriculum to impart the hard skills (including upskills, where appropriate) trainees need to be placed in the identified jobs and provide compliance with trade's required standards, and, when applicable and to the extent feasible, certification of skills required by the relevant industries. This should include a detailed description of the training program and curriculum, including the nature of the training, the resources (human and otherwise) to be used in the training, and the length of the training program, including the time needed to secure any necessary certifications (25%); and

d) Evidence that the Makerspace has the necessary experience, resources, and curriculum to impart the needed soft skills and teach trainees how to be successful in the workplace (25%).

Partnerships: Not Applicable

Advancement of Agency Mission: U.S. Small Business Administration helps Americans start, build, and grow businesses. The Office of Entrepreneurial Development's mission is to help small businesses start, grow, and compete in global markets by providing quality training, counseling, and access to resources.

Plan for Upcoming Two Fiscal Years: MaTCH was funded $1 million in FY2019. There are no plans for upcoming fiscal years for the Makerspace Training, Collaboration and Hiring (MaTCH) Pilot Competition.

Appendix C. Prizes and Challenges under Other Authorities

This Appendix provides summaries of select prizes and challenges voluntarily submitted by agencies that were conducted in FY19 and FY20 under authorities other than COMPETES. Agency reporting on prizes and challenges under other authorities was optional, and therefore the activities presented here are representative rather than comprehensive. Please note that agency plans for the upcoming two fiscal years are notional and subject to the availability of funding. Please also note that funding estimates in funding tables do not include FTEs and prize purse.

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C.1. Department of Homeland Security (DHS)

C.1.1. Opioid Detection Challenge[134]

Sponsoring Agency and Office: Science and Technology Directorate

Authority: Other authority (Interagency agreement between DHS Science and Technology Directorate and NASA Center of Excellence for Collaborative Innovation; uses NASA Open Innovation Services contract and task order process used for prize administration)

Status:

FY19: Launched

FY20: Completed

Competition Summary: Illicit opioids such as fentanyl have created an unprecedented public health crisis across the United States. In 2019, approximately 70,630 Americans died from opioid overdoses. International mail — through both USPS and express consignment — has been identified as a route for illicit opioids entering the U.S., commonly transported in nearly pure, powdered form. Consequently, large-scale drug trafficking can occur via very small packages sent in the mail. In February 2019, the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T), the White House Office of National Drug Control Policy (ONDCP), U.S. Customs and Border Protection (CBP), and the U.S. Postal Inspection Service (USPIS) launched a $1.55M multi-stage prize competition. The Challenge called upon innovators to submit novel plans for rapid, nonintrusive detection tools that will help find illicit opioids in international mail. In Stage 1, the Challenge called for well-developed plans for automated, user-friendly tools and technologies that had the potential to quickly and accurately detect opioids in parcels, without disrupting the flow of mail. The Challenge received 83 submissions from U.S. and international innovators. From those submissions eight finalists were chosen, each received $100,000 in cash prizes and advanced to Stage 2 of the competition. In Stage 2, finalists participated in a 14-week prototyping accelerator, where they developed their plans into testable prototypes, culminating in a live test event, where finalists convened at the DHS Transportation Security Laboratory (TSL) in Atlantic City, New Jersey for on-site testing of their prototypes and competed for an additional $750,000 in cash prizes. On December 12, 2019, DHS S&T and its government partners announced the grand prize winner and runner-up in the Opioid Detection Challenge. IDSS received the grand prize of $500,000 for its detection solution, which combines a 3D X-ray computed tomography (CT) scanner with automated detection algorithms. The runner-up, One Resonance, received $250,000 for its detection solution, the QROD system, which is a quadrupole resonance technology that uses radio-frequency signals to search for specific materials. S&T and its government partners continue working with the providers of the most promising solutions to further

[134] The website for Opioid Detection Challenge is accessible at https://www.challenge.gov/challenge/opioid-detection-challenge/ ; https://www.dhs.gov/science-and-technology/Challenge-Updates

develop prototypes Most recently, DHS entered an agreement with the winner, who partnered with one of the other finalists, to produce a fused option that could leverage the advantages of both technologies, while effectively diminishing both solutions' weaknesses. The government plans to deploy these tools in international mail facilities, express consignment facilities, and other environments across the country that call for rapid, accurate detection of opioids and related substances.

Budget and Resources: All agencies involved in the challenge provided time and effort in promotion, defining and scoping, planning, execution of stage 1 and stage 2, providing judges' recommendation, helping with webinars, logistics planning, principal participation, press coordination, and outreach and communication. In addition, during In Stage 2, challenge team supported the finalists as they developed functional prototypes and prepared for government testing and participated in a 14-week accelerator. During stage 2, finalists participated in webinars on parcel inspection process, science of detection, preparing for the field, and government contracting. Finalists also has access to government and industry mentors. This challenge also had support from agencies' legal, privacy, public affairs, financial teams, and operators. This was a significant team effort.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award); Non-monetary award(s); Federal personnel (FTE); Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Database development; Software development; Data entry/analysis; Discovery and design support; Operations or administrative support; Solution acceleration	Prize purse (monetary award); Non-monetary award(s); Federal personnel (FTE); Purchase of consumable materials; Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or app development and support; Database development; Software development; Data entry/analysis; Discovery and design support; Operations or administrative support; Solution acceleration
FTEs	25	25
Funding Estimate	$82,000	$47,500

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The challenge called upon innovators to submit novel plans for rapid, nonintrusive detection tools that will help find illicit opioids in international mail. The challenge sought novel, automated, nonintrusive, user-friendly, and well-developed plans for tools and technologies that have the potential to quickly and accurately detect opioids in parcels, without disrupting the flow of mail.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$800,000	8	8	06-11-2019
2	$750,000	2	2	12-12-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$800,000	$800,000
FY20	$750,000	$750,000

Non-Cash Prizes Include: Stage 2 finalists participated in 14-week accelerator and in webinars on parcel inspection process, science of detection, preparing for the field, and government contracting. Finalists also has access to government and industry mentors to ask questions during that 14-week before the test and evaluation at TSL.

Participants:

FY19: 83 team(s)

FY20: 8 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	02-27-2019	04-24-2019	06-11-2019	83
2	06-11-2019	12-12-2019	12-12-2019	8

Solicitation of Submissions: Social media; Email; Press release; Life video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov Other (Recognized by Homeland Security Today as MOST INNOVATIVE CAMPAIGN TO INCREASE SECURITY)

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Prototype device or object

Submissions: In Stage 1, the challenge sought well-developed plans. In Stage 2, the challenge supported solvers as they developed functional prototypes and prepared for government testing. Finalists participated in a 14-week prototyping accelerator, where they developed their plans into testable prototypes. During this time, finalists participated in several webinars, which featured guidance and open question and answer periods with government and other technical experts. Additionally, the challenge offered access to mentors to provide individual support to entrants, and a training dataset was made available to finalists as required by the solution type. Stage 2 culminated in a mandatory live test event, where finalists convened at a government-selected facility for on-site testing of their prototypes. The government team applied a standard testing approach to all solutions, including providing the articles for solutions testing. Test results were a factor in determining the Stage 2 winners, but not the sole basis for selection. Fentanyl simulant chemicals used by the finalists for developmental testing of challenge prototypes were supplied by Arspichem, LLC (Durham, North Carolina).

Evaluation of Submissions: The Opioid Detection Challenge included eight judges and over 20 review panelists with a mix in expertise in forensic science, postal operations, drug interdiction, industrial engineering, and artificial intelligence. In Stage 1, the review panel assessed all 83 submissions received, and the 34 highest-scoring submissions advanced to the judging panel. In Stage 1, the challenge called for well-developed plans and were judged by accuracy, speed, feasibility, usability, flexibility, and team. Judges scored submissions against the Stage 1 selection criteria, and the challenge held a deliberation call to discuss and debate differences and select eight finalist teams to advance to Stage 2. In Stage 2, the challenge supported finalists as they developed functional prototypes and prepared for government testing and participated in a 14-week accelerator. During stage 2, finalists participated in webinars on parcel inspection process, science of detection, preparing for the field, and government contracting. Finalists also has access to government and industry mentors. Stage 2 criteria include everything in stage 1 plus reliability, scalability, and threat adaptability.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
U.S. Customs and Border Protection	Federal Agency or Office	$750,000	Not provided	Prize purse (monetary award); Non-monetary awards; Transportation of participants; Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support; Solution acceleration

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
The U.S. Postal Inspection Service	Federal Agency or Office	Not provided	Not provided	Non-monetary awards; Transportation of participants; Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support
The White House Office of National Drug Control Policy	Federal Agency or Office	Not provided	Not provided	Non-monetary awards; Transportation of participants; Publicity, advertising, outreach, or/and communications; Discovery and design support; Operations or administrative support
NASA	Federal Agency or Office	Not provided	Not provided	Transportation of participants; Discovery and design support; Operations or administrative support
Luminary Labs	Private Industry	Not provided	Not provided	Transportation of participants; Publicity, advertising, outreach, or/and communications; Operations or administrative support

Advancement of Agency Mission: Illicit opioids such as fentanyl have created an unprecedented public health crisis across the United States. In 2019, approximately 70,630 Americans died from opioid overdoses. International mail — through both USPS and express consignment — has been identified as a route for illicit opioids entering the U.S., commonly transported in nearly pure, powdered form. Consequently, large-scale drug trafficking can occur via very small packages sent in the mail. Detection of such illicit drugs before they get into the United States is key in the fight against opioids. The interagency partners involved in this challenge each have a role to play in protecting the nation.

Plan for Upcoming Two Fiscal Years: DHS does not currently have any planned prize competitions. Prize competitions are based on customer need and driven by DHS Components. DHS Science and Technology Directorate supports prize competitions for DHS and helps with planning and execution. No appropriations for funding prize competitions. Funding for prizes will come primarily from our DHS customers for each individual prize.

C.2. Department of Commerce (USDOC)

C.2.1. TC4TL[135]

Sponsoring Agency and Office: National Institute of Standards and Technology (Information Technology Laboratory)

Authority: Other authority (NIST Organic Act)

[135] The website for TC4TL is accessible at https://tc4tlchallenge.nist.gov/.

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: NIST, in coordination with the MIT PACT project, organized the pilot Too-Close-for-Too-Long (TC4TL) Challenge to facilitate research efforts in support of COVID-19. One of the keys to managing the current (and future) pandemic is notifying people of possible virus exposure so they can isolate and seek treatment to limit the further spread of the disease. While manual contact tracing is effective for notifying those who may have been exposed, it is believed that automated exposure notification will be a necessary addition as societies open up. Current approaches to automated exposure notification rely on using Bluetooth Low Energy (BLE) signals (or chirps) from smartphones to detect if a person has been too close for too long (TC4TL) to an infected individual. To better characterize the effectiveness of range and time estimation using the BLE, many research organizations around the world are collecting Bluetooth data and other phone sensor data (e.g., accelerometer, gyroscope, proximity) between various types of phones with simulated real-world variability. The best hope for a solution to this difficult and important problem is to leverage the world-wide research community with common well-established tasks, data, and success metrics that allow for the exchange of and building on collective ideas and approaches.

Budget and Resources: FTE support was used. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE)
FTEs	Not applicable	0.3
Funding Estimate	Not applicable	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community; Other (Better characterize the effectiveness of estimates using Bluetooth Low Energy (BLE) signals from smartphones)

Problem or Opportunity Addressed: The TC4TL Challenge served the following objectives: To help advance the BLE-based proximity detection technology using evaluation-driven research; to explore promising new ideas in TC4TL detection using BLE; to support the development of advanced technologies incorporating these ideas; and to measure performance of the state-of-the-art TC4TL detectors. It was intended to be of interest to all researchers in the machine learning community interested in the TC4TL detection problem using BLE signals. To this end, the evaluation was designed to be simple, to focus on core technology issues, to be fully supported, and to be accessible to those wishing to participate.

Justification for Using Prizes and Challenges: Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	0	0	08-20-2020

Non-Cash Prizes Include: The main incentive for teams was to work on an important research problem coordinated by NIST as a reputable research organizer and earn visibility as evidenced by their scores and ranking on the public leaderboard.

Participants:

FY19: Not applicable

FY20: 11 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Retiree; Small businesses; Large businesses; Other (government-sponsored labs, research institutions)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
06-22-2020	08-20-2020	277

Solicitation of Submissions: Email; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types: Analysis or visualization of data; Other (Estimates of the distance between two phones given a test set of phone sensor data, generated by the participants' algorithms.)

Submissions: The TC4TL Challenge was conducted as an open evaluation where the test data was sent to the participants who processed the data locally and submitted the output of their systems to NIST for scoring. The basic task in the NIST TC4TL Challenge was estimating the distance between two phones given a series of BLE received signal strength indicator (RSSI) values along with other phone sensor data. These distance estimates were converted into contact event hypothesis labels, i.e., TC4TL or not-TC4TL, using a configurable distance parameter that defines a TC4TL event. Reference TC4TL labels were generated using true distance from contact events. Hypothesized labels were compared to reference labels and the probability of false negative and probability of false positive were calculated. A normalized decision cost function that combined these two errors into a single value using weights reflecting the relative cost of each type of error was used to evaluate and rank the submissions.

Evaluation of Submissions: Submissions were evaluated as detailed in the NIST Pilot TC4TL Challenge Evaluation Plan (https://www.nist.gov/system/files/documents/2020/07/01/2020_NIST_Pilot_TC4TL_Challenge_Evaluation_Plan_v1p3.pdf). To facilitate information exchange between the participants and NIST, all evaluation activities were conducted over an evaluation management web platform (https://tc4tlchallenge.nist.gov).

Partnerships: The prize competition involved one partner.

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
MIT Private Automated Contact Tracing (PACT) consortium (https://pact.mit.edu)	Academic Institution	Not applicable	None reported

Advancement of Agency Mission: The NIST mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. To this end, as a neutral and unbiased research coordinator, NIST designed the TC4TL Challenge to help drive the BLE-based proximity detection technology forward using its evaluation-driven R&D model. Specifically, NIST designed and provided well-established tasks, datasets, and performance metrics to explore promising new ideas for the BLE-based proximity detection, and to measure the performance of the current state of the BLE-based technology. NIST brought together research teams from around the world that developed machine learning algorithms and systems to tackle one of the largest remaining engineering problems for digital exposure notification.

Plan for Upcoming Two Fiscal Years: NIST may continue efforts to host evaluations of potential technology solutions using BLE or other wireless signals similar to the goals of TC4TL. In general, the NIST Multimodal Information Group (https://www.nist.gov/itl/iad/mig) is likely to host continuing evaluations that serve to challenge the research community.

C.2.2. TREC-COVID[136]

Sponsoring Agency and Office: National Institute of Standards and Technology (Information Technology Laboratory)

Authority: Other authority (NIST Organic Act)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The U.S. Department of Commerce's National Institute of Standards and Technology (NIST) and the White House Office of Science and Technology Policy (OSTP) launched a joint effort to support the development of search engines for research that will help in the fight against COVID-19. The project was developed in response to the March 16, 2020 White House "Call to Action to the Tech Community on New Machine Readable COVID-19 Dataset." TREC-COVID was a collaboration among the Allen Institute for Artificial Intelligence (AI2), the National Institute of Standards and Technology (NIST), the National Library of Medicine (NLM), Oregon Health & Science University (OHSU), and the University of Texas Health Science Center at Houston (UTHealth). The team applied NIST's successful, long-running program of expert engagement and technology assessment called the Text Retrieval Conference, or TREC, to the COVID-19 Open Research Dataset (CORD-19), a resource of research articles and related data about COVID-19 and the coronavirus family of viruses. The TREC-COVID program goals included creating datasets and using an independent assessment process that will help search engine developers to evaluate and optimize their systems in meeting the needs of the research and healthcare communities.

[136] The website for TREC-COVID is accessible at https://ir.nist.gov/covidSubmit/.

Budget and Resources: Funds used to support FTEs. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Not applicable	Federal personnel (FTE)
FTEs	Not applicable	0.25
Funding Estimate	Not applicable	$0

Goal Types: Develop/demonstrate technology; Build or strengthen a community; Other (Identify answers for today's COVID-19 researchers and improve search systems)

Problem or Opportunity Addressed: Researchers, clinicians, and policymakers involved with the response to COVID-19 are continually searching for reliable information on the virus and its impact. TREC-COVID presented a unique opportunity for the information retrieval (IR) and text processing communities to contribute to the response to this pandemic, as well as to study methods for quickly standing up information systems for similar future events. The results of the TREC-COVID Challenge identify answers for some of today’s questions and create infrastructure to improve tomorrow’s search systems.

Justification for Using Prizes and Challenges: Engage a specific community; Promote awareness of a specific topic or agency research area; Other (used well-known methodology to spur improvements for search retrieval of COVID-19 relevant searches)

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	05-04-2020
2	$0	0	0	05-26-2020
3	$0	0	0	06-24-2020
4	$0	0	0	07-22-2020
5	$0	0	0	08-05-2020

Non-Cash Prizes Include: TREC-COVID was designed to incentivize the development of new search algorithms. Consistent with the NIST TREC program, the main incentive for teams participating in TREC-COVID was to earn bragging rights as evidenced by their scores earned in each round.

Participants:

FY19: Not applicable

FY20: 90 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Small businesses; Large businesses; Other (information retrieval researchers)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-15-2020	04-23-2020	05-04-2020	143
2	05-04-2020	05-13-2020	05-26-2020	136
3	05-25-2020	06-03-2020	06-24-2020	79
4	06-24-2020	07-06-2020	07-22-2020	72
5	07-22-2020	08-03-2020	08-05-2020	126

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Analysis or visualization of data
2	Analysis or visualization of data
3	Analysis or visualization of data
4	Analysis or visualization of data
5	Analysis or visualization of data

Submissions: Registered teams submitted at least one analysis, or "run," by the stated deadline for each round. The task in TREC-COVID was a classic *ad hoc* search task. Teams were given a document set and a set of information needs called topics. The queries for each round were based on biomedical researchers' real questions from harvested logs of medical library search systems. Teams created a ranked list of documents per topic where each list was ordered by decreasing likelihood that the document matches the information need (this is called a "run"). A run consisted of a set of document lists, one per topic. Each list was required to contain at least one and no more than 1,000 entries in the specified format. Lists were ordered by decreasing likelihood that the document is relevant to the topic; that is, the document at rank 1 is the document the system thinks is the best match to the topic, the next-best match at rank 2, etc. Participants were required to retrieve at least one document for every topic.

Evaluation of Submissions: Human annotators judged a fraction of the documents submitted in each run for relevance, and those relevance judgments were used to score runs. The relevance judgments were made by human annotators that have biomedical expertise. Annotators used a three-way scale:

Relevant: the article is fully responsive to the information need as expressed by the topic, i.e., answers the question in the topic. The article need not contain all information on the topic but must, on its own, provide an answer to the question.

Partially Relevant: the article answers part of the question but would need to be combined with other information to get a complete answer.

Not Relevant: everything else.

At the conclusion of a round, the runs, descriptions, and scores were posted to the TREC-COVID website as a data archive to further research on pandemic search systems. Scores were computed using trec_eval, a publicly available suite of measures.

Partnerships: The prize competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Allen Institute for Artificial Intelligence (AI2)	Nonprofit Organization (excluding Academic Institutions)	Not applicable	None reported
National Library of Medicine	Federal Agency or Office	Not applicable	None reported
Oregon Health and Science University	Academic Institution	Not applicable	None reported
University of Texas Health Science Center at Houston (UTHealth)	Academic Institution	Not applicable	None reported

Advancement of Agency Mission: The NIST mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. The NIST Text Retrieval Conference (TREC) is a longstanding effort run by NIST since 1992 to encourage research in information retrieval (IR) from large text collections. The program drives innovation by advancing the state of the art for IR systems. TREC has made significant contributions to the technology infrastructure supporting IR system development, the benefits of which flow directly or indirectly to a variety of stakeholder groups, including commercial firms, academic research groups, and end-users. TREC-COVID helped to increase the IR community's knowledge of complex search systems for dynamic environments.

Plan for Upcoming Two Fiscal Years: None reported

C.3. Department of Defense (DOD)

C.3.1. Agriculture Field Delineation Challenge[137]

Sponsoring Agency and Office: National Geospatial-Intelligence Agency

Authority: Other authority (Title 10 U.S.C 2374a, as amended by Section 213 of the National Defense Authorization Act for Fiscal year 2018)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: NGA solicited ideas for a system that rapidly, accurately, and automatically delineates agricultural field outlines from satellite imagery. The proposed systems must ideally be applicable to large homogenous fields typical of the Midwest U.S. as well as heterogeneous fields typically found in sub-Saharan Africa.

[137] There was no website provided for Agriculture Field Delineation Challenge.

Budget and Resources: Agency funds were used to contract support for challenge design, execution, and award. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	operations or administrative support; prize purse	None reported
FTEs	1	None reported
Funding Estimate	$50,000	None reported

Goal Types: Generate innovative ideas/designs/concepts; Other (Market Research)

Problem or Opportunity Addressed: Field delineation is the process of segmenting individual agriculture fields in satellite images. This is a tough problem because agriculture practices across the world vary greatly and influence how a field might look. To date, global inventories of agriculture areas are limited to large scale aggregations and do not maintain spatial catalogs of individual fields.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Low risk approach and/or pay-for-performance structure

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$15,000	4	4	12-20-2018

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$15,000	$15,000
FY20	None reported	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 9 individuals

FY20: No individuals reported

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
10-24-2018	11-19-2018	7

Solicitation of Submissions: Social media; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: The competition sought white papers describing an existing or proposed system that could efficiently delineate agriculture areas using very high resolution commercial satellite imagery. These white papers would be of sufficient detail for NGA to explore the concept and would serve as market research for state of the art systems for agriculture field delineation.

Evaluation of Submissions: NGA formed a panel of three subject matter experts to evaluate the white papers. These judges evaluated the submissions based on three criteria: viability, suitability, and feasibility. Each criterion was rated on a scale of 1-5; all criteria were then summarized into a single total score. The submissions were ranked based on average total score.

Partnerships: USDA and USAID were partners, but did not supply funds.

Advancement of Agency Mission: The results gave NGA valuable market research on the different approaches that could advance field delineation at scale. Most notable was identification of OneSoil, a European startup that was using advanced techniques for field delineation in Europe and North Africa. This provided NGA knowledge that field delineation was not a basic research project as originally envisioned, but that the technologies were more advanced and commercialized.

Plan for Upcoming Two Fiscal Years: Based on these results, we have launched a new challenge in late FY20/early FY21 on delineating circular shaped features from satellite imagery. We took lessons learned from field delineation by providing more data, seeking algorithmic solutions, and expanding scope to multiple application domains.

C.3.2. C-17 Puckboard Challenge[138]

Sponsoring Agency and Office: Air Force

Authority: Unknown

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The Department of the Air Force is hosting a series of datathons designed to highlight Airmen solving Air and Space Force problems using data. The inaugural Datathon supported optimizing C-17 aircrew scheduling in Puckboard, a modern scheduling platform that enables real time, collaborative scheduling from anywhere in the world. Puckboard focuses on creating a great user experience for schedulers and crew members while automating time consuming tasks. The Puckboard project is led by a team of Airmen from TRON, a DoD software factory. TRON has partnered with the USAF/MIT Artificial Intelligence Accelerator and SAF/CO to incorporate lessons learned from this Datathon into Puckboard.

Budget and Resources: Funds were used for contract support to facilitate design workshops to define the challenge and to host the challenge. In addition, funds were used to provide graphics design. The following table indicates the budget and resources to support the activity.

[138] The website for C-17 Puckboard Challenge is accessible at https://www.af.mil/News/Article-Display/Article/2268590/air-force-chief-data-office-announces-first-datathon/.

Funding	FY19	FY20
Agency Fund Use	None reported	Discovery and design support; Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	None reported	1
Funding Estimate	None reported	$198,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: Aircrew scheduling is a very manpower intensive activity as schedulers work to balance many competing factors. Using data science and Artificial Intelligence (AI) can help streamline this process.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	3	3	07-16-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: Coins, T-shirts, stickers

Participants:

FY19: No teams reported

FY20: 6 teams

Intended Participants: Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	07-14-2020	07-16-2020	07-16-2020	6

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept; Software or computer code; Analysis or visualization of data

Submissions: Presentation and code prioritizing weighted factors that had most impact C-17 aircrew scheduling.

Evaluation of Submissions: Judges were experts in their fields of data science, technology, and/or C-17 scheduling. They were internal to Department of the Air Force. They were provided a rubric to create the presentation and the actual code generated.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
SAF/CO	Federal Agency or Office	None reported	$198,000
USAF/MIT AI Accelerator	Federal Agency or Office	None reported	$0
Lincoln Labs	Academic Institution	None reported	$0
TRON	Federal Agency or Office	None reported	$0
AFWERX	Federal Agency or Office	None reported	$0

Advancement of Agency Mission: The challenge brought together people from a variety of career fields to solve a problem. It educated participants on the power of data.

Plan for Upcoming Two Fiscal Years: Planning another Puckboad Datathon focused on wrangling data to make it use usable for AI.

C.3.3. DARPA Subterranean (SubT) Challenge[139]

Sponsoring Agency and Office: Defense Advanced Research Projects Agency

Authority: Other authority (10 U.S.C. 2374a)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The DARPA Subterranean (SubT) Challenge aims to develop innovative technologies that would augment operations underground. The SubT Challenge will explore new approaches to rapidly map, navigate, search, and exploit complex underground environments, including human-made tunnel systems, urban underground, and natural cave networks. Tunnels can extend many kilometers in length and include highly constrained passages, multiple levels, and vertical shafts. Urban underground environments are often more structured and constructed out of human-made materials, but can have complex layouts that cover multiple stories and/or span multiple city blocks. Natural cave networks often have irregular geological structures, with both constrained passages and large caverns, and unpredictable topologies often stretching large distances in extent and depth. These environments present significant challenges for situational

[139] The website for DARPA Subterranean (SubT) Challenge is accessible at www.subtchallenge.com.

awareness. In time-sensitive scenarios, such as active combat operations or disaster response settings, warfighters and first responders face increased technical challenges including difficult terrain, unstable structures, degraded environmental conditions, severe communication constraints, and expansive areas of operation. For these reasons, natural cave networks, human-made tunnels, and urban underground environments have consistently played a central role in historical warfare and military operations. The SubT Challenge will ensure that our warfighters and first responders are equipped with the technologies and capabilities they need to effectively execute their future missions.

Budget and Resources: Budget and Resources information not reported.

Goal Types: Develop/demonstrate technology

Problem or Opportunity Addressed: Underground environments present significant challenges for operational situational awareness. Tunnels can extend many kilometers in length and include highly constrained passages, multiple levels, and vertical shafts. Urban underground environments are often more structured and constructed out of human-made materials, but can have complex layouts that cover multiple stories and/or span multiple city blocks. Natural cave networks often have irregular geological structures, with both constrained passages and large caverns, and unpredictable topologies often stretching large distances in extent and depth.In time-sensitive scenarios, such as active combat operations or disaster response settings, warfighters and first responders face increased technical challenges due to difficult terrain, unstable structures, degraded environmental conditions, severe communication constraints, and expansive areas of operation. For these reasons, natural cave networks, human-made tunnels, and urban underground environments have consistently played a central role in historical warfare and military operations.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	None reported	1	1	10-30-2019
2	None reported	1	1	02-27-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: None reported

Participants:

FY19: 19 teams

FY20: 18 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-20-2018	06-10-2019	10-30-2019	19
2	09-20-2018	01-03-2020	02-27-2020	18

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Software or computer code
2	Proposal or concept; Software or computer code

Submissions: None reported

Evaluation of Submissions: Teams were evaluated based on the number of DARPA-placed artifacts they accurately report within their scored runs. Upon receiving an artifact report, DARPA evaluated the validity of the report through software validation and provided score updates back to the team's Base Station. Artifacts are distributed throughout the competition course in a manner which rewards teams that are able to rapidly explore and maneuver through the course successfully.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The DARPA Subterranean (SubT) Challenge aims to develop innovative technologies and explore new approaches to rapidly map, navigate, search, and exploit complex underground environments, including human-made tunnel systems, urban underground, and natural cave networks. Given the complexity of these environments, the SubT Challenge seeks to inspire technological breakthroughs to offer key insights into: 1) Concepts of operations that enable and exploit the capability to conduct rapid and autonomous subterranean missions and save lives through enhanced situational awareness, and 2) composition of system capabilities to offer freedom of mobility at operationally relevant speeds in complex, unpredictable, and diverse subterranean environments.

Plan for Upcoming Two Fiscal Years: None reported

C.3.4. MagQuest[140]

Sponsoring Agency and Office: National Geospatial-Intelligence Agency

Authority: Other authority (Economy Act)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: NGA's World Magnetic Model (WMM) team used the NASA Open Innovation Services contract to execute a prize challenge called MagQuest to engage industry and academia in order to rapidly explore options for a new Earth magnetic field data collection system. The WMM is

[140] The website for MagQuest is accessible at https://www.magquest.com/.

fundamental digital infrastructure that makes modern navigation possible. It corrects for the difference between magnetic north (the constantly moving location where a compass points) and true north (the fixed geographic location at 90 degrees north). More than a billion smartphone users depend on WMM to point them in the right direction when they use mobile navigation apps, and it is critical for thousands of military and commercial systems around the world. Among other applications, the WMM supports navigation and attitude determination for submarines, satellites, and aircraft, while also informing operational logistics like the numbering of airport runways. The United States began collecting magnetic data in 1904 using wooden ships, and has continually evolved to military aircraft, ground observatories, and eventually satellites. MagQuest was part of the process towards defining a new system to collect the magnetic field data that is necessary to build future WMMs.

Budget and Resources: NGA used the NASA Open Innovation Services contract managed by NASA's Center of Excellence for Collaborative Innovation, and hired Luminary Labs to run the day-to-day operations of MagQuest Phases 1-3. NGA provided the funding to NASA, who then provided the funding to Luminary Labs. Prize money was handed out to the winners by Luminary Labs. The MagQuest website was built and maintained by Luminary Labs. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	6	4.75
Funding Estimate	$1,472,000	$1,130,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community; Other (Analysis of Alternatives)

Problem or Opportunity Addressed: In 2016, the Joint Staff (J28) tasked NGA, in its capacity as the Title 10 agency responsible for maintaining the World Magnetic Model (WMM), to develop a Capability-Based Assessment (CBA) that describes the capability, impending capability gap, operational risks, and potential alternatives to mitigate the gap. After the CBA and Initial Capabilities Document (ICD) were approved, a Joint Requirements Oversight Council (JROC) memorandum was issued directing NGA to conduct an Analysis of Alternatives (AoA) to help Joint Staff determine the best solution for a new geomagnetic collection capability that will enable the continuation of WMM production and help ensure DoD and civilian Safety of Navigation.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$200,000	10	10	06-20-2019
2	$1,000,000	5	5	09-27-2019
3	$900,000	5	5	10-13-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$1,200,000	$1,200,000
FY20	$900,000	$900,000

Non-Cash Prizes Include: There were no non-monetary incentives for Phases 1 and 2. Phase 3 was supposed to include a visit to NGA Campus East and NASA Johnson Space Center, but all trips were canceled due to COVID-19.

Participants:

FY19: 47 teams

FY20: 6 teams

Intended Participants: Master/PhD students; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	03-21-2019	05-16-2019	06-20-2019	40
2	06-20-2019	08-28-2019	09-27-2019	17
3	03-10-2020	08-28-2020	10-13-2020	5

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Interviews with news, and NGA podcast)

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept
3	Proposal or concept; Business or commercial development plan

Submissions: MagQuest Phase 1 awarded equal prizes across 10 winners based on concepts that proposed novel methods or technologies that may be promising to provide sufficient data for the World Magnetic Model (WMM). MagQuest Phase 2 awarded equal prizes to five winners based on detailed designs and plans for data collection methodologies. MagQuest Phase 3 awarded non-equal prizes to each of five participants based on refined solutions from Phase 2.

Evaluation of Submissions: The independent judging panels for MagQuest Phases 1, 2, and 3 include distinguished experts in sensors, platform engineering, mission operations and program management, the World Magnetic Model, and geomagnetism. Judges recused themselves from evaluating any submissions deemed to present a conflict of interest. Some judges were from government agencies and others were not. Several judges were from outside the United States.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
NASA	Federal Agency or Office	$0	$0	Non-monetary award (cancelled due to COVID-19); Web portal or app development and support; Publicity, advertising, outreach, or/and communications; Operations or administrative support; Discovery and design support

Advancement of Agency Mission: The results were used to significantly reduce the trade space of a formal Analysis of Alternatives (AoA) as part of the Joint Capabilities Integration and Development System (JCIDS) process, successfully resulting in a faster, simpler, and less costly system definition and procurement approach. The team achieved significant value to NGA through their creative, innovative, and efficient solution to the WMM collection system acquisition, and received the IC Team Innovation award for their work.

Plan for Upcoming Two Fiscal Years: There are no future plans for any further World Magnetic Model or MagQuest prize competitions. MagQuest is the largest and most complex prize competition ever attempted by NGA, and its success has created interest within NGA for other prize challenges.

C.3.5. Space Security Challenge 2020: Hack-A-Sat[141]

Sponsoring Agency and Office: Air Force

Authority: Other authority (10 U.S.C. 2374a)

Status:

FY19: Launched

FY20: Completed

Competition Summary: The US Air Force, US Space Force, and US Defense Digital Service, in partnership with DEF CONs Aerospace Village, hosted the Space Security Challenge 2020: Hack-A-Sat. The event was intended to enable security researchers of all levels to focus their skills and creativity on solving cyber security challenges on space systems by facilitating a satellite hacking challenge and hands-on workshops in DEF CON's virtual Aerospace Village at the DEF CON 28 Security Conference (an entirely virtual event due to COVID-19 precautions).

[141] The website for Space Security Challenge 2020: Hack-A-Sat is accessible at https://www.hackasat.com/.

Budget and Resources: Agency funds were used to fund the entire Space Security Challenge 2020: Hack-A-Sat effort including: Game Infrastructure, logistics, online environment, social media, educational outreach, prizes, etc. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Software development	Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Software development; Web portal or app development and support
FTEs	10	24
Funding Estimate	$1,000,000	$5,002,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The world relies on satellites, sharing common goals and needs: to have safe, reliable, and trustworthy space operations that enable optimized use of the space domain for the planet. Current space systems were designed for survivability and peace-time operations. Recent technological and policy breakthroughs, however, have paved the way for an explosion of commercial investment in satellite systems and thus a proliferation of the space domain.The Space Security Challenge 2020: Hack-A-Sat is an effort to bridge the security knowledge gap between the aerospace and cyber security communities and incentivize innovation in securing satellite systems. Bringing aerospace-focused workshops and a Capture the Flag (CTF) challenge to DEF CON not only bridges the cyber and aerospace communities by expanding their skills and expertise across the two domains, but it will foster a mutually beneficial dialog between the communities of developers, operators, and users for both cyber and space.

Justification for Using Prizes and Challenges: Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$150,000	10	10	06-18-2020
2	$100,000	3	3	08-09-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$250,000	$250,000

Non-Cash Prizes Include: The Qualification Event awarded 10 prize packages which include $15,000 and a functioning FlatSat trophy to each team ranked in the top ten who submitted an acceptable technical paper within three weeks of the conclusion of the Qualification Event. Only the top eight ranked teams received a formal invitation to participate in the Final Event. If a top eight ranked team does not accept their invitation, the next place alternate team received a formal invitation by completing the requirements outlined above. The top 40 scoring teams also received up to 14 t-shirts and commemorative qualification event coins. The Final Event awarded prizes to the top 3 placed teams as follows: $50,000 first place, $30,000 second place, $20,000 third place. Teams had to submit an acceptable technical paper to claim their prize within three weeks of the conclusion of the Final Event. The top three scoring teams also received commemorative final event coins for every registered member of their team. We also sent coins to the top scoring team (PFS) that was ineligible for the cash awards.

Participants:

FY19: No teams reported

FY20: 2000 teams

Intended Participants: Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-22-2020	05-24-2020	06-18-2020	6000
2	05-24-2020	06-04-2020	08-09-2020	9

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Analysis or visualization of data; Other
2	Analysis or visualization of data; Other

Submissions: To receive a formal invitation to the Final Event and receive a Qualification Event prize, a team had to submit an acceptable technical paper to the Hack-A-Sat organizers describing their solutions to at least five of the challenges they solved during the Qualification Event. Qualification Event technical papers were reviewed and accepted according to their accuracy and had to include a background description of the challenge and a description of the techniques used to solve the challenge. Write-ups had to follow the format of typical CTF write-ups (and example was provided at: https://github.com/ctfs/write-ups- 2015/tree/master/defcon-qualifier-ctf-2015/babys-first/babyecho). Associated source code, dependencies and instructions for deploying the code to solve the challenge also had to be provided.

Evaluation of Submissions: Qualification Scoring: Competitor teams accumulated points by solving challenges on the challenge board and redeeming flags to the contest website. The more difficult challenges that have fewer total solutions were awarded a higher point value than easier challenges that have more total solutions. Final Scoring: The Final Event consisted of a FlatSat CTF and an On-

Orbit Challenge. Teams were ranked by their combined score balance from the FlatSat CTF and completion of the On-Orbit Challenge. FlatSat CTF Scoring: Each challenge in the FlatSat CTF event were assigned a number of points based on estimated difficulty. Teams won a fraction of the total points available based on accuracy, efficiency, and timeliness of solutions. On-Orbit Scoring was a time-based, completion challenge and could only be solved within a limited time window. Completion was judged on submission of a correct solution to the Hack-A-Sat organizers before the on-orbit challenge deadline.

Partnerships: The prize competition involved more than five partners.

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**
Air Force Research Laboratory - Information Directorate	Federal Agency or Office	$1,000,000	$5,002,000
Defense Digital Service	Federal Agency or Office	None reported	None reported
United States Space Force	Federal Agency or Office	None reported	None reported
Space and Missile Systems Center - Special Programs	Federal Agency or Office	None reported	None reported
Cromulence	Private Industry	None reported	None reported

Advancement of Agency Mission: By bringing forth efforts like Hack-A-Sat, the DoD and DAF hope to appeal to the broader security research (aka hacker) community as an ally willing to approach the challenges of tomorrow in an open and collaborative way. We hope to connect stakeholders across the aerospace domain so that cybersecurity experts and aerospace system engineers work together to build resilient and secure systems at the onset of system design. By enabling this type of collaboration, we intend to learn from the community and change how the DoD and DAF acquire, secure and integrate our technologies.

Plan for Upcoming Two Fiscal Years: The United Space Force will be taking the lead on Hack-A-Sat 2.0 in 2021.

C.3.6. xTechBOLT[142]

Sponsoring Agency and Office: Army

Authority: Other authority (Title 10, US Code (U.S.C.) Section 2374a)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The U.S. Army Medical Research and Development Command (USAMRDC) is sponsoring the xTech Brain Operant Learning Technology xTechBOLT prize competition. The prize competition is designed to incentivize industry to develop and demonstrate the use of one or more

[142] The website for xTechBOLT is accessible at https://www.arl.army.mil/xtechsearch/competitions/xtechBOLT.html.

tool(s) (e.g., QEEG, fMRI, MEG, BIOMRK, NIRS, PET, MEA, SPECT, or other) to locate, track, and trace four types of learning traits, including explicit and implicit knowledge, from exposure to storage, and use those neural pathways to capture emotions and empathy and research a proof of concept mechanism (software or hardware or both) that could be developed to promote optimal retention and access to memories. The goals for this competition are to understand the effects of emotion and empathy on learning and memory and the functional roles played by various brain regions and their mutual interactions in relation to emotional and empathetic processing and effect on both implicit and explicit learning. Understanding these effects will help build the United States Military of the future, by revolutionizing how we teach and train Warfighters, how we make better medical providers, and how we utilize novel brain operant learning technologies. The Army (and more broadly the U.S. Department of Defense) seek path finding teams and technologies through this competition. xTechBOLT is not interested in low-risk, repackaged approaches of tried and true techniques. We aim to find early-stage innovations with the potential to dramatically improve military training outcomes with novel hardware- and/or software-based technologies. The prize authority the competition falls under is Title 10, US Code (U.S.C.) Section 2374a.

Budget and Resources: Funds were used for contest execution including support of the xTechBOLT program office that is responsible for contest planning, event execution, evaluation software and services, communication, marketing, website, and social media support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Discovery and design support; Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	None reported	2
Funding Estimate	None reported	$100,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The goals for this competition are to understand the effects of emotion and empathy on learning and memory and the functional roles played by various brain regions and their mutual interactions in relation to emotional and empathetic processing and effect on both implicit and explicit learning. Understanding these effects will help build the United States Military of the future, by revolutionizing how we teach and train Warfighters, how we build better medical providers, and how we utilize novel brain operant learning technologies.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$100,000	10	10	11-06-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 23 teams

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-01-2020	10-16-2020	11-06-2020	23

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media

Submissions: A concept white paper and accompanying video up to three minutes in length outlining the use of one or more tool(s) (e.g., QEEG, fMRI, MEG, BIOMRK, NIRS, PET, MEA, and/or SPECT) to locate, track, and trace four types of learning traits including explicit and implicit knowledge from exposure to storage, and those neural pathways capturing emotions and empathy. The white paper had to clearly communicate understanding of the topic, tools, and technologies related to the neurobiology of operant learning, considering and applying emotion and empathy factors, and describe fully a proposal to deliver a technical solution based on emerging science, novel discovery, and modern detection methodologies.

Evaluation of Submissions: Each concept white paper was reviewed by an xTechBOLT Panel including Warfighter, acquisition, and research and development subject matter experts. Up to 10 applicants with the highest ranking concept white papers received a prize of $10,000 and advanced to the Semifinals: Technology Pitches. The concept white papers were scored on the following dimensions: Abstract: 5%; Team: 20%; BOLT Program Fit: 30%; Technology and Concept Viability: 35%; Proposal Quality: 10%.

Partnerships: No partners were indicated.

Advancement of Agency Mission: xTechBOLT is a competition targeting path finding teams and technologies to find early-stage innovations with the potential to dramatically improve military training outcomes with novel hardware- and/or software-based technologies.

Plan for Upcoming Two Fiscal Years: The Army plans to continue to execute the xTechSearch open-topic prize competition annually as well as support problem-focused competitions using the same competition structure and process as approved on a case-by-case basis. We estimate that the xTechSearch competition will execute 4-5 competitions per fiscal year.

C.3.7. xTechCOVID19 Ventilator Challenge[143]

Sponsoring Agency and Office: Army

Authority: Other authority (Title 10 U.S.C. 2374a)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: The Army is conducting a change of mission to focus on combating the COVID-19 pandemic. With this new mission, the Army will protect the force, posture the force to maintain global operational readiness, and support the national effort to fight COVID-19. The Army continually assesses how we will best protect Soldiers, Civilians and their families, maintain force readiness to meet global challenges, and provide support to the FEMA-led national COVID-19 response. Accordingly, effective immediately, the Army Acquisition Executive launched the xTech: COVID-19 Ventilator Challenge to all innovators across the nation. The Army solicited the innovation community's ideas for combatting this unprecedented modern pandemic. The prize competition will evaluate technology proposals immediately upon submission and award novel solutions with a prize of $5,000 to present a virtual pitch of the technology concept to the xTech COVID-19 panel, and award prizes of $100,000 to solutions accepted by the panel to develop a concept prototype. Select technologies may receive follow-on contracts for additional production and deployment.The efforts described in this Notice are being pursued under the authorities of 10 U.S.C. 2374a

Budget and Resources: Funds were used for contest execution including support of the xTech program office that is responsible for contest planning, event execution, evaluation software and services, communication, marketing, website, and social media support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	None reported	0.25
Funding Estimate	None reported	$50,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: The Army seeks a low-cost, readily manufacturable emergency ventilator to quickly augment ventilator capacity in the exigent COVID-19 pandemic. The technology solution must provide a rapid response breathing apparatus capable of short-term, rugged field operation. In addition, the ventilator must be low cost, require minimal components, have a small footprint, and be designed for mass production. Ideally, the technology would support field hospitals

[143] The website for xTechCOVID19 Ventilator Challenge is accessible at https://www.arl.army.mil/xtechsearch/competitions/covid-19-ventilator-challenge.html.

that are still acquiring critical infrastructure such as generators, power distribution, and pressurized oxygen.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$60,000	20	12	04-30-2020
2	$500,000	9	5	05-01-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$1,000,000	$560,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 171 teams

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	04-05-2020	04-30-2020	04-30-2020	171
2	04-13-2020	05-01-2020	05-01-2020	12

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Proposal or concept; Prototype device or object; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: The Army seeks a low-cost, readily manufacturable emergency ventilator to quickly augment ventilator capacity in the exigent COVID-19 pandemic. The technology solution must provide a rapid response breathing apparatus capable of short-term, rugged field operation. In addition, the ventilator must be low cost, require minimal components, have a small footprint, and be designed for mass production. Ideally, the technology would support field hospitals that are still acquiring critical infrastructure such as generators, power distribution, and pressurized oxygen.

Evaluation of Submissions: Submissions were evaluated by a panel of Army science and technology ecosystem experts including specialists in technical, acquisition, and user experience as well as medical professionals, critical care doctors, regulatory experts, and manufacturing/supply chain experts. Part I: Concept Quad Chart and Video applications were evaluated and ranked using the following Scoring Criteria: Requirements Alignment: 30%; Technical Viability: 20%; Regulatory: 20%; Speed: 30%.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Army continually assesses how we will best protect Soldiers, Civilians and their families, maintain force readiness to meet global challenges, and provide support to the FEMA-lead national COVID-19 response. Through this contest, the Army solicited the innovation community's ideas for combatting this unprecedented modern pandemic with designs for a low-cost, readily manufacturable emergency ventilator to quickly augment ventilator capacity in the exigent COVID-19 pandemic.

Plan for Upcoming Two Fiscal Years: The Army plans to continue to execute the xTechSearch open-topic prize competition annually as well as support problem-focused competitions using the same competition structure and process as approved on a case-by-case basis. We estimate that the xTechSearch competition will execute 4 to 5 competitions per fiscal year.

C.3.8. xView Detection Challenge[144]

Sponsoring Agency and Office: Under Secretary of Defense Research and Engineering

Authority: Other authority (2374a)

Status:

FY19: Launched

FY20: Completed

Competition Summary: When a disaster strikes, quick and accurate situational information is critical to an effective response. Before responders can act in the affected area, they need to know the location, cause, and severity of damage. But disasters can strike anywhere, disrupting local communication and transportation infrastructure, making the process of assessing specific local damage difficult, dangerous, and slow. Satellite imagery can provide unbiased overhead views, but raw imagery is not enough to inform recovery efforts. High-resolution imagery is required to see specific damage conditions, but because disasters cover a large ground area, analysts must search through huge swaths of pixel space to localize and score damage in an area of interest. Then annotated imagery must be summarized and communicated to the recovery team. It is a slow and laborious process. Recognizing an opportunity to solve a key analytical bottleneck, the Defense Innovation Unit, together with other Humanitarian Assistance and Disaster Recovery (HADR) organizations, is releasing a new

[144] The website for xView Detection Challenge is accessible at https://xview2.org/.

labeled, high-resolution satellite dataset and a challenge to the computer vision community to create machine learning models that can automatically assess building damage from satellite imagery.

Budget and Resources: Funds were used for Amazon Web Services computing, FTE support from CMU/SEI, and commercial vendor support to (a) help create the dataset and (b) build the NEXUS software used to run the competition. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Federal personnel (FTE); Operations or administrative support; Purchase or rental of equipment; Web portal or app development and support	Data entry/analysis; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Purchase or rental of equipment; Web portal or app development and support
FTEs	3	3
Funding Estimate	$1,225,000	None reported

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community

Problem or Opportunity Addressed: When a disaster strikes, quick and accurate situational information is critical to an effective response. Before responders can act in the affected area, they need to know the location, cause, and severity of damage. But disasters can strike anywhere, disrupting local communication and transportation infrastructure, making the process of assessing specific local damage difficult, dangerous, and slow. Satellite imagery can provide unbiased overhead views, but raw imagery is not enough to inform recovery efforts. High-resolution imagery is required to see specific damage conditions, but because disasters cover a large ground area, analysts must search through huge swaths of pixel space to localize and score damage in an area of interest. Then annotated imagery must be summarized and communicated to the recovery team. It is a slow and laborious process.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$150,000	20	11	02-21-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: None reported

Participants:

FY19: 1,877 teams

FY20: 1,877 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-18-2019	12-31-2020	2,000

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Software or computer code; Analysis or visualization of data

Submissions: Each submission was provided as a Docker container including all required code for model inference. Each submission was evaluated using the NEXUS scalable containerized T&E platform developed for DIU.

Evaluation of Submissions: Participants submitted Dockerized containers which held their machine learning models. DIU's T&E platform, NEXUS, automatically executed those containers with test and metric scripts that produced measurements and evaluations of the results. This process was scaled for all containers over the entire dataset, all run in minutes.

Partnerships: The prize competition involved more than five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
DIU	Federal Agency or Office	$150,000	None reported
JAIC	Federal Agency or Office	$500,000	None reported
CAL FIRE	State or Local Government	None reported	None reported
MAXAR Open Data Program	Private Industry	None reported	None reported
California Air National Guard	State or Local Government	None reported	None reported

Advancement of Agency Mission: As a result of this challenge, partner agencies are now able to provide scalable post-disaster damage assessment capability. Further, a large number of individuals, teams, and commercial entities participated in the challenge, working on national security problems and—as a result—increasing the reach of the National Security Innovation Base.

Plan for Upcoming Two Fiscal Years: We currently plan to run a follow-on program—xView3—which will leverage commercial Synthetic Aperture Radar (SAR) data to support algorithms that can automatically identify and characterize dark vessels at scale. Algorithms that result from this

challenge will ideally be used to support important missions like the fight against illegal, unregulated, and unreported fishing.

C.4. Department of Energy (DOE)

C.4.1. Marine Energy Collegiate Competition[145]

Sponsoring Agency and Office: Energy Programs

Authority: Other authority (Department of Energy Science Education Enhancement Act)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The U.S. Department of Energy (DOE) hosted a challenge for university students to advance one of the most up-and-coming industries: marine energy. This annual competition is designed to challenge interdisciplinary teams of undergraduate and graduate students to offer unique solutions to the burgeoning marine energy industry that can play a vital role in powering the blue economy. Marine energy has the potential to provide reliable power to the blue economy, but further work is needed to optimize designs and reduce costs. The competition's objectives are to bring together diverse groups of students from multiple disciplines to explore opportunities for marine energy technologies to benefit other existing maritime industries via real-world concept development experiences. The competition will provide students with real-world experience and industry connections that will help them prepare for future careers in the marine energy sector and the blue economy. Although few institutions offer marine-specific advanced degrees, having related experience is highly valuable for future prospects within a wide range of blue economy opportunities. Jobs across the blue economy include opportunities for researchers, scientists, engineers, educators, project managers, business, sales forces, and many others.

Budget and Resources: Agency Funds Description not provided.

Budget and Resources information not reported.

Goal Types: Not provided

Problem or Opportunity Addressed: Not provided

Justification for Using Prizes and Challenges: Not provided

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

Non-Cash Prizes Include: None reported

Participants:

FY19: Not provided

FY20: Not provided

[145] The website for Marine Energy Collegiate Competition is accessible at https://openei.org/wiki/PRIMRE/STEM/Prizes_and_Competitions/Marine_Energy_Collegiate_Competition_(MECC).

Intended Participants: Not provided

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
Not provided	Not provided	Not provided

Solicitation of Submissions: Not provided

Submission Types: Not provided

Submissions: Not provided

Evaluation of Submissions: Not provided

Partnerships: No partners were indicated.

Advancement of Agency Mission: None reported

Plan for Upcoming Two Fiscal Years: None reported

C.5. Department of the Interior (DOI)

C.5.1. Developing the Next Generation of Animal Telemetry[146]

Sponsoring Agency and Office: Bureau of Ocean Energy Management (BOEM, Office of Environmental Programs)

Authority: Other authority (Outer Continental Shelf Lands Act)

Status:

FY19: Completed

FY20: Completed

Competition Summary: Developing the Next Generation of Animal Telemetry is a collaboration between BOEM and the National Aeronautics and Space Administrations (NASA) Advanced Exploration Systems Program. Space-based transceivers aboard CubeSats could provide a low-cost and higher quality method for ocean monitoring using animal telemetry in U.S. federal waters that would be very useful to BOEM and other resource management agencies. NASA is interested in advancing this technology for the potential use of CubeSats for remote surface tracking capabilities on future missions at the Moon, Mars, or other deep space destinations.

Budget and Resources: FTE resources included administrative, scientific, and engineering support for developing the challenge, as well as financial/contract management. Funding was provided through an Interagency Agreement. The prize amount was $30,000. The following table identifies the budget and resources used to support the activity.

[146] The website for Developing the Next Generation of Animal Telemetry is accessible at https://www.herox.com/animaltracking/community.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	None reported
FTEs	1	None reported
Funding Estimate	$60,000	None reported

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: To address limited data bandwidth through the use of open-source small satellites by increasing data throughput and geospatial accuracy.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; incentivize a larger number of submissions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$30,000	2	2	12-20-2018

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$30,000	$30,000
FY20	None reported	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 38 team(s)

FY20: 0 team(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-15-2018	12-15-2018	38

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: Submissions were focused on an ideation challenge to describe an open-source system for animal telemetry data using small satellites.

Evaluation of Submissions: The elements, questions, and point system used to evaluate submissions are shown in the table below. As stated above, the evaluators were comprised of experts from BOEM, NASA, ONR, and NOAA. Advances the state of marine animal tracking on the U.S. OCS In order of priority, solutions should improve one or more of the following above and beyond the capabilities of the Argos system: 1. Spatial and Temporal Coverage 2. Data Packet Size 3. Spatial Accuracy Solutions that propose a complete system for improving coverage, accuracy and data size will be favored. 4. Feasibility. Are the subsystems currently commercially available? How long would software and hardware development take for integration? (shorter is better) Novelty and Innovativeness Is the proposed solution unique, and stretches the bounds of science and engineering, and inspire a spirit of innovation?

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**
NASA (National Aeronautics and Space Administration)	Federal Agency or Office	$40,000	None reported
NOAA (National Oceanic and Atmospheric Administration)	Federal Agency or Office	$10,000	None reported
Office of Naval Research	Federal Agency or Office	$5,000	None reported

Advancement of Agency Mission: Several proposals provided dramatic improvements in geospatial accuracy and antenna design for developing a new system.

Plan for Upcoming Two Fiscal Years: None reported

C.5.2. Guardians of the Reservoir[147]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: Other authority (Procurement)

Status:

[147] The website for Guardians of the Reservoir is accessible at https://www.usbr.gov/research/challenges/sediment-removal.html; https://www.herox.com/GuardiansoftheReservoir.

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The lifespan of reservoirs relies on our ability to effectively and continually manage sediment. Sediment enters reservoirs each year, particularly when rivers are experiencing floods or runoff conditions. Sediment accumulation reduces available water storage, which affects the ability to meet critical operational objectives along with environmental, cultural and recreational needs. The Bureau of Reclamation, in collaboration with the U.S. Army Corps of Engineers, launched a three-phase competition spanning nearly two years seeking solutions that develop more cost-effective reservoir sediment removal methods. This competition builds upon the successes of the Sediment Removal Techniques for Reservoir Sustainability competition and looks to continue progress in developing new processes and technologies for collecting and/or transporting sediment from reservoirs at a rate that sustains their current capacity. This challenge offers technical support and testing opportunities to the most compelling ideas. This competition aims to jumpstart interests and activities to improve sediment removal strategies and stimulate interest in the industry for potential partnerships to further develop innovative solutions.

Budget and Resources: Agency funding supports vendor contract (platform and solver engagement), competition design, data management, judging, promotion and outreach, and administrative activities such as solver payment and post competition announcements. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	0.17
Funding Estimate	Not applicable	$109,250

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Develop/demonstrate technology; Build or strengthen a community

Problem or Opportunity Addressed: Reservoirs are bodies of stored fresh water that typically form behind dams. They are a critical water source, supplying farms with irrigation and providing potable water to people and homes. Increasingly, they are also an important component of outdoor, water-based recreation. The goal of this challenge is to develop and demonstrate new processes and technologies that will collect and transport sediment from reservoirs at a rate that sustains their current capacity. Reclamation's primary interest is in technology that will move sediment downstream at the average annual rate at which it would otherwise accumulate. Approaches that can help regain lost reservoir capacity are of interest if they can do so in addition to meeting environmental and other performance criteria.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$550,000	None reported

Non-Cash Prizes Include: All participants in Phase 2 will receive subject matter expert engagement and up to 20 hours of technical support. Phase III participants receive an opportunity to engage with experts and potential commercial interests during the demonstration of their technologies. Phase III participants will also receive the testing and evaluation results for their respective submissions.

Participants:

FY19: No teams reported

FY20: No teams reported

Intended Participants: No specific intended group

Participation:

None reported

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Reclamation webpage)

Submission Types: None reported

Submissions: The goal of this challenge is to develop and demonstrate new processes and technologies to collect and transport sediment from reservoirs at a rate that sustains their current capacity. Reclamation's primary interest is in technology that will move sediment downstream at the average annual rate at which it would otherwise accumulate, but approaches that can help in regaining lost reservoir capacity are of interest if they can do so in addition to meeting environmental and other performance criteria. Over the three phases of the competition, it is anticipated the technology will progress from a concept and plan on paper to a technology demonstration.

Evaluation of Submissions: Evaluation panels will be used for all phases of the competition include a mix Federal and non-Federal subject matter experts and experts from private industry. Evaluation panels provide feedback to the contractor responsible for selecting the final winners for each phase.

Partnerships: The prize competition involved 1 partner. The following table lists this partner and their contribution:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
U.S. Army Corps of Engineers	Federal Agency or Office	None reported	None reported

Advancement of Agency Mission: Reservoir sedimentation has become a significant problem with aging water storage facilities. Sediment deposition in reservoirs limits the active life of reservoirs by reducing reservoir storage capacity for water supply or flood risk reduction. Sedimentation also impacts dam outlets, reservoir water intakes, water quality, recreation, upstream flood stage, and downstream habitat. Most reservoirs are over 50 years old and many are over 100 years old. The sediment-design life (typically 100 years) will be reached when the sediment level at the dam is higher than the outlet and the outlet is prone to plugging. New or improved techniques for reservoir sediment removal and transport of the removed sediment in a cost-effective manner is necessary for sustaining Reclamations mission to carry-out its critical operational objectives for reservoirs along with meeting environmental, cultural, and recreational needs.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

C.5.3. Rust Busters[148]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: Other authority (Procurement)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: Water infrastructure in the United States is critical to the domestic economy, commerce, and resource management. Hydraulic steel structures (HSS) require regular maintenance and upkeep. Existing methods to protect HSS are disfavored or no longer used due to environmental and safety concerns. Newer methods often have higher costs, shorter service life, and reduced efficacy. To address rising maintenance costs and to advance the state of the art for corrosion control, the Bureau of Reclamation (Reclamation), in collaboration with the U.S. Army Corps of Engineers (USACE), sponsored the Rust Busters Challenge. This Challenge seeks new methods for corrosion control outside of the conventional approaches that can be applied to existing structures in situ or advances existing technologies, would significantly improve service life, reduce costs (through innovative application methods or use of new materials), or improve performance range (through

[148] The website for Rust Busters is accessible at https://www.usbr.gov/research/challenges/corrosion.html; https://www.herox.com/RustBusters.

additional features such as health monitoring or self-healing). Rust Busters offers the opportunity for the most compelling corrosion control approaches to be evaluated and field-tested by the Challenge sponsors. In Phase 1, participants submitted papers detailing their proposed approach to corrosion control, its scientific rationale, and supporting data. 5 of the most compelling submissions were selected as Phase 1 winners and invited to participate in Phase 2. Each Phase 1 winner received up to $50,000 to help support Phase 2 efforts. During Phase 2, participants will demonstrate their technologies using test coupons, steel samples, supplied by Reclamation. Test coupons and/or prototypes will be evaluated by Reclamation, and up to 3 final winners will share the final prize of $100,000. Rust Busters has a total prize purse of $350,000 ($250,000 in Phase 1 and $100,000 in Phase 2) and offers a rare opportunity for Phase 2 participants to receive lab- and field-test data for their technologies.

Budget and Resources: Agency funds were used to: develop an agency prize webpage competition design and on-going operational activities throughout the competition; secure a contractor to administer the competition including the development of a platform to manage solver engagement, submissions, and manage scoring; procure, prepare, and ship steel samples for competitors to apply their solution prototypes complete laboratory and field evaluation and testing of solver prototypes; conduct data collection and evaluation. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Web portal or app development and support
FTEs	0.2	0.25
Funding Estimate	$102,200	$60,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: In order to address rising maintenance costs and to advance the state of the art for corrosion control, the Bureau of Reclamation (Reclamation), in collaboration with the U.S. Army Corps of Engineers (USACE), sponsored Rust Busters Challenge. This Challenge seeks to identify and develop new corrosion control methods. The Challenge sponsors are vitally interested in completely new approaches that are outside of conventional thought processes for corrosion control that can be applied to existing structures in situ. There is also interest in advancing existing technologies that can significantly improve service life, reduce costs (through innovative application methods or use of new materials), or improve performance range (through additional features such as health monitoring or self-healing).

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-

for-performance structure; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$250,000	5	5	03-03-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$250,000	None reported
FY20	$100,000	$250,000

Non-Cash Prizes Include: Phase 2 participants will be eligible to win a Best Lab Performance recognition for the best overall laboratory testing performance. In additional to the Best Lab Performance recognition, the winners' results will be presented by Reclamation at a corrosion conference. Overall winners of the competition will also have their work presented by Reclamation at a leading corrosion conference and may have the opportunity to further develop and test their approaches with an existing Reclamation or Corps of Engineers project. All participants in Phase 2 will receive testing and evaluation results for their respective submissions.

Participants:

FY19: No teams reported

FY20: 5 teams

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-22-2019	01-16-2020	03-03-2020	35

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Agency prize webpage)

Submission Types:

Phase	Submission Type
1	Proposal or concept

Submissions: The Rust Buster Challenge seeks to identify and develop new methods for corrosion control. The challenge is interested in completely new approaches that are outside of conventional

thought processes for corrosion control that can be applied to existing structures in situ. There is also interest in advancing existing technologies that can significantly improve service life, reduce costs (through innovative application methods or use of new materials), or improve performance range (through additional features such as health monitoring or self-healing).

Evaluation of Submissions: Phase I: An Evaluation Panel reviewed all Phase 1 submissions and selected 5 of the most compelling entries as Phase 1 winners. Entries were reviewed against evaluation criteria that included general criteria, corrosion performance, durability, life cycle cost, feasibility and innovation. The evaluation panel included Federal subject matter experts internal and external to Reclamation, private sector, and academia. Phase II evaluations include laboratory and field testing to address corrosion protection, durability and service life, and feasibility. Phase II results will be evaluated by the same panel that reviewed Phase 1 submissions and will be augmented with feedback from laboratory and field personnel.

Partnerships: The prize competition involved 1 partner. The following table lists the partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
U.S. Army Corps of Engineers	Federal Agency or Office	None reported	None reported

Advancement of Agency Mission: Water infrastructure in the United States is critical to the domestic economy, commerce, and resource management. There are thousands of existing hydraulic steel structures (HSS) that require regular maintenance and upkeep. Original methods to protect HSS are disfavored or no longer used due to environmental and safety concerns. Newer approaches to corrosion control suffer from higher costs, shorter service life, and reduced efficacy. Improved technologies or methods will support Reclamation in its mission to economically operate and maintain our water and power facilities.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

C.5.4. Streamflow Forecast Rodeo[149]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: Other authority (Procurement)

Status:

FY19: No activity occurred during FY19

[149] The website for Streamflow Forecast Rodeo is accessible at https://www.usbr.gov/research/challenges/streamflowrodeo.html; https://www.topcoder.com/community/streamflow.

FY20: Ongoing

Competition Summary: Streamflow forecasting is integral to water management, and with higher skill forecasts water managers are better equipped to operate facilities for high flows, mitigate impacts of drought, and achieve other improved outcomes like hydropower generation. The Streamflow Forecast Rodeo seeks to improve the skill of short-term streamflow forecasts (10 days) via a year-long competition. It is intended for solvers to develop and implement their methods for locations across the western United States to ideally outperform state-of-practice streamflow forecasts. With this approach, Reclamation aims to spur innovation using data science communities and Artificial Intelligence (AI)/Machine Learning (ML) methods toward enhancing streamflow forecasts. Prior to the start, teams were provided the opportunity to participate in a pre-season to build and refine their forecasting systems. This helped generate interest in the real-time competition and better position teams to compete with the state-of-practice forecasts. The year-long real-time competition kicked off in late September 2020 and will run through September 2021. A successful challenge outcome will be short-term streamflow forecasts (10 days) with skill scores higher than the state of practice methods. Participants are competing against benchmark, state-of-practice forecasts.

Budget and Resources: Agency funds were used to develop an internal webpage and secure a contractor to administer the competition including the development of a platform to manage solver engagement, submissions, and scoring. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.04
Funding Estimate	$221,000

Goal Types: Develop/demonstrate technology; Build or strengthen a community

Problem or Opportunity Addressed: Streamflow forecasting is integral to water management, and with higher skill forecasts water managers are better equipped to operate facilities for high flows, mitigate impacts of drought, and achieve other improved outcomes like hydropower generation. This challenge seeks to improve the skill of short-term streamflow forecasts (10 days) via a year-long competition. It is intended for solvers to develop and implement their methods for locations across the western United States to ideally outperform state-of-practice streamflow forecasts. With this approach, Reclamation aims to spur innovation using data science communities and Artificial Intelligence (AI)/Machine Learning (ML) methods toward enhancing streamflow forecasts.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$34,000	15	Not applicable	11-25-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$34,000	None applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: Not applicable

FY20: 55 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-28-2020	09-27-2020	11-25-2020	55

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Agency prize webpage)

Submission Types:

Phase	Submission Type
1	Software or computer code

Submissions: The Streamflow Forecast Rodeo seeks to improve the skill of short-term streamflow forecasts (10 days) via a year-long competition. It is intended for solvers to develop and implement their methods for locations across the western United States to ideally outperform state-of-practice streamflow forecasts. With this approach, Reclamation aims to spur innovation using data science communities and Artificial Intelligence (AI)/Machine Learning (ML) methods toward enhancing streamflow forecasts.

Evaluation of Submissions: A panel of judges is not being utilized for this competition. Phase 1: The warm-up marathon match, included solvers predicting a 10-day streamflow forecast in 6-hour intervals for specific locations where solvers created predictive algorithms on historical streamflow data. Submitted solutions were matched against ground truth data and executed using target prediction data that were not provided to solvers. Phase 2: 12 monthly challenges will occur over the

year-long real-time competition. Solvers will predict a 10-day streamflow forecast in 6-hour intervals for specific locations. Algorithms are scored on how closely the predicted streamflow matches the actual measured values. Solutions are evaluated on live data. The top 10 solvers in each monthly challenge will receive cash prizes. To win quarterly and overall prizes, solvers scores much be higher than the benchmark forecast.

Partnerships: The prize competition involved eight partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
CEATI International - Hydropower Operations and Planning Interest Group	Other	None reported	None reported
Tennessee Valley Authority	Federal Agency or Office	None reported	None reported
Hydro-Quebec	Other	None reported	None reported
Department of Energy - Water Power Technologies Office	Federal Agency or Office	None reported	None reported
RTI International	Private Industry	None reported	None reported
Southern Company	Other	None reported	None reported
NASA Tournament Lab (contract vehicle provider)	Federal Agency or Office	None reported	None reported
Topcoder	Private Industry	None reported	None reported

Advancement of Agency Mission: Techniques that outperform current forecast practices are expected to offer valuable insight as to how operational forecasts may be improved. This in turn can provide water managers much needed information to better operate water and power facilities, manage resources, and prepare for extreme events.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

C.5.5. Sub-seasonal Climate Forecast Rodeo II[150]

Sponsoring Agency and Office: Bureau of Reclamation

Authority: Other authority (Procurement)

[150] The website for Sub-seasonal Climate Forecast Rodeo II is accessible at https://www.usbr.gov/research/challenges/forecastrodeo.html; https://www.topcoder.com/lp/rodeo2.

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Recognizing the success of Rodeo 1 and need for continued innovation on sub-seasonal prediction, a second competition, the Sub-Seasonal Climate Forecast Rodeo 2 prize competition, was developed targeting new potential solvers. Rodeo 2 sought to continue advancing the skill of sub-seasonal forecasting of precipitation and temperature. Solvers were permitted to leverage existing forecasts in their solution but must be able to demonstrate appreciable value added by the solution relative to any input or foundational framework. Specifically, the competition desired solutions that can outperform a current operational forecast at a 1x1 degree gridded resolution for the western United States at two forecast outlooks: weeks 3-4 and weeks 5-6 for temperature and precipitation. Skill was evaluated using spatial anomaly correlation between forecasts and observations over a year, during which solvers submitted real-time forecasts every two weeks. To be eligible for prizes, solvers were required to satisfy three criteria: (1) over the year-long real-time portion of the competition, have an average spatial anomaly correlation score greater than the benchmark forecasts (2) provide a 10-year hind cast (warm-up competition) that outperforms the benchmark forecast, also evaluated using spatial anomaly correlation, and (3) submit documentation that satisfactorily describes the forecast method. The competition was posted on June 27, 2019. The warm-up portion of the competition concluded on August 25, 2019. The year-long real-time portion of the competition spanned from October 1, 2019 to September 28, 2020. Final scoring of submissions will occur in November 2020. An online leaderboard hosted by the National Integrated Drought Information System (NIDIS) tracked and displayed Solvers performance for the duration of the competition period.

Budget and Resources: Agency funds were used to develop an internal webpage and secure a contractor to administer the competition including the development of a platform to manage solver engagement, submissions, and scoring. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Web portal or app development and support	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Web portal or app development and support
FTEs	0.06	0.04
Funding Estimate	$200,000	$189,800

Goal Types: Develop/demonstrate technology; Build or strengthen a community

Problem or Opportunity Addressed: Water managers can benefit from more skillful information on weather and climate conditions at the sub-seasonal outlook (lead-times ranging from 3 to 6 weeks and beyond). Lacking skillful sub-seasonal information limits water managers ability prepare for shifts in hydrologic regimes, such as the onset of drought or wet weather extremes. The challenge with sub-seasonal prediction is that it encompasses the time frame where initial state information (e.g., coupled land-atmosphere processes) becomes less important and slowly varying long-term states (e.g., sea surface temperatures, soil moisture, snow pack) become more important to prediction skill.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$80,000	40	40	09-06-2019
2	$720,000	760	Not applicable	01-13-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$80,000	Not applicable
FY20	$720,000	$294,164

Non-Cash Prizes Include: None reported

Participants:

FY19: 61 teams

FY20: 4705 teams

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	07-19-2019	08-25-2019	09-06-2019	956
2	10-01-2019	09-28-2020	01-03-2021	4696

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Agency prize webpage)

Submission Types:

Phase	Submission Type
1	Software or computer code
2	Software or computer code

Submissions: The Rodeo II Sub-Seasonal Climate Forecasting challenge sought predictive algorithms based on historical weather data via a warm-up competition then through recurring data science challenges over a full year sought predictive algorithms for sub-seasonal forecasts every two weeks refining solutions on live weather data. The year-long sub-seasonal forecasting encompassed the lead times of 3 to 6 weeks into the future, which lay between those of weather forecasting (i.e. up to 3 weeks, where initial ocean and atmospheric conditions matter most) and seasonal to longer-lead climate forecasting (i.e. beyond 6 weeks, where slowly varying earth system conditions matter most, such as sea surface temperatures, soil moisture, snow pack).

Evaluation of Submissions: A panel of judges was not utilized for this competition. Phase 1, the warm-up marathon match, consisted of four concurrent matches where solvers created predictive algorithms on historical weather data. Submitted solutions were matched against ground truth data and executed using target prediction data that were not provided to solvers. Phase 2, the year-long real-time competition, forecasts in four concurrent matches were submitted every two weeks. Algorithms were scored on how closely the solution predicted weather data matched the actual, measured values for each time period in each temperature and precipitation category. Competitors competed against each other for prizes awarded based on their performance in the matches. For bonus quarterly and overall prizes, scores from the matches were calculated as the average of values over the respective periods. To be eligible for quarterly and overall prizes, solvers had to beat benchmark forecasts and meet submission requirements.

Partnerships: The prize competition involved 1 partner. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
National Oceanic and Atmospheric Administration National Integrated Drought Information System	Federal Agency or Office	None reported	None reported

Advancement of Agency Mission: Techniques that outperform current forecast practices are expected to offer valuable insight as to how operational forecasts at the sub-seasonal timescale may be improved. This in turn will offer a variety of sectors, not just water management, much needed information to better manage resources and prepare for extreme events. A few examples include advanced emergency preparedness, public health, tourism, enhanced water order scheduling, and wildfire management.

Plan for Upcoming Two Fiscal Years: Reclamation continues to identify topics and plan for future competitions to address infrastructure, water availability, and environment challenges where advancement or resolution of issues can contribute to Reclamation carrying out its mission more effectively or efficiently. Competitions currently being planned are focused on canal safety, reducing

seepage in canals, testing of hydropower protection systems, vegetation control, fish predation, precipitation measurement, and snow-water equivalent estimates.

C.6. Environmental Protection Agency (EPA)

C.6.1. Campus RainWorks Challenge - 2019[151]

Sponsoring Agency and Office: Office of Water

Authority: Other authority (necessary expense rule)

Status:

FY19: Launched

FY20: Completed

Competition Summary: The Campus RainWorks Challenge is a green infrastructure design competition for American colleges and universities that seeks to engage with the next generation of environmental professionals, foster a dialogue about the need for innovative stormwater management techniques, and showcase the environmental, economic, and social benefits of green infrastructure practices. Green infrastructure refers to a variety of practices that restore or mimic natural hydrological processes. While gray stormwater infrastructure is largely designed to convey stormwater away from the built environment, green infrastructure uses soils, vegetation, and other media to manage rainwater where it falls through capture and evapotranspiration. By integrating natural processes into the built environment, green infrastructure provides a wide variety of community benefits, including improving water and air quality, reducing urban heat island effects, creating habitat for pollinators and other wildlife, and providing aesthetic and recreational value. Stormwater runoff is a significant source of water pollution in communities across the United States. The Campus RainWorks Challenge invites students to be part of the solution today and in the future.

Budget and Resources: Federal personnel are responsible for organizing and implementing the Campus RainWorks Challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Federal personnel (FTE); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	1	1
Funding Estimate	None reported	None reported

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

[151] The website for 2019 Campus RainWorks Challenge is accessible at https://www.epa.gov/green-infrastructure/campus-rainworks-challenge-0.

Problem or Opportunity Addressed: Water pollution associated with stormwater runoff is a problem that is growing in scope and magnitude in communities across the country. Communities need planners, designers, engineers, and other professionals to create dynamic, resilient, and affordable solutions for stormwater management. EPAs Campus RainWorks Challenge invites the current generation of scholars to apply their creativity, knowledge, and energy to solving these challenges today and in the future. Together, regulators, communities, and the next generation of environmental professionals have the creativity, knowledge, and energy necessary to solve the challenges of stormwater management and protect public health and the environment for all Americans.

Justification for Using Prizes and Challenges: Incentivize a larger number of submissions; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$30,000	4	4	04-29-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$30,000	None reported
FY20	None reported	$30,000

Non-Cash Prizes Include: Prize recipients were recognized in an EPA press release and social media announcements on EPA Water Facebook and Twitter accounts.

Participants:

FY19: 50 team(s)

FY20: 50 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-01-2019	12-17-2019	50

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal or concept; Creative media; Analysis or visualization of data

Submissions: For submissions in the demonstration project category EPA is seeking proof-of-concept level designs that examine how green infrastructure could be integrated into a specific site on the team's campus. Demonstration project entries must include individual or grouped (e.g., a treatment train) green infrastructure practices that manage stormwater within smaller drainage areas. For submissions in the master plan category, EPA is seeking conceptual designs that examine how green infrastructure could be integrated into a broad area of the team's campus. Master plan entries should

provide a cohesive vision for how green infrastructure could be further integrated into the campus foot print, providing long term environmental, economic, and social benefits.

Evaluation of Submissions: Qualifying submissions will be judged by two rounds of reviewers that include EPA staff, industry professionals, and/or academics from noncompeting colleges or universities. First round judges will score submissions on a scale of 0 to 100 using pre-determined criteria. Based on the average of all scores for each submission, the top submissions will be recommended to a Final Panel of judges. The Final Panel will then rank the top submissions and recommend finalists in each category to a lead judge in EPAs Office of Water. The lead judge will assess the recommendations using the criteria below and select the first and second place winners in each category.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Water Environment Federation	Other	$5,000	$5,000
American Society of Landscape Architects	Other	$5,000	$5,000
American Society of Civil Engineers	Other	$5,000	$5,000

Advancement of Agency Mission: The Campus RainWorks Challenge is a green infrastructure design competition for American colleges and universities that seeks to engage with the next generation of environmental professionals, foster a dialogue about effective stormwater management, and showcase the environmental, economic, and social benefits of green infrastructure practices. Stormwater runoff is a significant source of water pollution in communities across the United States. The Campus RainWorks Challenge invites students to create green infrastructure designs can protect public health and water quality today and in the future.

Plan for Upcoming Two Fiscal Years: The Campus RainWorks Challenge is an annual challenge that follows the same facilitation process and requires the same amount of funding and FTEs from one year to the next.

C.6.2. Campus RainWorks Challenge - 2018[152]

Sponsoring Agency and Office: Office of Water

Authority: Other authority (necessary expense rule)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The Campus RainWorks Challenge is a green infrastructure design competition for American colleges and universities that seeks to engage with the next generation of environmental

[152] The website for Campus RainWorks Challenge - 2018 is accessible at https://www.epa.gov/green-infrastructure/campus-rainworks-challenge-0.

professionals, foster a dialogue about the need for innovative stormwater management techniques, and showcase the environmental, economic, and social benefits of green infrastructure practices. Green infrastructure refers to a variety of practices that restore or mimic natural hydrological processes. While gray stormwater infrastructure is largely designed to convey stormwater away from the built environment, green infrastructure uses soils, vegetation and other media to manage rainwater where it falls through capture and evapotranspiration. By integrating natural processes into the built environment, green infrastructure provides a wide variety of community benefits, including improving water and air quality, reducing urban heat island effects, creating habitat for pollinators and other wildlife, and providing aesthetic and recreational value. See Green Infrastructure BasicsStormwater runoff is a significant source of water pollution in communities across the United States. The Campus RainWorks Challenge invites students to be part of the solution today and in the future. Check out last year's winners to see how green infrastructure can be used to better manage stormwater runoff, protect public health and water quality, and build resilient communities.

Budget and Resources: Agency personnel are responsible for implementing all aspects of the Campus RainWorks Challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Not applicable
FTEs	1	Not applicable
Funding Estimate	$0	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Stormwater runoff is a major source of water pollution in urban communities across the United States. Traditionally, stormwater is drained through engineered collection systems, or gray infrastructure, and discharged into nearby waterbodies. Stormwater doesn't like to travel alone: as it moves through the landscape it captures and carries trash, bacteria, heavy metals, and other pollutants from the urban environment. These contaminants degrade water quality and threaten public health. Stormwater also causes erosion and flooding, damaging habitat, property, and infrastructure. Green infrastructure offers flexible solutions for managing stormwater runoff. EPA's Campus RainWorks Challenge invites the current generation of scholars to apply their creativity, knowledge, and energy to solving these challenges today and in the future.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$16,000	4	4	04-23-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$16,000	$16,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: Prize winners were recognized in an EPA press release and social media announcements on EPA Water Facebook and Twitter accounts.

Participants:

FY19: 68 team(s)

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-01-2018	12-14-2018	68

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Proposal or concept; Creative media; Analysis or visualization of data

Submissions: For submissions in the demonstration project category EPA is seeking proof-of-concept level designs that examine how green infrastructure could be integrated into a specific site on the teams campus. Demonstration project entries must include individual or grouped (e.g., a treatment train) green infrastructure practices that manage stormwater within smaller drainage areas. For submissions in the master plan category EPA is seeking conceptual designs that examine how green infrastructure could be integrated into a broad area of the teams campus. Entries should provide a systemic vision for how green infrastructure could be further integrated into the campus foot print, providing long term environmental, economic, and social benefits.

Evaluation of Submissions: Qualifying submissions will be judged by two rounds of reviewers that include EPA staff, industry professionals, and/or academics from noncompeting colleges or universities. First round judges will score submissions on a scale of 0 to 100 using the criteria in the 2018 Campus RainWorks Competition Brief. Based on the average of all scores for each submission, the top submissions will be recommended to a Final Panel of judges. The Final Panel will then rank the top submissions and recommend finalists in each category to a lead judge in EPA's Office of Water. The lead judge will assess the recommendations using pre-determined criteria and select the first and second place winners in each category.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Water Environment Federation	Other	$10,000	Not applicable

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
American Society of Landscape Architects	Other	$10,000	Not applicable
American Society of Civil Engineers	Other	$10,000	Not applicable

Advancement of Agency Mission: The Campus RainWorks Challenge is a green infrastructure design competition for American colleges and universities that seeks to engage with the next generation of environmental professionals, foster a dialogue about effective stormwater management, and showcase the environmental, economic, and social benefits of green infrastructure practices. Stormwater runoff is a significant source of water pollution in communities across the United States. The Campus RainWorks Challenge invites students to create green infrastructure designs can protect public health and water quality today and in the future.

Plan for Upcoming Two Fiscal Years: The Campus RainWorks Challenge is an annual challenge that follows the same implementation process and schedule from one year to the next.

C.6.3. EcoTox TARGET Challenge[153]

Sponsoring Agency and Office: Office of Research and Development

Authority: Other authority (Section 20 of the Federal Insecticide, Fungicide, and Rodenticide Act,7 U.S.C. 136r; Section 10 of theToxic Substances ControlAct, 15 U.S.C. 2609; as well as Section 104 of theCleanWater Act, 33 U.S.C. 1254.)

Status:

FY19: Launched

FY20: Ongoing

Competition Summary: This challenge calls for respondents to develop high quality, low cost, technologies/platforms for evaluating global gene expression in samples from four common aquatic toxicity test organisms: *Pimephales promelas* (a fish), *Daphnia magna* (a crustacean), *Chironomous dilutus* (an insect), and *Raphidocelis subcapitata* (a green algae). These represent species and components of food webs that are most frequently tested when evaluating the hazards of chemicals to ecosystems. While there are many existing viable technologies for measuring global gene expression, the significant technological leap and challenge to the solver community is to provide these capabilities at a cost and scale of commercial throughput that can accommodate the analysis of thousands or tens of thousands of samples per year. A target price point is $50 per sample or less. Achieving this price point can facilitate efficient and effective screening of large numbers of chemicals and environmental samples with regard to safe/unsafe levels.

Budget and Resources: Approximately $2,500 in travel funds were used to promote the Challenge at a scientific meeting attended by the target solver community. Approximately $100 was spent for printing of promotional materials. The following table indicates the budget and resources to support the activity.

[153] The website for EcoTox TARGET Challenge is accessible at https://www.epa.gov/innovation/ecotox-target-challenge; https://www.challenge.gov/challenge/ecotox-challenge/.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Purchase of consumable materials
FTEs	0.2	0.5
Funding Estimate	$50	$2,550

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Development of high throughput methods for evaluating the safety of chemicals to ecosystems and the environment have lagged behind those aimed at assessing potential impacts on human health. High throughput assays that can screen chemicals for their ability to impact organisms with physiology different from that of humans are under development. Incorporation of global gene expression measurements into those assays can serve to maximize coverage of relevant biological pathways using a minimum number of representative taxa and testing resources. However, the analytical technologies and analysis pipelines currently available in the commercial market are not sufficiently tailored or cost effective for these applications.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Other (Expertise required to develop a solution is more available in the commercial and academic spheres than within the agency's workforce.)

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$300,000	1	1	09-30-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$300,000	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 0 team(s)

FY20: 6 team(s)

Intended Participants: Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
03-18-2020	06-15-2021	5

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Prototype device or object; Other (Technology/analysis platform)

Submissions: U.S. EPA and partners seek high quality, low cost, technologies/platforms for evaluating global gene expression in samples (RNA or tissue homogenates) from non-human organisms. Technology development should include development of an automated and standardized pipeline or process for annotating the messenger RNA transcripts detected and quantified with respect to their identity (e.g., associated gene name or unique identifier) and biological function (if known).

Evaluation of Submissions: This challenge is on-going and judging has not yet been completed. A panel of 4-8 judges involving a mix of agency and on non-agency representatives is expected to conduct the judging. Judging will be based on weighted scores related to pre-defined criteria in each of three categories (1) quality and performance; (2) economic and commercial viability; (3) coverage, in terms of the percentage of the transcribed genome. Solvers will be supplied with a common set of reference samples so that scoring is based entirely on performance of the analysis platform and pipeline, independent of sample quality and/or composition.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
European Commission Joint Research Centre	Federal Agency or Office	$2,500	$2,500	Publicity, advertising, outreach, or/and communications
Environment and Climate Change Canada	Federal Agency or Office	$2,500	$2,500	Publicity, advertising, outreach, or/and communications
Syngenta	Private Industry	$2,500	$2,500	Publicity, advertising, outreach, or/and communications
Dow	Private Industry	$2,500	$2,500	Publicity, advertising, outreach, or/and communications

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
US Army Engineer Research and Development Center	Federal Agency or Office	$2,500	$2,500	Publicity, advertising, outreach, or/and communications

Advancement of Agency Mission: Development of the technologies sought through the EcoTox TARGET Challenge, at the price point targeted, will allow for the development and implementation of high throughput testing strategies that account for physiological pathways and processes unique to nonhuman organisms. Incorporation of these testing approaches into EPA practice and into test guidelines followed by industry and other international regulatory authorities will improve the quantity and quality of information available to assess the environmental safety of chemicals. This supports a critical aspect of the Agency's mission with regard to chemical safety and implementation of chemical safety-related legislation.

Plan for Upcoming Two Fiscal Years: None reported

C.6.4. EmPOWER Air Data Challenge[154]

Sponsoring Agency and Office: Office of Air and Radiation

Authority: Other authority (Clean Air Act Section 103)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The EmPOWER Air Data Challenge, hosted by EPA's Clean Air Markets Division (CAMD), invites universities and think tanks to develop innovative and creative uses of CAMDs Power Sector Emissions Data and Clean Air Status and Trends Network (CASTNET) data. Potential project themes include analyzing data, enhancing communications, developing apps and data mashups, promoting environmental education, and improving data quality. Winners of the challenge are assigned a CAMD staff expert for technical assistance in retrieving and understanding the data. Winners also receive recognition for their work by being featured on the EmPOWER Air Data Challenge website, present their work to EPA staff, and have the opportunity to network with fellow winners EPA and non-EPA experts.

Budget and Resources: The EmPOWER Air Data Challenge does not award prize money. Agency resources used to support this challenge are mainly time. The staff point of contact for this challenge coordinates logistics, including outreach, application review, and winner webinar scheduling. This amounts to about five to ten hours per month during challenge launch, review, and closeout (six months out of the year). Eight review panel members spend two to three hours reviewing and discussing applications. CAMD staff members that are assigned to a project provide occasional

[154] The website for EmPOWER Air Data Challenge is accessible at https://www.epa.gov/airmarkets/empower-air-data-challenge.

assistance in downloading and understanding the data as well as feedback on the project itself. This amounts to no more than one to two hours per month over the academic year. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Non-monetary award(s)	Non-monetary award(s)
FTEs	0.05	0.07
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The EmPOWER Air Data Challenge allows EPA to increase awareness and understanding of CAMDs Power Sector Emissions Data and Clean Air Status and Trends Network (CASTNET) data. It also enables EPA to engage data users to better understand the users' needs and how to improve EPA's data and data products. The challenge also fosters a data and research community to promote connections among researchers utilizing these data.

Justification for Using Prizes and Challenges: Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	3	3	05-01-2019
2	$0	3	2	04-14-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$0	$0

Non-Cash Prizes Include: Challenge winners receive direct support from EPA staff experts to assist them with downloading and understanding CAMDs Power Sector Emissions Data and Clean Air Status and Trends Network (CASTNET) data. In addition, winners receive national recognition by being featured on the EmPOWER Air Data Challenge website, present their work to EPA staff, connect with EPA and non-EPA experts to further their research, and participate in special networking events and webinars.

Participants:

FY19: 10 team(s)

FY20: 4 team(s)

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	02-15-2019	04-08-2019	05-01-2019	10
2	12-02-2019	03-16-2020	04-14-2020	4

Solicitation of Submissions: Social media; Email; Posted on challenge.gov; Other (Webinar prior to application deadline)

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept

Submissions: Submissions should propose to advance the knowledge, use, and understanding of CAMD's Power Sector Emissions Data, Clean Air Status and Trends Network (CASTNET) data, and related information, with priority on the following possible project themes: analyzing emission data, enhancing communications, developing technology and data mashups, promoting environmental education, or improving data quality. Submissions should include a detailed description of the approach and outcomes of the project and how CAMD data will be used, an explanation of why the project meets challenge objectives, and a project schedule. Submissions should not exceed eight pages.

Evaluation of Submissions: EPA scored the technical merit of each submission primarily based on the clarity and effectiveness of the proposed approach and the project outcomes. EPA also considered the capabilities of the applicant(s). The review panel for each phase was made up of eight EPA staff members. Each application was scored by at least two reviewers and was discussed by the full panel.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The EmPOWER Air Data Challenge helps EPA advance its mission of protecting human health and the environment by increasing awareness and understanding of environmental data and engaging the research community, who provide important insights into environmental problems. In addition, EPA has a responsibility to the public to make these data accessible to a variety of stakeholders, and challenge winners have provided invaluable feedback as EPA seeks to improve the materials and tools for accessing these data.

Plan for Upcoming Two Fiscal Years: EPA's Clean Air Markets Division (CAMD) is hosting a 2nd round of the EmPOWER Air Data Challenge during FY21 (it launched in FY20). CAMD would like to launch a 3rd round of the EmPOWER Air Data Challenge in FY21, with ongoing engagement through FY22.

C.6.5. Innovative Ways to Destroy PFAS[155]

Sponsoring Agency and Office: Office of Research and Development

[155] The website for Innovative Ways to Destroy PFAS is accessible at https://www.epa.gov/innovation/innovative-ways-destroy-pfas-challenge.

Authority: Other authority (Section 104(b)(2) of the Federal Water Pollution Control Act (the Clean Water Act), 33 U.S.C 1254(b)(2) and Section 103(b)(2) of the Clean Air Act, 42 U.S.C. 103(b)(2) supplemented by Section 102(2)(2)(F) of NEPA, 42 U.S.C. 4332(2)(F))

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: There is an urgent need to better understand per- and polyfluoroalkyl substances (PFAS) and to develop efficient, cost-effective solutions to manage and/or destroy PFAS contaminated media and waste. EPA is partnering with the U.S. Department of Defense's Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP); the Environmental Council of States (ECOS) and the Environmental Research Institute of the States (ERIS); Michigan Department of Environment, Great Lakes & Energy; and Colorado Department of Public Health & Environment, to co-sponsor a technical challenge regarding the destruction of per- and polyfluoroalkyl substances (PFAS). The challenge asks solvers to submit detailed plans for a non-thermal way of destroying PFAS in concentrated film forming foam (AFFF), while creating the least amount of potentially harmful byproducts. Currently, EPA is investigating all methods of destroying PFAS. The goal of this challenge is to discover new non-thermal technologies and approaches that can remove at least 99 percent of PFAS in unused AFFF, without creating any harmful byproducts. Although PFAS compounds can be found in various waste streams, the challenge is focused on unused AFFF. The challenge is intended to encourage the development of new approaches, technologies, or technology combinations that meet the following objectives: (1) must be applicable for use on unspent aqueous film forming foam (AFFF) from unused AFFF concentrates containing 3 percent and/or 6 percent PFAS; (2) must destroy at least 99 percent of the PFAS in the unused AFFF concentrates, including PFAS byproducts that may form by volatilization, particulates, and leaching from effluents; (3) must demonstrate scalability and cost effectiveness for a defined quantity over thermal methods used to treat the same waste stream (AFFF).

Budget and Resources: Agency funds were used for contractor support with InnoCentive (portal through which applicants are received). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	2
Funding Estimate	Not applicable	$25,000

Goal Types: Develop/demonstrate technology (hardware or software); Generate innovative ideas/designs/concepts (ideation)

Problem or Opportunity Addressed: Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have been widely used for more than 60 years to make plastics, firefighting foams, and

lubricants, and to help make products stain-resistant, waterproof, and nonstick. Addressing and managing PFAS in the environment is one of the most pressing issues facing EPA and its partners. This issue is particularly challenging because PFAS chemicals have a very strong carbon-fluorine chemical bond that leads to persistence in the environment and makes their complete destruction extremely difficult. Given the ubiquitous nature of PFAS and increasing public concerns, EPA and its state, tribal, local, and federal partners are looking for greater certainty when making decisions about disposal and treatment of PFAS containing materials and PFAS-contaminated media/waste. PFAS compounds are found at different concentrations in various waste streams including aqueous film forming foam (AFFF).

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Develop solutions in a quick timeframe; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	0	None reported	01-31-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	Not applicable	Not applicable
FY20	$50,000	None reported

Non-Cash Prizes Include: Recommendation for further funding through various Challenge Partners.

Participants:

FY19: Not applicable

FY20: Not available

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
08-25-2020	11-23-2020	None reported

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov; Other (webinar)

Submission Types: Proposal or concept

Submissions: This challenge is intended to encourage the development of new approaches, technologies, or technology combinations that meet the following objectives: (1) must be applicable for use on unspent aqueous film forming foam (AFFF) from unused AFFF concentrates containing 3 percent and/or 6 percent PFAS; (2) must destroy at least 99 percent of the PFAS in unused AFFF concentrates, including PFAS byproducts that may form by volatilization, particulates, and leaching from effluents; (3) must demonstrate scalability and cost effectiveness for a defined quantity over thermal methods used to treat AFFF. Solvers are not required to give up any of their intellectual

property rights to EPA and its partners to be eligible to receive an award. Additional features that are desired (but not required) of submitted PFAS destruction technologies/approaches: (1) demonstrates compatibility with current production and destruction practices; (2) avoids creating other toxic residues after destruction of PFAS.

Evaluation of Submissions: Submissions not yet received.

Partnerships: The prize competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
US DOD: Strategic Environmental Research and Development Program (SERDP) & Environmental Security Technology Certification Program (ESTCP)	Federal Agency or Office	Not applicable	None reported
ECOS/ERIS: Environmental Council of States & environmental research institute of the states	Other	Not applicable	None reported
Colorado Department of Public Health & Environment	State or Local Government	Not applicable	None reported
Michigan Department of Environment, Great Lakes, & Energy	State or Local Government	Not applicable	None reported

Advancement of Agency Mission: Currently, EPA is investigating all methods of destroying PFAS. Incineration has been used to treat PFAS-contaminated media, and EPA scientists are collaborating with the private sector to evaluate the effectiveness of thermal treatment technologies to completely destroy PFAS. The goal of this challenge is to discover new non-thermal technologies and approaches that remove at least 99 percent of PFAS in unused AFFF while preventing the creation of harmful byproducts.

Plan for Upcoming Two Fiscal Years: None reported

C.6.6. "See a Bloom, Give it Room" Harmful Algal Bloom Video Challenge[156]

Sponsoring Agency and Office: Region 7 - Kansas City

Authority: Other authority (Clean Water Act Section 104)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: EPA's "See a Bloom Give it Room" video challenge was open to high school students in EPA Regions 7 (Iowa, Kansas, Missouri, Nebraska and Nine Tribal Nations) and 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 28 Tribal Nations). Students competed to

[156] The website for See a Bloom, Give it Room Harmful Algal Bloom Video Challenge is accessible at https://www.challenge.gov/challenge/harmful-algal-bloom-video-challenge/.

develop short videos informing the public about Harmful Algal Blooms (HABs) in water bodies (e.g. freshwater lakes and streams) and how to be safe around them. Solvers were required to produce videos that were focused on at least one or more groups that use the waters such as swimmers, boaters, fishers, or people who bring pets to the water for recreation.

Budget and Resources: Federal personnel time was spent creating the challenge and reviewing the videos to select winners. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)	Prize purse (monetary award)
FTEs	0.1	0
Funding Estimate	$0	$0

Goal Types: Generate innovative ideas/designs/concepts; Education/training

Problem or Opportunity Addressed: Harmful algal blooms get a lot of press and attention near coastal areas, but stakeholders in Regions 7 and 8 noted that while harmful algal blooms are a huge problem, there aren't a lot of materials focused on these regions. Based on this feedback, EPA designed the proposal to get innovative communication materials about harmful algal blooms local to Regions 7 and 8.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Target audience could not have been reached through traditional mechanisms

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$20,600	14	11	02-05-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	Not applicable	Not applicable
FY20	$32,000	$20,600

Non-Cash Prizes Include: None reported

Participants:

FY19: 17 team(s)

FY20: 0 team(s)

Intended Participants: 9th-12th grade students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-19-2019	01-02-2020	19

Solicitation of Submissions: Social media; Email; Press release; Posted on challenge.gov

Submission Types: Creative media

Submissions: A video, no more than two minutes in length, that teaches people how to spot harmful algal blooms and how to be safe around them. Videos promote public awareness of harmful algal blooms to people who use the waters, such as swimmers, boaters, fishers, or people who bring pets or livestock to the waters.

Evaluation of Submissions: Judges were both internal and external to EPA. Judges created a scoring spreadsheet based on a set of criteria. Judges from EPA's office of public affairs scored the quality of the video. Technical judges scored on scientific accuracy. External partners scored videos for state and tribal winners. EPA selected EPA grand prize winners; states and tribes recommended their winners to EPA. The criteria includes the follow: (1) Has a clear message and theme that is easily understood (20 pts); (2) Is supported by scientific references on harmful algal blooms (20 pts); (3) Increases awareness of harmful algal bloom issues (15 pts); (4) Is educational, imparts knowledge, or deepens understanding of the issue by recreational users (15 pts); (5) Is in focus with balanced color and light and has logical transitions that move the narrative forward (10 pts); (6) Has discernable audio that is easily understood (10 points); and (7) Relates to a water body in your state/tribal lands (10 points).

Partnerships: The prize competition involved the Iowa Department of Natural Resources, the Kansas Department of Health, and 36 Tribal nations and states.

Advancement of Agency Mission: Due to the diversity of the stakeholders in a given community and the non-residents that might travel to the recreational waterbody, this challenge resulted in products that can help recreational water body managers and states who typically use a combination of notification methods. The EPA Office of Water has developed examples of risk communication materials for recreational water body managers and this challenge is an open call for citizen participation in the creation of risk communication content which EPA and Regions 7 and 8 will be able to utilize in materials for outreach on harmful algal blooms. Also, by participating in the challenge, students learned about the risks of harmful algal blooms and communicated those risks to other recreational users.

Plan for Upcoming Two Fiscal Years: None reported

C.7. National Aeronautics and Space Administration (NASA)

C.7.1. 3-D Printed Habitat Challenge[157]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (51 U.S.C. 20144)

[157] The website for 3-D Printed Habitat Challenge is accessible at https://www.bradley.edu/sites/challenge/, https://www.nasa.gov/directorates/spacetech/centennial_challenges/3DPHab/index.html.

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The 3D-Printed Habitat Challenge sought solutions to print large structures typically seen in civil engineering applications, such as infrastructure for a Martian pressurized habitat to house a human crew. The competitors developed autonomous robotic printing systems with concrete like materials using simulated Mars resources. The competition also invited architects to use their imagination and creativity to design habitats that are optimized for 3D Automated Additive Construction (3DAAC) technology in the Mars environment. The outcome of this competition was that the feasibility of 3DAAC was proven in a terrestrial environment. Before the competition, this technology was at a speculative technology readiness level (TRL) of 2 (technology concept and/or application formulated), and after the competition concluded it had advanced to TRL 3 (analytical and experimental critical function and/or characteristic proof of concept).

Budget and Resources: Agency funds were used to obtain communications support and fund the prize purse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Database development; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Not applicable
FTEs	None reported	Not applicable
Funding Estimate	None reported	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination

Problem or Opportunity Addressed: The 3D-Printed Habitat Challenge sought ideas to develop housing solutions for extended duration missions on planetary surfaces (particularly on Mars) using advanced additive construction technology. This technology used indigenous materials, mission recyclables, and the capabilities of 3D printing to achieve efficient and sustainable building materials and construction. These developments will be applicable both to the fulfillment of the Mars mission and to the creation of cheaper and more sustainable housing solutions on Earth.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community;

Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	None reported	None reported	None reported	None reported
2	None reported	None reported	None reported	None reported
3	$1,320,000	None reported	17	2019-05-04

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$2,000,000	$1,320,000
FY20	Not applicable	Not applicable

Non-Cash Prizes Include: None reported

Participants:

FY19: 19 teams

FY20: Not applicable

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	None reported	None reported	None reported	None reported
2	None reported	None reported	None reported	None reported
3	2017-11-07	2019-05-04	2019-05-04	39

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	None reported
2	None reported
3	Proposal or concept; Prototype device or object; Software or computer code

Submissions: Phase 3 concentrated on hardware and software requirements to design and fabricate large structures autonomously. It was subdivided into two components: (1) Design a virtual model to showcase in a three-dimensional video and (2) Construct a 1/3 scale of habitat exterior that would be subjected to various structural tests.

Evaluation of Submissions: A clear scoring rubric listing the scores for each performance goal was included in the challenge rules. A lead judge was selected from one of the sponsors to bring expertise from the construction industry. In selecting judges, experts with a good mix of experience with both space and terrestrial projects were sought. The submissions were evaluated strictly according to the rules and rubrics established prior to the competition starting. Wherever possible, there were objective guidelines established to help the judges make their evaluations.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Bradley University	Academic Institution	None reported	Not applicable	None reported
US Army Corps of Engineers	Federal Agency or Office	None reported	Not applicable	None reported
Caterpillar Inc.	Private Industry	None reported	Not applicable	None reported
Bechtel Global Corporation	Private Industry	None reported	Not applicable	None reported
Brick and Mortar Ventures	Private Industry	None reported	Not applicable	None reported

Advancement of Agency Mission: Advancements in 3D-Printing (additive manufacturing) will provide benefits to future missions and may enable new mission scenarios. Reducing the amount of material that has to be taken on a lunar or Mars mission using indigenous and recyclable material will reduce overall payload requirements and enable space exploration missions. Autonomous construction on another planetary body will provide habitable space and reduce the risk for astronauts.

Plan for Upcoming Two Fiscal Years: None reported

C.7.2. A Common Restraint and Mobility Aid System for Multiple Gravity Environments[158]

Sponsoring Agency and Office: Space Technology Mission Directorate

[158] The website for A Common Restraint and Mobility Aid System for Multiple Gravity Environments is accessible at https://grabcad.com/challenges/nasa-challenge-a-common-restraint-and-mobility-aid-system-for-multiple-gravity-environments.

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: In microgravity, astronauts need hand rails, foot holds, and work area restraints. In gravity, astronauts may need safety railings, steps or ladders, particularly for large, multi-deck habitats. NASA sought designs for a common restraint and mobility aid system that works in four gravity environments. The challenge received 103 submissions from 35 unique countries. Five winners were awarded.

Budget and Resources: Agency funds were used to obtain communications support and fund the prize purse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.05
Funding Estimate	None reported	$10,000

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: In microgravity, astronauts need hand rails, foot holds, and work area restraints. In gravity, astronauts may need safety railings, steps or ladders, particularly for large, multi-deck habitats.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$7,000	5	5	09-11-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	None reported	None reported
FY20	$7,000	$7,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No participants reported.

FY20: 103 teams

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
07-06-2020	08-17-2020	103

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: Develop a common solution for a single system that will restrain crew members in microgravity, while being unobtrusive in gravity; and that will enable astronauts to translate between decks on the Moon or Mars, but not be a passageway obstruction in microgravity. The same system must be effective in any gravity field, including 0g, 1/6g, 3/8g, and 1g with no reconfiguration.

Evaluation of Submissions: 1. Successful designs will meet submission requirements 2. Short description of restraints and mobility aid system and each component item and how they should be used throughout the Common Habitat. Sufficient to describe your concept. Includes illustrations. 3. Is the design real? Can the design work? Can it actually be created? 4. Meets dimension requirements 5. If an engineer can provide a simulation of the system, that is a plus.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This challenge was in support of the Common Habitat, an exploratory design study seeking to develop a single habitat architecture that functions on the Moon, Mars, in microgravity transit, and as an Earth trainer/analog. The advantage of such a design is that if successful, a single design and procurement activity can provide for all four needs. The solutions would help NASA's human exploration efforts.

Plan for Upcoming Two Fiscal Years: None reported

C.7.3. ALLGO Challenge[159]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

[159] The website for ALLGO Challenge is accessible at https://grabcad.com/challenges/nasa-challenge-an-advanced-lightweight-lunar-gantry-for-operations-allgo.

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: This contest was in support of a NASA concept study called the Advanced Lightweight Lunar Gantry for Operations (ALLGO). The goal of the ALLGO study is to develop an innovative, low-mass unloading system based on inflatable structural components that can be tightly packaged and easily deployed on the lunar surface. NASA sought designs for a mobile lunar gantry system that could be used for routine operations at the Artemis base camp.

Budget and Resources: Agency funds were used to support marketing and communications of the challenge, as well as fund the prize purse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.05
Funding Estimate	None reported	$10,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: Deployment and operations of a lunar base requires an effective system to unload payloads from various lander configurations and transport those payloads to the Artemis base camp that, for safety reasons, will be located one or more kilometers away from the landing site. This contest is in support of a NASA concept study called the Advanced Lightweight Lunar Gantry for Operations (ALLGO). The goal of the ALLGO study is to develop an innovative, low-mass unloading system based on inflatable structural components that can be tightly packaged and easily deployed on the lunar surface.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Engage a specific community; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$7,000	5	5	11-16-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	None reported	None reported

FY	Prize Purse Offered	Prize Purse Awarded
FY20	$7,000	$7,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 0 individuals

FY20: 133 individuals

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-21-2020	11-02-2020	133

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: A successful outcome of this contest is a 3D model of an effective mobile lunar gantry with a primary structure composed of inflatable components such as beams, arches, and tori. In addition, a basic structural analysis is desired that will be used to help assess the designs and potentially help in prototyping a subscale system in a follow-on to the ALLGO study. Contest submissions must include: 1. CAD models of a deployed mobile lunar gantry utilizing inflatable components for much of the primary structure (Submissions to be provided in STEP or IGES file formats). 2. Include a concept for packaging the mobile lunar gantry system that shows a feasible method of deployment from a packaged state on a lunar lander. This may be provided in 2D drawings or as a 3D model. 3. Provide an estimate of system mass and packaged (stowed)/deployed size.

Evaluation of Submissions: 1. Operational feasibility of unloading and transporting lunar payloads 2. Feasibility of operating in a lunar environment 3. Feasibility of deploying from a packaged state 4. Feasibility of packaging inside a launch vehicle 5. Feasibility of manufacturing and fabrication 6. Quality and fidelity of the 3D models

Partnerships: No partners were indicated.

Advancement of Agency Mission: The ALLGO Challenge supported the agency's Moon 2024 efforts and the Artemis program.

Plan for Upcoming Two Fiscal Years: None reported

C.7.4. Artemis Moon Pod Challenge[160]

Sponsoring Agency and Office: Headquarters (Office of Stem Engagement)

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: NASA asked K-12 students to imagine what it might be like if they were living with a pod of astronauts on the Moon. Participants were asked to write an essay imagining leading a one-week expedition at the Moon's South Pole. Students were split into three categories based on grade-level: K-4, 5-8, and 9-12. NASA will distribute prizes to 155 semi-finalists, nine finalists, and three grand prize winners.

Budget and Resources: Agency funds were used to obtain communications support and develop non-monetary awards. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.16
Funding Estimate	None reported	$322,705

Goal Types: Outreach/information dissemination

Problem or Opportunity Addressed: This challenge was designed to engage and educate students about NASA's Artemis program and Moon exploration efforts.

Justification for Using Prizes and Challenges: Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	168	0	12-17-2020

No Prize Purse Information Reported by Fiscal Year.

[160] The website for Artemis Moon Pod Challenge is accessible at https://www.futureengineers.org/artemismoonpodessay.

Non-Cash Prizes Include: Three grand prize winners receive a trip to an Artemis launch with family members; nine finalists (including three grand prize winners) receive a trip to NASA JSC with one chaperone; and 155 semi-finalists (including finalists) will receive a prize pack consisting of: backpack, jacket, $50 STEM e-book credit, and a Fire HD tablet.

Participants:

FY19: 0 individual(s)

FY20: 14,000 individual(s)

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-15-2020	12-17-2020	357

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Posted on challenge.gov

Submission Types: Other (Written Essay)

Submissions: The prompt was as follows: Your challenge is to imagine leading a one-week expedition at the Moons South Pole with the whole world cheering you on. Tell us about the types of skills, attributes, and/or personality traits that you would want your Moon Pod crew to have and why. How many would be in your pod? And of course, you'll need high tech gear and gadgets! In your essay, also describe one machine, robot, or technology that you would leave on the lunar surface to help future astronauts explore the Moon. Your entry must meet these requirements: grades K-4: essay, up to 100 words; grades 5-8: essay, up to 200 words; and grades 9-12: essay, up to 300 words.

Evaluation of Submissions: Description of ability to address challenges and opportunities of exploring the moon, usefulness of proposed science or technology, originality, and overall quality.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This challenge informed a specific audience about NASA's space exploration efforts.

Plan for Upcoming Two Fiscal Years: None reported

C.7.5. Artists Inspire Astronauts[161]

Sponsoring Agency and Office: Centers and Facilities (Kennedy Space Center)

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

[161] The website for Artists Inspire Astronauts is accessible at https://www.nasa.gov/solve/Artists_Inspire_Astronauts.

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: As NASA prepares for the return of human spaceflight from U.S. soil through the Commercial Crew and Artemis Program, Kennedy Space Center is working to ensure they are ready to support launch operations. As part of this push, Astronaut Crew Quarters, which houses astronauts the weeks prior to their mission, has undergone upgrades since the conclusion of the Space Shuttle Program in 2011 to accommodate this new era of human spaceflight. The Artists Inspire Astronauts Challenge was an open competition for artists to submit their work for a chance to be displayed in Crew Quarters. The challenge included themes that are a priority for the agency, including Explore Humans in Space: Leading Discovery; Improving Life on Earth; Explore Moon to Mars: Moon Lights the Way; and Explore Solar System and Beyond: Discovering the Secrets of the Universe.

Budget and Resources: One civil servant organized the challenge and had a couple others help advertise on social media and gather the artwork to provide to the judges--minimal FTE used. The only cost was the printing of the five winning pieces as 4x5 inch metal pieces of art that cost less than $2,000 for all five. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Non-monetary award(s); Publicity, advertising, outreach, or/and communications; Purchase of consumable materials	None reported
FTEs	0.02	None reported
Funding Estimate	$2,000	None reported

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Help to decorate the Astronaut Crew Quarters with inspirational art with little to no budget.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Most cost-effective approach

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$0	5	5	06-06-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$0	$0
FY20	None reported	None reported

Non-Cash Prizes Include: The awards are access to a human spaceflight launch for the artist and up to 3 others (so could be 20 people total). No cost is associated with this.

Participants:

FY19: 200 individuals

FY20: 0 individuals

Intended Participants: Adult not affiliated with higher education

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-15-2019	04-30-2019	200

Solicitation of Submissions: Social media; Press release; Posted on challenge.gov

Submission Types: Creative media

Submissions: Judging was subjective by panel and based on quality, originality, creativity and representation of theme. Judges selected diverse mediums and subject matter to create a varied display of themes. Only submissions meeting those requirements were reviewed. Five pieces of art were selected from hundreds of submissions and the winners received an invitation for them and three guests to attend a Commercial Crew Program launch at Kennedy Space Center along with their art being displayed.

Evaluation of Submissions: There were two astronauts and three judges from the local art community on the panel. Judging was subjective by panel and based on quality, originality, creativity and representation of theme. Judges selected diverse mediums and subject matter to create a varied display of themes. Only submissions meeting those requirements were reviewed. Five pieces of art were selected from hundreds of submissions and the winners received an invitation for them and three guests to attend a Commercial Crew Program launch at Kennedy Space Center along with their art being displayed.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The artwork showcases NASA's vision for the future of human spaceflight. The contest help engage and educate the public about NASA's missions.

Plan for Upcoming Two Fiscal Years: None reported

C.7.6. BIG Idea Challenge[162]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (Cooperative Agreement 31 U.S.C. 6301, et seq)

Status:

[162] The website for BIG Idea Challenge is accessible at http://bigidea.nianet.org.

FY19: Completed

FY20: Ongoing

Competition Summary: Space Technology Mission Directorates (STMDs) Game Changing Development Program (GCD) efforts to rapidly mature innovative/high impact capabilities and technologies for infusion in a broad array of future NASA missions. The BIG Idea Challenge also offers real world experience for university students in the development of the systems needed to support NASAs exploration goals. The BIG Idea challenge allows students to incorporate their coursework into real aerospace design concepts and work together in a team environment. Multi-university and interdisciplinary teams are encouraged. In FY19, the BIG Idea Challenge sought innovative ideas from teams of undergraduate and graduate students at accredited U.S.-based colleges and universities for the design and operation of a Mars Greenhouse. The 2020 BIG Idea Challenge sought innovative ideas from teams of undergraduate and graduate students at accredited U.S.-based colleges and universities affiliated with their states' Space Grant Consortium (or partnered with a space grant affiliated university) for a wide variety of concepts, systems, and technology demonstrations supported by solid engineering rigor that will address near-term technology capability requirements to support NASA's exploration objectives for Permanently Shadowed Regions (PSRs) in and near the Moons polar regions. In FY20, Space Grant leveraged funds to help develop the next line of a STEM-trained workforce with skills and experience aligned directly with STMD technology focus areas and capability needs. For this reason, participation in the 2020 BIG Idea Challenge was limited to space-grant affiliated universities.

Budget and Resources: The administrative costs of the FY19 BIG Idea Challenge activity was $127,766, and the cost of the FY20 Challenge was $750,072. These costs were for manual labor, material and meeting costs for the on-site Forum, and university participation stipends managed by the participating universities Office of Sponsored Programs to enable the teams to conduct rigorous proof-of-concept testing and to participate in the culminating NASA Forum/Design Review, as described in the approved activity on the cooperative agreement between Langley Research Center and National Institute of Aerospace (NIA). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support	Data entry/analysis; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support
FTEs	0.3	0.3
Funding Estimate	$127,766	$750,072

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Other (Educational outreach and engagement)

Problem or Opportunity Addressed: The Challenge provides the free flow of information and ideas between Game Changing Development (GCD) and the university research, education and industry communities, and achieves the following secondary objectives: 1. Opportunities for GCD to inexpensively tap university talent on important challenges facing GCD with potential to advance TRLs; 2. Potentially introduce concepts into future NASA research and program planning; 3. Provide opportunity for NASA GCD engineers interaction with faculty and students and explore workforce pipeline opportunities; 4. Provide real-world challenges for the aerospace industry and other stakeholders that results in the development of a highly talented future workforce; 5. Demonstrate and leverage university-NASA GCD-industry cooperation; and 6. Provide students with the opportunity to develop transferable skills in collaboration, communication, and critical thinking, opportunity to engage in team-work activities, which are relevant and highly desired skills for future NASA GCD.

Justification for Using Prizes and Challenges: Other (N/A - not a prize competition)

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	04-10-2019

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: Opportunity to work on real-world, NASA-based research; Expert feedback from judges; Public recognition; Possibility for tour of NASA Facility; Opportunity to present in front of subject-matter expert judges.

Participants:

FY19: 5 teams

FY20: 8 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	07-31-2019	01-06-2019	04-10-2019	23

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object

Submissions: Prospective teams are asked to submit a 2-minute video and robust project plans detailing their proposed concept, including detailed information on how the proposed concept adhered to the design constraints and requirements for each year's theme. For the FY20 challenge, teams were also asked to include the following information: how their concept could be demonstrated, a brief anticipated path-to-flight, detailed timeline and budget, and a capabilities statement illustrating the teams experience and expertise. In FY20, finalist teams submitted a 5s to 8-page mid-project report in the spring semester their progress, including any significant changes, a contingency plan, a safety plan, an updated timeline and budget, and any impacts of COVID-19. There was no mid-project report due in FY19. The final submission includes a technical report with in-depth details on the final concept, a prototype or proof-of-concept demonstration, a poster, and a presentation intended for public.

Evaluation of Submissions: FY19: Feasibility and completeness of proposed design, including low system mass, optimization for maximum food production, design simplicity, Mars environmental resiliency, and Earth-ground testability (30 pts). Innovation of proposed ConOps for launch, deployment, and sustained operation in theMartian environment (30 pts). Cost effective operation in a Martian outpost and dual use capabilities (10 pts). Impact of knowledge gained from proof-of-concept experimental prototype (10 pts). Quality of 3D CAD models, prototype, and graphics (20 pts). FY20: Technical Paper: 80 points broken down as follows: Proof-of-Concept Testing (30 points); technical Credibility and Feasibility (25 points); technical Management (15 points); and path-to-Flight (10 points). Presentation: 15 points. Poster Session: 5 points. Bonus: up to 10 additional points possible for concepts worthy of investment and/or ready by the early 2020s.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Challenge is an initiative that engages the university community with NASAs Game Changing Development (GCD) Program efforts to rapidly mature innovative/high impact capabilities and technologies for infusion in a broad array of future NASA missions. It links academic institutions with the NASA Space Technology Mission Directorate (STMD), and multidisciplinary university teams are asked to provide innovative solutions to current projects GCD is working on. Each year, the program theme is developed by one of GCDs Principal Technologists (PT), which allows the academic community to be an active, productive, and contributing part of the PTs work at NASA. Within this framework, NASA communicates and interacts with the innovative minds of tomorrow, sharing concepts and technology that could lead to opportunities for future NASA missions. The competition is intended to be an open innovation challenge with minimal constraints so that proposing teams can genuinely create and develop out-of-the-box solutions.

Plan for Upcoming Two Fiscal Years: None reported

C.7.7. Cinespace[163]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

[163] The website for Cinespace is accessible at https://tongal.com/project/Cinespace2019/#!/tab-brief.

FY19: Completed

FY20: Completed

Competition Summary: NASA and the Houston Cinema Arts Society partnered to host the CineSpace Short Film Competition. The challenge sought filmmakers, editors, and animators with a passion for storytelling to create unique films for a chance to win cash prizes. Films were required to be 10 minutes or less and comprised of at least 10% NASA imagery.

Budget and Resources: Agency funds were used to fund the prize purse and obtain communications support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	0.04	0.04
Funding Estimate	$50,000	$50,000

Goal Types: Outreach/information dissemination

Problem or Opportunity Addressed: Engaging and informing the public of NASA's exploration efforts.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$26,000	5	5	11-18-2019
2	$26,000	6	6	11-14-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$26,000	$26,000
FY20	$26,000	$26,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 216 individual(s)

FY20: 285 individual(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	03-01-2019	07-15-2019	11-18-2019	216
2	03-02-2020	07-15-2020	11-14-2020	285

Solicitation of Submissions: Social media; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Creative media
2	Creative media

Submissions: Short films of 10 minutes or less that were comprised of at least 10% NASA imagery.

Evaluation of Submissions: Submissions were evaluated based on the following criteria: Is the work based on innovative artistic presentation and storytelling? Does the work provoke an emotional response? Does the work show a mastery of filmmaking? Does the work show a high level of technical, conceptual, and aesthetic innovation and display an exceptional creative vision? Does the work show an exemplary use of the original NASA material used? Extra credit for using unusual or obscure NASA imagery that hasn't been used before. Judges were internal-to-agency or affiliates of the Houston Cinema Arts Society.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Houston Cinema Arts Society	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported

Advancement of Agency Mission: The competition engaged and informed the public of NASA's exportation efforts.

Plan for Upcoming Two Fiscal Years: None reported

C.7.8. CO2 Conversion Challenge[164]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (51 U.S.C. 20144)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The CO2 Conversion Challenge seeks to develop technologies to manufacture a high energy substrate to serve as food for microbial reactors, which would be used to produce a variety of organic materials. The ultimate goal is to produce glucose, a sugar readily metabolized by substrates that optimizes bioreactor efficiency. Glucose can also be directly used as a food ingredient for human consumption. This challenge provides an opportunity for participants to advance the capability and efficiency of carbon dioxide (CO2)-based physiochemical systems being developed in academic institutions and industry. Applications of this technology could include and address the need to efficiently manufacture a wide variety of materials in space from CO2 and hydrogen using physiochemical synthesis methods. Future planetary habitats on Mars will require a high degree of self-sufficiency. This requires a concerted effort to both effectively recycle supplies brought from Earth and use resources from the Martian surface such as CO2 and regolith to manufacture mission-relevant products. The ability to make glucose in space would enable microbes to rapidly convert it to valuable mission products such as nutrients, pharmaceuticals, plastics and chemicals. Successful outcomes for this challenge not only improve sustainable manufacturing in space but also encourage research of terrestrial applications including recycling CO2 from Earth's atmosphere.

Budget and Resources: NASA contracted a firm to assist in the execution of the challenge by providing: administrative tools and expertise, registration services, determining team eligibility, communications and outreach, screening of submissions, coordinating judging functions, and tracking challenge status and metrics. This contractor also established a website to include all functions associated with participating in the challenge. The CO2 Conversion Challenge also attended the VERGE conference in FY20 to reach a diverse, relevant audience for the purpose of engaging potential participants at the Phase 2 launch. CO2 Conversion Challenge also had an exhibit created that has been used at events and conferences during FY19 and FY20. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Operations or administrative support; Prize purse (monetary award)	Publicity, advertising, outreach, or/and communications
FTEs	1	1
Funding Estimate	$85,000	$6,500

[164] The website for CO2 Conversion Challenge is accessible at https://www.co2conversionchallenge.org; https://www.nasa.gov/directorates/spacetech/centennial_challenges/co2challenge/index.html.

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination

Problem or Opportunity Addressed: Future planetary habitats on Mars will require a high degree of self-sufficiency. This requires a concerted effort to both effectively recycle supplies brought from Earth and use local resources such as CO2, water, and regolith to manufacture mission-relevant products. Many of these required mission products such as food, nutrients, medicines, plastics, fuels and adhesives are organic, and are comprised mostly of carbon, hydrogen, oxygen, and nitrogen molecules. These molecules are readily available in the Martian atmosphere and surface water, and could be used as the feedstock for microorganisms that can efficiently produce a wide array of targeted products. While sugar-based substrates are inexpensively made on Earth by plants, this approach is not easily adapted to a space habitat because it would require large amounts of habitat area to grow plants plus the use of limited resources like energy, water, and crew time. Innovations also have applications on Earth related to CO2 conversion.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$250,000	5	5	05-16-2019
2	$750,000	6	None reported	04-13-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$250,000	$250,000
FY20	$750,000	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 20 teams

FY20: 7 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-30-2018	02-28-2019	05-16-2019	20
2	09-19-2019	12-04-2020	04-13-2021	None reported

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (conference audiences)

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media
2	Prototype device or object; Creative media; Analysis or visualization of data

Submissions: Phase 1: Design—Teams described in detail their approach to achieve the conversion of CO2 to D-glucose or other simple sugars. Teams submitted a system design concept and preliminary supporting data to prove ability to carry out a conversion process. The system had to use CO2 as the sole carbon source for the production of the product compounds and could not use any organic compound(s) as a feedstock. Phase 2: Demonstration—Competitors are required to build, demonstrate, and produce a product from a system that manufactures simple sugars for microbial bioreactors from CO2 and hydrogen molecules, with the ultimate goal of producing glucose. In addition to providing the sample product, the team must indicate the predicted compound(s) in the sample, indicate if a racemic mixture of sugars is expected, and approximate concentrations. The sample must contain one or more challenge target compounds.

Evaluation of Submissions: Phase 1: Each concept design was evaluated by a panel of internal, cross-agency and industry judges who scored the technology overview, assumptions, design schematic, physical properties, data analysis, project milestones, and a video discussing the proposed system's ability to succeed. Phase 2: Will be scored by an on-site, mixed panel of judges who will assess the functional operating system. An independent chemical analysis will be used to determine if any of the targeted compounds are present. Each target compound will be assigned a score by multiplying the mass fraction of the target compound by the corresponding weighting factor. The assigned scores for each target compound will then be added to produce a cumulative score for each team. The cumulative score for each team will be normalized to define the overall score for product quality. Bonus points can be awarded for the overall system effectiveness for future application in space missions.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This challenge advances technology needed in order to establish and maintain the Agency's goal of humans living and working on the surface of Mars. It supports the Artemis mission, which will put the first woman and next man on the Moon. From the Moon, NASA will establish a long-term, sustained presence before proceeding to Mars. NASA's Moon-to-Mars efforts, including the Space Launch System, Orion spacecraft, Human Landing Systems, Moon and Mars science missions, ground support equipment, space suits, and the many other technologies required

to make it all possible, represent a significant investment in our nation's space-faring capabilities, research and education endeavors, and national technology development here on Earth.

Plan for Upcoming Two Fiscal Years: Phase 2 of the CO2 Conversion Challenge will end in FY21 with a submission deadline of December 4, 2020, and awards being announced in April 2021. No additional phases are planned at this time.

C.7.9. Create NTL Videos[165]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: The NASA Tournament Lab enables the use of crowdsourcing, or Open Innovation, to tackle scientific, technological, and engineering challenges to support NASA's mission. The goal of this project is to create a series of animated videos that encapsulate the NASA Tournament Lab's presentation on Open Innovation. This material is meant to serve as a substitute for viewers who may not be able to attend presentations or need supplementary material for later reference. The competition received 22 submissions from eight countries. One winner was selected.

Budget and Resources: Agency funds were used to fund the prize purse and acquire communications support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.01
Funding Estimate	None reported	$91,000

Goal Types: Outreach/information dissemination

Problem or Opportunity Addressed: The goal of this project is to create a series of animated videos that encapsulate the NASA Tournament Lab's presentation on Open Innovation. This material is meant to serve as a substitute for viewers who may not be able to attend presentations or need supplementary material for later reference.

[165] The website for Create NTL Videos is accessible at https://tongal.com/dev/project-info.html?bra=632&r=Q05fMDQwOV9ub25l&set=cix2LF91LHBhZ2VTaXplLHByb2plY3RJZA~~&utm_campaign=CN_0409_none&v=a&_u=24832&utm_medium=share&pageSize=1000&projectId=OpenInnovationAnimationSeries&utm_source=gallery&cket=kaUP%2FPr12o#!/tab-brief.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$44,000	1	1	04-24-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$44,000	$44,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No participants reported.

FY20: 22 teams

Intended Participants: Other (Professional Film Makers)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
04-10-2020	04-20-2020	22

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors

Submission Types: Creative media

Submissions: A series of animated videos that encapsulate the NASA Tournament Lab's presentation on Open Innovation.

Evaluation of Submissions: Submissions were evaluated based on synopsis, links to previous work, treatment, sample art frames, and an option pitch video. Judges were internal-to-agency.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The challenge sought creative solutions for informing internal and external public about NASA's crowdsourcing efforts through the NASA Tournament Lab.

Plan for Upcoming Two Fiscal Years: None reported

C.7.10. CubeQuest Challenge[166]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (51 U.S.C. 20144)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: NASA's Space Technology Mission Directorate/Centennial Challenges program administers the Cube Quest Challenge to incentivize the advancement of CubeSat and nanosatellite capabilities to stimulate the small spacecraft market needed for conducting unique and more affordable science and explorations missions in deep space. The goal of the Cube Quest Challenge is to develop CubeSat technologies and missions with advanced capabilities needed for deep space operations and then to demonstrate their performance at the moon (Lunar Derby) and beyond (Deep Space Derby).

Budget and Resources: The FY19-20 FTE and procurement budget was used for administration of the Challenge, enforcement and updates of the rules, and preparations for the upcoming in-space competition scheduled for FY21-FY22. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination

Problem or Opportunity Addressed: The Cube Quest Challenge incentivizes the advancement of CubeSat and nanosatellite capabilities to stimulate the small spacecraft market needed for conducting unique and more affordable science and explorations missions in deep space. The goal of the Cube Quest Challenge is to develop CubeSat technologies and missions with advanced capabilities needed for deep space operations and then to demonstrate their performance at the moon (Lunar Derby) and beyond (Deep Space Derby).

[166] The website for CubeQuest Challenge is accessible at https://www.nasa.gov/cubequest/details.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low-risk approach and/or pay-for-performance structure; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	None reported	None reported	None reported	None reported
2	$4,500,000	2	None reported	11-01-2022

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$4,500,000	None reported
FY20	$4,500,000	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 3 teams

FY20: 3 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	None reported	None reported	None reported	None reported
2	07-01-2017	None reported	11-01-2022	3

Solicitation of Submissions: Social media; Press release

Submission Types:

Phase	Submission Type
1	None reported
2	Prototype device or object; Software or computer code

Submissions: CubeSats with advanced propulsion, navigation, and communication technologies.

Evaluation of Submissions: A set of eight challenge goals are set for the in-space competition that takes place after a competitor achieves lunar orbit (Lunar Derby) or a range of 4 million km from Earth (Deep Space Derby). A panel of judges (mix of internal and external) will evaluate the data submitted by the teams to select winners.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Advancements in small spacecraft capabilities will provide benefits to future missions and may enable new mission scenarios, including future investigations of the moon and near-Earth asteroids. If capabilities associated with larger spacecraft can be achieved in the smaller platform of CubeSats, there will be a dramatic improvement in the affordability of space missions, and greatly increase science and research possibilities.

Plan for Upcoming Two Fiscal Years: Cube Quest Challenge continues in FY21 and FY22 with the in-space competition phase. In FY21, the top three CubeSat designs are scheduled to launch on NASAs Artemis-1 mission. From the Moon and beyond, the CubeSat operating teams will compete for prizes by accomplishing any of a set of eight in-space competition goals. Other teams may choose to compete by obtaining their own launch to reach the Moon or beyond to compete in the in-space competition. The competition will end exactly 365 days after Artemis-1 launch (regardless of whether or when a team may have obtained their own launch), and prizes will be awarded after all accomplishments are judged at that time.

C.7.11. Exploring Hell: Avoiding Obstacles on a Clockwork Rover[167]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: NASAs Jet Propulsion Laboratory (JPL), under a grant from the NASA Innovative Advanced Concepts (NIAC) program, is studying a mission concept to return to the surface of Venus, known as the Automaton Rover for Extreme Environments (AREE). Current, state-of-the-art, military-grade electronics fail at approximately 125℃, so mission scientists at JPL have taken their design cues from a different source: automatons and clockwork operations. As the rover explores the surface of Venus, collecting and relaying data to an orbiter overhead, it must also detect obstacles in its path like rocks, crevices, and steep terrain. To assist AREE on its groundbreaking mission concept, JPL needed an equally groundbreaking obstacle avoidance sensor; one that does not rely on vulnerable electronic systems. For that reason, JPL turned to the global community of innovators and inventors to design this novel avoidance sensor for AREE. 572 submissions were received from 82 countries. There were 15 winners awarded.

[167] The website for Exploring Hell: Avoiding Obstacles on a Clockwork Rover is accessible at https://www.herox.com/VenusRover.

Budget and Resources: Agency funds were used to obtain communications support for the challenge and fund the prize purse. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award)
FTEs	None reported	0.12
Funding Estimate	None reported	$66,750

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Providing AREE with an obstacle avoidance sensor for potential future missions to Venus.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$30,000	15	15	07-06-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$30,000	$30,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No participants reported.

FY20: 572 teams

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
02-18-2020	05-29-2020	572

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: An obstacle avoidance sensor for AREE that will serve as the primary mechanism by which the potential rover would detect and navigate through dangerous situations during its operational life.

Evaluation of Submissions: The following questions were considered during the evaluation process: Is the concept likely to meet the challenge obstacles avoidance requirements? Is the design something that could actually be constructed? Are there any practical limitations to implementing the design? Would the concept, if built out of the right materials, operate at Venus high temperatures? Would the concept operate at Venus pressure? Judges were internal-to-agency.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The challenge provided a concept/design for application to a potential future rover for continued space exploration.

Plan for Upcoming Two Fiscal Years: None reported

C.7.12. Honey, I Shrunk the NASA Payload[168]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: As human space exploration evolves toward a permanent presence on the lunar surface, In situ Resource Utilization (ISRU) will become increasingly important. Resupply missions are very expensive. We need to develop practical and affordable ways to identify and use lunar resources so that our astronaut crews can become more independent of Earth. NASA issued this challenge to the global community to develop miniaturized payloads that can be sent to the moon in the next 1-4 years and bridge lunar strategic knowledge gaps. The challenge garnered 132 solutions, of which 14 were awarded.

Budget and Resources: Agency funds were used to obtain communications support and fund the prize purse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Prize purse (monetary award); Publicity, advertising, outreach, or/and communications

[168] The website for Honey, I Shrunk the NASA Payload is accessible at https://www.herox.com/NASApayload.

Funding	FY19	FY20
FTEs	None reported	0.17
Funding Estimate	None reported	$242,500

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: The Commercial Lunar Payload Services (CLPS) program supports the Artemis Program through the development and deployment of small robotic landers and rovers. These new lunar micro-rovers will be launching over the next several years to gather information about and conduct scientific research on the lunar surface. To meet the size, weight, and power constraints of these micro-rovers, new scientific payloads have to be designed, built, and tested in time for the different launch opportunities.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$160,000	14	14	07-14-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$160,000	$160,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No participants reported.

FY20: 169 teams

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
04-09-2020	06-08-2020	132

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: Key payload guidance includes: Ability to manage external temperatures ranging from -120℃ to +100℃, Maximum exterior enclosed dimensions of 100mm x 100mm x 50mm, Maximum mass of 0.4 kilograms. There is particular interest in payloads that will help identify and characterize lunar resources, as well as those that will enable ISRU.

Evaluation of Submissions: Proposal quality, capabilities, technical maturity, impact, innovation, compliance with Small Lunar Payload User's Guide requirements.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This challenge supported the agency's space exploration efforts and Artemis program.

Plan for Upcoming Two Fiscal Years: None reported

C.7.13. Human Exploration Rover Challenge[169]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate

Authority: Other authority (51 U.S.C. 20113(e))

Status:

FY19: Completed

FY20: Completed

Competition Summary: Each year, the NASA Human Exploration Rover Challenge (HERC) features an engineering design challenge to engage students worldwide in the next phase of human space exploration. The competition provides an authentic engineering experience for high school and college students. In its second year as an Artemis Student Challenge, student teams design, build and test technologies that enable rovers to perform in a variety of environments. The rovers should be capable of traversing a challenging exoplanetary-like landscape. These engineering challenges, however, are motivated by the assignment of mission objective tasks to be accomplished along the way. Teams have to make real-time decisions about which mission objectives to attempt and which to leave behind all driven by a limited, virtual eight-minute supply of oxygen. The competition course requires two students, at least one female, to traverse a terrain using the student-designed vehicle of approximately 0.50 miles that includes a simulated field of asteroid debris, boulders, an ancient streambed, and erosion ruts and crevasses. The challenges of weight and time requirements encourage the rover to be compact, lightweight, high performance, and efficient. The competition emphasizes designing, constructing and testing technologies, including tools, mobility devices and traversing in unique environments. Teams must document their designs and technologies in a Design Review and Operational Readiness Review, mimicking NASAs design cycle process. Teams earn points by successful completion of design reviews, designing and assembling the rover that is lightweight, successfully completing course obstacles, performing tasks throughout the mission; and meeting pre- and post-challenge requirements. This student design challenge encourages the next generation of scientists and engineers to aid in the design process by providing innovative designs and unique perspectives.

[169] The website for Human Exploration Rover Challenge is accessible at https://www.nasa.gov/roverchallenge.

Budget and Resources: NASA's Human Exploration and Operations Mission Directorate provided funding for FTEs and WYEs, web services, and logistics. Sponsor funding supported prizes and a portion of special events services. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support
FTEs	0.4	0.4
Funding Estimate	$280,250	$220,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training

Problem or Opportunity Addressed: The NASA Human Exploration Rover Challenge looks to the next generation of scientists and engineers to aid in the design process by providing innovative designs and unique perspectives. The challenge also continues the agency's legacy of providing valuable experience to students who someday may be responsible for planning future space missions, including crewed missions to other worlds.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Engage a specific community; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$14,350	29	29	04-13-2019
2	$0	13	13	08-21-2020

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$14,350	$14,350
FY20	$0	$0

Non-Cash Prizes Include: plaques, certificates

Participants:

FY19: 84 teams

FY20: 111 teams

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	10-11-2018	01-19-2019	04-13-2019	84
2	10-10-2019	01-162020	08-21-2020	111

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Software or computer code; Analysis or visualization of data
2	Proposal or concept; Prototype device or object; Software or computer code; Analysis or visualization of data

Submissions: Student teams design and build human-powered rovers capable or traversing a challenging planetary landscape. The challenge's weight and time requirements encourage the rover's compactness and efficiency. Vehicles must be capable of traversing hills up to 5 feet high and pathways with up to 30 degree inclines in the direction of travel. Wheels must be designed by the team and be non-pneumatic. In addition to the vehicle, teams are encouraged to create a telemetry device, complete a spectrographic analysis, deploy a solar-powered instrument, create a core sample retrieval tool, and design and build a 3D-printed tool for liquid sample retrieval.

Evaluation of Submissions: Team submissions were evaluated on effectiveness of product performance by judges from both internal and external to the agency. A variety of awards were presented, and each had its own success criteria. Teams had 6 minutes of oxygen to complete as many obstacles and tasks as possible. One minute of reserve oxygen was added, if necessary, for teams to journey back to home base. However, no additional points could be earned after 6 minutes or during the use of reserve oxygen; all teams should return in 7 minutes or less. Teams returning to the home base within 6 minutes received bonus points. Teams arriving after 7 minutes were not eligible for competition prizes. Obstacles and tasks were assigned points based on difficulty. Additionally, points were given for meeting pre- and post-challenge requirements. Awards were also given for Systems Safety, Technology Challenge, Drivetrain, Best Report, Telemetry/Electronics, Best Design, Task Challenge, STEM Engagement.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
U.S. Space and Rocket Center	Nonprofit Organization (excluding Academic Institutions)	$0	$0
The Boeing Company	Private Industry	$20,000	$0
Jacobs	Private Industry	$10,000	$10,000
Polaris	Private Industry	$10,000	$10,000
Lockheed Martin Corporation	Private Industry	$5,000	$5,000

Advancement of Agency Mission: This challenge meets the following NASA Office of Education 2017 Performance Goals: 2.4.1: Assure that students participating in NASA higher education investments are representative of the diversity of the Nation. Over 600 students participated in the Human Exploration Rover Challenge. Nine of the teams were from Minority-Serving Institutions. Individual participants from minority groups were as follows: Hispanic (197); Black or African American (71); American Indian/Alaska Native (10); Asian (130). 2.4.4: Continue to provide opportunities for learners to engage in STEM education through NASA-unique content provided to informal education institutions designed to inspire and educate the public. The Rover Challenge is held at the U. S. Space & Rocket Center, an Alabama state flagship museum and Smithsonian affiliate. The U.S. Space & Rocket Center also serves as Marshall Space Flight Centers official Visitor Center. The Rover Challenge is open to the public and is widely promoted in the media. 2.4.5: Continue to provide opportunities for learners to participate in STEM education engagement activities that capitalize on NASA-unique assets and content.

Plan for Upcoming Two Fiscal Years: None reported

C.7.14. International Space Apps Challenge[170]

Sponsoring Agency and Office: Science Mission Directorate (Earth Science Division)

Authority: Other authority (51 U.S.C. 20113(e)(NASA Space Act))

Status:

FY19: Completed

FY20: Completed

Competition Summary: Space Apps is the largest global hackathon. It is an international event for coders, scientists, designers, storytellers, makers, builders, technologists, and others in cities around the world, where teams engage with the National Aeronautics and Space Administration's free and open data to address real-world problems on Earth and in space.

Budget and Resources: Space Apps is organized and executed by the Space Apps Global Organizing team, which is comprised of personnel from three contractor firms: Booz Allen Hamilton (prime),

[170] The website for International Space Apps Challenge is accessible at https://www.spaceappschallenge.org/.

Mindgrub Technologies, and SecondMuse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Database development; Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Transportation of participants; Web portal or app development and support	Data entry/analysis; Database development; Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Web portal or app development and support
FTEs	5.2	7.2
Funding Estimate	$1,300,000	$1,800,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The goals of the Space Apps Challenge are: to inspire collaboration, creativity, and critical thinking; to foster interest in Earth and space science and exploration; to raise awareness of NASA data around the world; and to encourage growth and diversity of the next generation of scientists, technologists, designers, engineers, and artists.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	6	6	2019-01-31
2	$0	6	6	2020-01-31

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: Space Apps award winners are featured on the Space Apps website and are invited to present their projects to NASA and observe a rocket launch at Kennedy Space Center (travel permitting - the Space Apps 2019 winners' trip has been postponed due to COVID-19).

Participants:

FY19: 2000 teams

FY20: 3655 teams

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2018-10-19	2018-10-21	2019-01-31	1375
2	2019-10-18	2019-10-20	2020-01-31	2067

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data; Other
2	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data; Other

Submissions: The type of submissions sought by Space Apps is broad and is most simply defined as: demonstrations of the use of NASA data for societal benefit.

Evaluation of Submissions: Space Apps 2018 and 2019 submissions are evaluated by internal subject matter experts from NASA (including contractors and civil servants) according to our internal rubric.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
European Space Agency	Federal Agency or Office	None reported	None reported	None reported

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Canadian Space Agency	Federal Agency or Office	None reported	None reported	None reported
Japan Aerospace Exploration Agency	Federal Agency or Office	None reported	None reported	None reported
CNES- Centre national d'etudes spatiales	Federal Agency or Office	None reported	None reported	None reported
Global Collaborators	Other	None reported	None reported	None reported

Advancement of Agency Mission: Space Apps advanced NASA's mission by inspiring collaboration, creativity, and critical thinking; fostering interest in Earth and space science and exploration; raising awareness of NASA data around the world; and encouraging the growth and diversity of the next generation of scientists, technologists, designers, engineers, and artists

Plan for Upcoming Two Fiscal Years: None reported

C.7.15. International Space Apps COVID-19 Challenge[171]

Sponsoring Agency and Office: Science Mission Directorate (Earth Science Division)

Authority: Other authority (1 U.S.C. 20113(e)(NASA Space Act))

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: On May 30-31, 2020, NASA, along with the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA), the Canadian Space Agency (CSA), and the National Centre for Space Studies (CNES), invited coders, entrepreneurs, scientists, designers, storytellers, makers, builders, artists, and technologists to participate in an all-virtual, global hackathon called the Space Apps COVID-19 Challenge. During a period of 48 hours, more than 15,000 participants from 150 countries created more than 2,000 virtual teams. They used Earth observation and other open data to propose solutions to one of twelve challenges related to the COVID-19 pandemic. The challenges focused on the following themes: (1) Learning about the virus and its spread using space-based data; (2) Local response/change and solutions; (3) Impacts of COVID-19 on the Earth system/Earth system response; and (4) Economic opportunity, impact, and recovery during and following COVID-19.

[171] The website for International Space Apps COVID-19 Challenge is accessible at https://covid19.spaceappschallenge.org/.

Budget and Resources: Agency funds pay for the Global Organizing Team to design, operate, market, and administer the program. The Global Organizing Team consists of contractors at three firms: Booz Allen Hamilton (prime), Mindgrub Technologies, and SecondMuse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Not applicable	Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	Not applicable	1.5
Funding Estimate	Not applicable	$450,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community; Other (Address the COVID-19 pandemic)

Problem or Opportunity Addressed: As the Space Apps COVID-19 Challenge made evident, the unique capabilities of NASA and its partner space agencies in the areas of science and technology enable them to lend a hand during the global COVID-19 crisis. Since the start of the global outbreak, NASA, European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA), the Canadian Space Agency (CSA), and the National Centre for Space Studies (CNES) Earth science specialists have been exploring ways to use unique Earth observation data to aid understanding of the interplay of the Earth system on global to local scales with aspects of the COVID-19 outbreak, including, potentially, our ability to combat it. Space Apps participants explored these themes in their projects, along with the human and economic response to the virus.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$0	6	6	2020-08-03

Non-Cash Prizes Include: Winners are featured on the Space Apps website and are invited to present their projects to NASA and (travel permitting) attend a rocket launch.

Participants:

FY19: Not applicable

FY20: 2268 teams

Intended Participants: Pre-k through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2020-05-30	2020-05-31	1,422

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types: Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: Submissions must include an application of NASA data or other collateral in order to be eligible for global judging. The application can be of Earth or Space science and/or technology, and even artistic and social science submissions are accepted.

Evaluation of Submissions: Over 220 internal, cross-agency, and external subject matter experts volunteered as judges.

Partnerships: The prize competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
European Space Agency (ESA)	Other	Not applicable	$0	None reported
Japan Aerospace Exploration Agency (JAXA)	Other	Not applicable	$0	None reported
Canadian Space Agency (CSA)	Other	Not applicable	$0	None reported
National Centre for Space Studies (CNES)	Other	Not applicable	$0	None reported

Advancement of Agency Mission: None reported

Plan for Upcoming Two Fiscal Years: None reported

C.7.16. ISS Research Design Challenge[172]

Sponsoring Agency and Office: Glenn Research Center

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: Completed

FY20: Completed

Competition Summary: The curiosity-driven design challenge is a joint educational program of NASA and Portland State University (PSU) enabling students to participate in microgravity research on capillary action related to that conducted on the International Space Station (ISS). Students create their own experiments using Computer-Aided Design (CAD) with a provided template and tutorial for the freely downloaded version of DraftSight software. Experiment proposals, which each consist of a single CAD drawing and short entry form, are emailed to NASA. The test cells are then manufactured using the drawings and a computer-controlled laser cutter. Each experiment is conducted in PSUs Dryden Drop Tower, in which it falls 22 meters (73 feet) and experiences 2.1 seconds of apparent near weightlessness, i.e., microgravity. Video and still images from each drop are provided online for student analysis and the reporting of results, for example in a science fair or class presentation.

Budget and Resources: Agency funds were used for challenge staff, i.e., FTE. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE)	Federal personnel (FTE)
FTEs	0.1	0.02
Funding Estimate	$0	$0

Goal Types: Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: The challenge was created to inspire, engage, and educate grade 8-12 youth by providing them an opportunity to create an experiment relevant to NASA while analyzing and reporting on its microgravity results. There are few opportunities for secondary students to experience that breadth of NASA-relevant research in their formative years. Furthermore, this opportunity was open to U.S. territories and overseas Department of Defense Education Activity (DODEA) schools for the children of U.S. military personnel, where most NASA challenges are limited to the 50 states, the District of Columbia, and Puerto Rico.

Justification for Using Prizes and Challenges: Incentivize a larger number of submissions

Cash Prize Purses and/or Non-Cash Prize Awards:

[172] The website for ISS Research Design Challenge is accessible at https://www1.grc.nasa.gov/space/education-outreach/drop-tower-competition/past-drop-tower-challenges-and-competitions/celere/.

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	20	11	11-23-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$0	$0

Non-Cash Prizes Include: Experimental materials by teams selected for testing were fabricated, experiments were conducted in microgravity, and the results were provided. Selected team members could indicate their participation in nationwide design challenge in their college applications, etc. High-performing teams were furthermore invited to present their results at the annual meeting of the American Society for Gravitation and Space Research (ASGSR) at which they were presented with certificates recognizing their distinguished participation.

Participants:

FY19: 11 teams

FY20: No participants reported.

Intended Participants: Other (open to 8th-12th grade students; where furthermore younger students were also allowed if they had grade 8-12 team members)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
03-01-2019	03-31-2019	11

Solicitation of Submissions: Social media; Email; Other (online, e.g., through https://www.nasa.gov/education/materials/ under Contests and Challenges)

Submission Types: Proposal or concept; Analysis or visualization of data; Other (written report (incl. analysis) for selection for American Society Gravitational and Space Research (ASGR) conference participation)

Submissions: The initial submission is a 2D CAD drawing accompanied by a short entry form. If selected for testing (by Oregon Portland State University), the participants are also requested to submit a final report on their experimental results.

Evaluation of Submissions: With the number of proposals received in the FY19 challenge, all teams were selected for testing, although drawing revisions are often requested so that the design rules are met. The selection of teams for invitation to present at the ASGSR conference is based on their use of the scientific method in their experiment design, their analysis of the resulting experimental data, and their written report. The judges were internal to NASA.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Portland State University, Portland, Oregon	Academic Institution	$2,000	None reported	None reported

Advancement of Agency Mission: The challenge advances NASAs mission through the agency's strategic objective 3.3 Inspire and Engage the Public in Aeronautics, Space, and Science. The goal of the challenge is to inspire today's youth to become tomorrow's problem solvers and innovators who will address national challenges and catalyze national growth.

Plan for Upcoming Two Fiscal Years: None reported

C.7.17. Lunar Deep Freeze Challenge[173]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: NASA has a mission critical need for novel small-footprint, lightweight, low to no-power cryogenic containment solutions that will enable long-term storage and transportation of lunar material samples back to Earth. This challenge sought novel ideas to cryogenic containment that would allow lunar sample transport from the Moon to Earth.

Budget and Resources: Agency funds were used for the prize purse and to acquire communications support. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.04
Funding Estimate	None reported	$90,000

[173] The website for Lunar Deep Freeze Challenge is accessible at https://l1.techconnectventures.com/.

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: In 2024, NASAs Artemis program will return astronauts to the Moon for the first time in over 50 years. One of the primary objectives of Artemis will be to explore the permanently shadowed regions (PSRs) at the south pole of the Moon. PSRs are extremely cold (less than -200℃), with frozen conditions that are ideal for trapping and accumulating water, volatiles, and possible organics in the form of ice. NASA has a mission critical need for novel small-footprint, lightweight, and low- to no-power cryogenic (less than -150℃) containment solutions that will enable long-term storage and transportation of lunar material samples back to Earth.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$40,000	6	0	12-11-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$40,000	$40,000

Non-Cash Prizes Include: None reported

Participants:

FY19: No participants reported.

FY20: 75 teams

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-16-2020	11-12-2020	75

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: NASA is seeking novel approaches to cryogenic containment that would allow for lunar sample transport from the Moon to Earth. Any and all innovative approaches are accepted that can deliver or enable long-term cryogenic storage in a small footprint, lightweight, efficient approach.

Evaluation of Submissions: Submissions will be evaluated based on such criteria as performance, design, quality of proposal, safety/risk factors, technical maturity/technology readiness level, novelty, and potential for NASA applications.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The challenge seeks to gather ideas for cryogenic containment solutions that will enable long-term storage and transportation of lunar material samples back to Earth, furthering NASA's space exploration and research capabilities.

Plan for Upcoming Two Fiscal Years: None reported

C.7.18. Mars Ice Challenge[174]

Sponsoring Agency and Office: Space Technology Mission Directorate (STMD, SMD, OCT, HEOMD, SACD, NASA Langley Center Director)

Authority: Other authority (Cooperative Agreement 31 U.S.C. 6301, et seq.)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Through the Revolutionary Aerospace Systems Concepts – Academic Linkage (RASC-AL) Special Edition: Moon to Mars Ice & Prospecting Challenge, NASA will provide university-level engineering students with the opportunity to design and build prototype hardware that can extract water and assess subsurface density profiles from simulated lunar and Martian subsurface ice. Up to ten teams will be selected as finalists through a proposal and down-select process that assesses the team's initial plans and progress throughout the year. Finalists will travel to the NASA Langley Research Center (LaRC) in Hampton, VA in June to participate in a multi-day competition where the universities' prototypes will compete to extract the most water from an analog environment simulating a slice of a combined lunar and Martian surface, while simultaneously using system telemetry to distinguish between overburden layers and create a digital core of the various layers. Each simulated subsurface ice station will contain solid blocks of ice buried under various layers of overburden (terrestrial materials of varying hardness that represent possible materials found on lunar or Martian surfaces). Teams will be asked to provide a digital core that represents their knowledge and understanding of where each of the layers are, the general hardness of each different layer, and the thickness of each layer. The water extraction and prospecting system is subject to mass, volume, and power constraints. In addition to the test and validation portion of the project, teams will present their concepts in a technical poster session to a multi-disciplinary judging panel of scientists and engineers from NASA and industry. Poster presentations will be based on the team's technical paper that details the concept's paths-to-flight (how the design can be modified for use on an actual mission

[174] The website for Mars Ice Challenge is accessible at http://specialedition.rascal.nianet.org/.

on the Moon or Mars). This includes, but is not limited to, considerations for temperature differences, power limitations, and atmospheric pressure differences.

Budget and Resources: The Challenge is an activity managed by the National Institute of Aerospace (NIA) in collaboration with NASA, via a cooperative agreement. All administrative functions of the challenged are funded as a part of the activity's scope. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Database development; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support	Data entry/analysis; Database development; Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support
FTEs	0.15	0.15
Funding Estimate	$250,000	$180,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology

Problem or Opportunity Addressed: By providing students with the opportunity to design & build prototypes that can extract water from simulated lunar and Martian subsurface ice testing environments, a variety of methods can be explored and demonstrated. Recent discoveries about water on the moon and Mars have mission planners re-thinking how a sustained human presence could be enabled by a water-rich environment. This Challenge pulls in innovative thinking from university students on a task that NASA has spent very little resources on, yet may be the true enabler of Earth independence on the moon or Mars. The Challenge may yield several working prototypes of a water extraction system for very little investment and gets the greater community aware of NASA's efforts for off-world water extraction.

Justification for Using Prizes and Challenges: Other (The Challenge is not a prize-based challenge. The most promising designs may result in invitations to present their research at a technical conference, where they can collaborate with others and build on the collective knowledge in this little-explored field, thus enabling critical technology advancement. Subject to the availability of funds, such invitations may include an accompanying stipend to further advance development of the team concept and to offset the cost of traveling to the event.)

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	**Prize Purse**	**Awards Available**	**Awards Given**	**Winners Announcement Date**
1	$0	0	0	05-07-2019

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$0	$0

Non-Cash Prizes Include: Teams have the opportunity to work on real-world, in situ resource utilization (ISRU) research for NASA that is among the first of its kind, and receive expert feedback from subject matter experts. Other non-monetary incentives include public recognition; tours of NASA facilities; the opportunity to demonstrate prototypes to NASA and industry experts; developing capabilities, skills and hands-on experience for resume building; and the potential to attend technical conferences to present their research.

Participants:

FY19: 10 teams

FY20: 10 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-04-2018	11-15-2018	05-07-2019	19

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object

Submissions: Participants submit robust project plans detailing proposed concepts, including descriptions of mechanical, electrical, programming, and control systems, physical characteristics, a 3D model, mounting, a concept of operations, detailed timeline, team experience, paths-to-flight for the moon and Mars, proposed methods for testbed improvements, and (for returning teams) documented lessons learned and enhancements from the previous year. Finalist submit a 3-5 page mid-project review and 1-4 minute video in the spring semester detailing progress on the mounting, control, and operation systems, challenges and solutions, significant design changes, integration and operational test plan, contingency plan, safety plan, and updated timeline. The final submission includes a 10-15 page technical paper and integration video, a poster describing the work conducted and paths-to-flight, and a fully functioning prototype for demo at NASA Langley based on a submitted project plan, mid-project review, and technical paper.

Evaluation of Submissions: The Steering (and judging) Committee is comprised of a mix of NASA and industry experts who evaluate all submission deliverables using rubrics for project plan proposals, mid-project reviews, and onsite technology demonstrations. Projects are evaluated and judged based on adherence to the System Prototype Design Constraints & Requirements and additional criteria. For the onsite competition, 40% of the team's score was related to water extraction, 20% to drilling telemetry, 30% to the technical paper, and 10% to the poster presentation, with points deducted for penalties. Paramount to the Challenge is how well the teams can describe their water extraction systems path-to-flight (i.e., what modifications their system would need to operate on Mars).

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Honeybee Robotics	Private Industry	$5,000	$5,000	None reported
Protolabs, LLC.	Private Industry	$20,000	None reported	None reported
Buechel Stone Corp.	Private Industry	$16,000	None reported	None reported
Aerconn LLC.	Private Industry	$10,000	$10,000	None reported
Pancopia	Private Industry	$500	$500	None reported

Advancement of Agency Mission: The Challenge is an engineering design project and technology demonstration experience aimed at providing university undergraduate and graduate engineering students with the opportunity to assist NASA with achieving its strategic goal of extending humanity's reach into space. By engaging universities as partners in the journey, the Challenge fuels innovation for aerospace systems, analogs, and technology prototyping at our nation's best collegiate institutions and enlists teams of students to focus on ISRU technology demonstrations. Improving ISRU capabilities will be a focus for NASA over the next few decades, and the Challenge serves as an integral part of NASA's talent and idea pipeline. This Challenge fosters open innovation, facilitates technology infusion, and optimizes Agency technology investments for ISRU water harvesting capabilities. The Challenge contributes to the Agency's goals to enhance the STEM experience of undergraduate students and provide graduate-trained STEM professionals with basic and applied research expertise.

Plan for Upcoming Two Fiscal Years: None reported

C.7.19. Micro-G NExT[175]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate

Authority: Other authority (51 U.S. Code 20113(e))

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Microgravity Neutral Buoyancy Experiment Design Teams (Micro-g NExT) is an annual opportunity for undergraduate students to contribute to NASA missions. Student teams design, build, and test devices that address current, authentic space exploration challenges. The technical requirements for each challenge are developed directly with NASA technical organizations at multiple NASA centers. Test operations are conducted in the Neutral Buoyancy Laboratory, a NASA training facility where astronauts train for spacewalks. This Human Exploration Operations Mission Directorate collaboration with Office of STEM Engagement integrates undergraduate students into the technology and hardware development paths of NASA missions in support of human space exploration.

Budget and Resources: Agency funds were used to fund contractor support, website and application development, student lodging for onsite events, testing platform materials, testing facility costs, multimedia support and product development, and NASA internships. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Solution acceleration; Web portal or app development and support	Discovery and design support; Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Solution acceleration; Web portal or app development and support
FTEs	0.8	0.8
Funding Estimate	$395,000	$395,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination

Problem or Opportunity Addressed: The FY19 Challenges focused on design of hardware needed for International Space Station (ISS) extravehicular activities (EVA) and robotic deep space missions. The following mission needs were addressed: 1) a method for both detecting sharp edges and removing or

[175] The website for Micro-G NExT is accessible at https://microgravityuniversity.jsc.nasa.gov/about-micro-g-next.cfm.

permanently covering sharp edges from an EVA handrail on the outside of the ISS; 2) hardware to aid in providing another view of the EVA tasks from a separate camera that the astronauts can carry with them and attach to the ISS exterior nearby their worksite; and 3) an end-effector (gripper) that interfaces with the mini-arm of a robotic vehicle and can manipulate ice cores and instruments in an underwater environment. The FY20 Challenges focused on the design of devices and hardware required for NASA's Artemis program. Tasks focused on design of an autonomous vehicle to seek out crew members and deliver emergency rations in Orion abort scenarios, and design of dust tolerant geology sampling devices for lunar exploration.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	06-06-2019
2	$0	0	0	09-16-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: None reported

Participants:

FY19: 45 teams

FY20: 54 teams

Intended Participants: Undergraduate College/University/Technical students

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-30-2018	11-01-2018	06-06-2019	45
2	08-14-2019	10-31-2019	09-16-2020	54

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Live video streaming announcement

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Creative media

Phase	Submission Type
2	Proposal or concept; Prototype device or object; Creative media

Submissions: Student teams submit technical concept proposals detailing the design of a device and prototype device.

Evaluation of Submissions: The design concept proposals are evaluated on technical criteria by panels of NASA engineers and scientists at multiple NASA centers. The proposals are also evaluated on outreach criteria by the Office of STEM Engagement. Selections for advancement to the build and test component are based on a combination of proposal ranking and technical need.

Partnerships: No partners were indicated

Advancement of Agency Mission: Undergraduate student teams are integrated directly into the NASA technology and hardware development path and create and test hardware directly benefiting NASA missions. Benefits are realized in the area of accelerated technology and hardware development directly applicable to space exploration. Micro-g NExT student-designed tools have been integrated into astronaut training in the Neutral Buoyancy Laboratory (NBL), analog mission training with NASA Extreme Environment Mission Operation (NEEMO), and the Alpha Magnetic Spectrometer (AMS) repair spacewalks aboard the International Space Station. The integration of these tools into NASA missions demonstrate the value of student contributions to NASA's mission.

Plan for Upcoming Two Fiscal Years: As NASA pursues Artemis, landing American astronauts on the Moon by 2024, the agency is accelerating investments in surface architecture and technology development. The Micro-g NExT Challenge targets key aspects of the Artemis mission and is expected to continue engagements in both FY21 and FY22.

C.7.20. Lunar Loo Challenge[176]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: NASA called on the global community for novel design concepts for compact toilets that can operate in microgravity and lunar gravity. The designs may be adapted for use in the Artemis lunar landers. A student challenge was run in conjunction with the primary technical challenge, allowing participants under the age of 18 to submit their ideas.

Budget and Resources: Funds went toward the prize purse for the technical challenge and non-monetary awards for the student challenge. Additionally, funds were used for communications support. The following table indicates the budget and resources to support the activity.

[176] The website for NASA's Lunar Loo Challenge is accessible at https://www.herox.com/LunarLoo.

Funding	FY19	FY20
Agency Fund Use	None reported	Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.55
Funding Estimate	None reported	$79,720

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Although space toilets already exist and are in use (at the International Space Station, for example), they are designed for microgravity only. NASA is looking for a next-generation device that is smaller, more efficient, and capable of working in both microgravity and lunar gravity.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$35,000	6	6	10-21-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$35,000	$35,000

Non-Cash Prizes Include: Student challenge awards included certificates, public recognition, official NASA-logoed merchandise, and additional "mystery" prizes.

Participants:

FY19: No participants reported.

FY20: 2,937 teams

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
06-25-2020	08-17-2020	2,937

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: Lunar toilet design concepts should allow astronauts to urinate and defecate in both microgravity and lunar gravity. To be ready for deployment in 2024, the timelines for development and integration work are quite tight. Successful designs will probably have a Technology Readiness Level (TRL) of 3-5. Toilets will operate in a nominal spacecraft environment with an air pressure of 14.7 psia (sea-level like on Earth) or 8.2 psia, and the toilet storage systems could experience 0 psia (vacuum) during Extra-Vehicular Activities (EVA). Additionally, toilet designs should conserve water and help maintain a pristine environment inside the lander that is free of odors and other contaminants. Complete solutions will be ones that can support a crew of two astronauts for 14 days, while controlling odor and accommodating sick crew members dealing with vomiting and diarrhea.

Evaluation of Submissions: Evaluation based on proposal quality, usage, capacity, technical maturity, safety, and innovation.

Partnerships: No partners were indicated

Advancement of Agency Mission: This Challenge acquired innovative concepts to help astronauts

Plan for Upcoming Two Fiscal Years: None reported

C.7.21. Aeronautics Design Challenge[177]

Sponsoring Agency and Office: Aeronautics Research Mission Directorate

Authority: Other authority (Aeronautics Research Mission Directory (ARMD)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: NASA's nationwide team of aeronautical innovators are committed to giving university students opportunities to solve some of the biggest technical challenges facing the aviation community today. Through NASA-sponsored challenges and competitions, students representing multiple disciplines will put their skills to work by designing and building solutions to real-world problems.

Budget and Resources: Administrative support labor was paid to implement and execute the challenge. Award certificates, food, and lodging were provided as part of the awards symposium. The following table indicates the budget and resources to support the activity.

[177] The website for NASA Aeronautics Design Challenge is accessible at https://www.nasa.gov/aeroresearch/nasa-design-challenges-and-competitions-overview/.

Funding	FY19	FY20
Agency Fund Use	Operations or administrative support; Prize purse (monetary award); Purchase of consumable materials; Transportation of participants; Web portal or app development and support	Operations or administrative support; Prize purse (monetary award); Purchase of consumable materials; Web portal or app development and support
FTEs	None reported	None reported
Funding Estimate	$20,000	$20,000

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Students from U.S. universities are invited to design a safe, reliable autonomous system that can deliver small packages to extremely short-takeoff-and-landing platforms within an urban environment. The system must be designed for autonomous operation with the ability to conduct at least two round trip missions over a 10-mile radius without human intervention.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$12,000	3	3	08-20-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$12,000	$12,000
FY20	$12,000	$12,000

Non-Cash Prizes Include: Awardees were invited to an award symposium at NASA Langley Research Center. U.S.-based awardee institutions were providing lodging and food during participation in the award symposium.

Participants:

FY19: 12 teams

FY20: 11 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-01-2019	06-15-2020	11

Solicitation of Submissions: Social media; Email; Press release

Submission Types: Proposal or concept; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: Students from U.S. universities are invited to design a safe, reliable autonomous system that can deliver small packages to extremely short-takeoff-and-landing platforms within an urban environment. The system must be designed for autonomous operation with the ability to conduct at least two round trip missions over a 10-mile radius without human intervention

Evaluation of Submissions: Internal NASA subject matter experts were assigned to review all submitted proposals. All proposals received at least three reviews. Reviewers were given instructions and a 100-point grading rubric. Categories for review in 2019-2020 included safety/reliability, business case, performance (vehicle and ground systems), operations, and noise.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
German Aerospace Center (DLR)	Other	None reported	None reported	None reported

Advancement of Agency Mission: Competitions that challenge students to create design/build solutions to real-world problems are a proven method for engaging youth in technical disciplines. NASA offers a number of aeronautics or aerospace engineering competitions. Proposals provided innovative ideas and concepts to advance autonomous package delivery. This directly supports the objectives of the Advanced Air Mobility project. The Advanced Air Mobility (AAM) project focuses on enabling emerging aviation markets that will provide substantial benefit to the U.S. public and industry. Starting with Urban Air Mobility (UAM), the AAM project will enable these markets by being a community catalyst and developing and validating system-level concepts and solutions both within AAM and in coordination with other Aeronautics Research Mission Directorate (ARMD) projects that have a role related to enabling UAM.

Plan for Upcoming Two Fiscal Years: NASA plans to continue the NASA Aeronautics Design Challenge for the next two fiscal years.

C.7.22. RASSOR Drum Optimization Challenge[178]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (31 U.S.C. 6301, et seq.)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: NASA sponsored an open competition in which participants design a bucket drum for Regolith Advanced Surface Systems Operations Robot (RASSOR) that will provide the maximum amount of lunar regolith extraction and retention while remaining free of obstructions during loading and unloading. The challenge received 330 submissions of which five were awarded

Budget and Resources: Funds paid for prize purse and to obtain communications support. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	None reported	0.04
Funding Estimate	None reported	$10,000

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Regolith excavation is desired in future space missions for the purpose of In Situ Resource Utilization (ISRU) to make local commodities, such as propellants and breathing air, and to pursue construction operations.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$7,000	5	5	05-04-2020

[178] The website for RASSOR Drum Optimization Challenge is accessible at https://grabcad.com/challenges/nasa-regolith-advanced-surface-systems-operations-robot-rassor-bucket-drum-design-challenge.

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$7,000	$7,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 0 individual(s)

FY20: 330 individual(s)

Intended Participants: Other

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
03-16-2020	04-20-2020	330

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: Design a bucket drum for Regolith Advanced Surface Systems Operations Robot (RASSOR) with maximum total width of scoops engaged at any given time: 175 mm. Maximum bucket drum mass: 5 kg. Maximum bucket drum diameter: 450 mm. Maximum bucket drum length: 360 mm. Minimum volume of regolith captured: 17.6 liters.

Evaluation of Submissions: 1. Successful designs will have a fill ratio higher than 50%. 2. Short description of how your design works and intended fill ratio 3. Is the design real? Can the design work? Can it actually be created? 4. Meets dimension requirements. 5. If the engineer can provide a simulation of the regolith grain, that is a plus.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The crowdsourcing community helped develop a component to further NASA's research and space exploration.

Plan for Upcoming Two Fiscal Years: None reported

C.7.23. Recycling in Space: Waste Handling in a Microgravity Environment[179]

Sponsoring Agency and Office: Space Technology Mission Directorate

[179] The website for Recycling in Space: Waste Handling in a Microgravity Environment is accessible at https://ninesights.ninesigma.com/servlet/hype/IMT?userAction=Browse&documentId=746a9a7f2860bab1f6db99cbf19eb43b&templateName=&documentTableId=1008809502947354747.

Authority: Other authority (Procurement)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: On Earth, recycling technologies can utilize gravity to move waste when converting it to new materials or constituent molecules. In a microgravity environment, however, technology is the only way to transfer the waste for processing. The aim of this Challenge was to identify receptacle and feeder mechanisms suitable for a microgravity environment that can deliver mission waste for decomposition. The challenge received 43 submissions from 18 countries. Three winners were awarded.

Budget and Resources: Funds were used for communications support and the prize purse. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	None reported
FTEs	0.6	None reported
Funding Estimate	$60,000	None reported

Goal Types: Generate innovative ideas/designs/concepts

Problem or Opportunity Addressed: Given the volume and variety of waste products, it is crucial that NASA identify mechanisms to facilitate mission recycling.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$15,000	3	3	04-01-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$15,000	$15,000
FY20	None reported	None reported

Non-Cash Prizes Include: NASA recognized prize winners through published announcements and individual profile stories. Successful entrants also had the opportunity for future collaboration with NASA, including possible SBIR funding.

Participants:

FY19: 43 individual(s)

FY20: 0 individual(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
10-10-2018	01-16-2019	43

Solicitation of Submissions: Social media; Email; Press release; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Proposal or concept

Submissions: The feeder mechanism must: Transfer logistical mission waste from the habitable volume of the ISS (or other off-world habitation) to the waste reactor without dependence on gravity; Consume no more than 500W at peak power; Prevent the escape of waste gases into the habitation; Provide adequate insulation to allow all user surfaces to remain cool to the touch; Connect to 300C reactor via a 2 diameter opening; Ideally, fit within the confines of a middeck locker space; Avoid generation of sounds above 80 decibels; Must be operational within 2-3 years.

Evaluation of Submissions: Accept logistical mission waste from the habitable volume of the ISS (or other off-world habitation) without dependence on gravity; Accept a minimum of 5kg of 100kg/m bagged waste; Prevent escape of waste gases into the habitation; Avoid the use of consumables whenever possible; Ideally, fit within the confines of a middeck locker space; Consume no more than 500W at peak power; Provide adequate insulation to allow all user surfaces to remain cool to the touch; Avoid generation of sounds above 80 decibels; Must be operational within 2-3 years

Partnerships: No partners were indicated.

Advancement of Agency Mission: The challenge found solutions that can help astronauts minimize waste during long-term space exploration missions.

Plan for Upcoming Two Fiscal Years: None reported

C.7.24. Space Robotics Challenge[180]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (51 U.S.C. 2144(NASA Space Act))

[180] The website for Space Robotics Challenge is accessible at www.spaceroboticschallenge.com.

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: Phase 2 of the Space Robotics Challenge (SRC) is seeking to foster the creation or advancement of autonomous capabilities of lunar surface robots. Future ISRU missions may occur on surfaces such as Earth's moon, and will likely need to operate autonomously for long periods of time before, during, and after the presence of astronauts. Robots that can successfully perform ISRU tasks with little to no human intervention are valuable due to both the communication latencies and limited bandwidth between these destinations and Earth. The focus of SRC Phase 2 is on the ability of virtual robotic systems to perform a long-term fully-autonomous ISRU mission for the Moon. This challenge requires competitors to develop software that allows a team of virtual robots to operate fully autonomously for a specified length of time. The competition will be carried out in a robotic simulation format, using Open Robotics Gazebo and Robot Operating System (ROS) platforms.

Budget and Resources: Subject Matter Expert Support from the Johnson Space Center (JSC) Software Development for design and operation of the competition arena – contracted through JSC Centennial Challenges staff support to develop and execute the challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase or rental of equipment; Software development; Web portal or app development and support	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase or rental of equipment; Software development; Web portal or app development and support
FTEs	0.6	0.4
Funding Estimate	$670,000	$670,000

Goal Types: Develop/demonstrate technology

Problem or Opportunity Addressed: Future ISRU missions may occur on surfaces such as Earth's moon, and will likely need to operate autonomously for long periods of time before, during, and after the presence of astronauts. Robots that can successfully perform ISRU tasks with little to no human intervention are valuable because of inherent communication latencies and limited bandwidth between these destinations and Earth. Additionally, NASA has unique constraints for robotic systems in space compared to terrestrial applications, namely the radiation and thermal environments encountered, which affect the processing and sensing capabilities available for robotic systems.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-

for-performance structure; Identify and work with new innovators; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	None reported	None reported	None reported	None reported
2	$0	25	0	2021-01-06

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$375,000	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: 122 teams

FY20: 96 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	None reported	None reported	None reported	None reported
2	08-12-2019	09-16-2020	01-06-2021	23

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	None reported
2	Software or computer code

Submissions: Qualification Round: Comprised of three tasks. Each task will come with its own simulation environment and will be awarded points as described in the Official Challenge Rules. Task 1: Search the lunar surface within a predefined area for resources and report the location and type.

Task 2: Collect a specific amount of resources. Task 3: Locate an object, report the location of that object, and return to home base. Competition Round will consist of all Qualification Round tasks in a continuous time frame. Each competitor will be allowed three runs, and the average score of those three runs will be used for the final score. Scoring will consist of points per unit of resource processed using the processing plant.

Evaluation of Submissions: Qualification Round scoring is specific to each task, and has automated scoring where teams' submitted solutions are run through a scoring algorithm on Amazon Web Services machines. The top 25 scoring teams that are eligible for prizes are asked to submit their code for verification. In the Competition Round, scoring will be based on points per unit of resource processed using a given processing plant. Once each competitor's three scoring runs have been completed on the field computer, the average score of the three runs will be calculated, and all competitors' scores will be ranked highest to lowest. If a tie-breaker is required, the tie-breaker criteria will be applied. In order to qualify for prize money in the Competition Round, competitors are expected to submit an electronic summary containing their concept of operations, results, and lessons learned. Judges will verify the top 10 scoring teams by viewing videos of their solutions to ensure no hacks/cheats were used.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Space Center Houston	Nonprofit Organization (excluding Academic Institutions)	$338,000	$50,000	None reported

Advancement of Agency Mission: The goal of the challenge is to identify and foster the advancement of autonomous capabilities for future planetary surface robotic systems. The challenge is currently ongoing, and solutions have not been finalized or reviewed by the agency yet.

Plan for Upcoming Two Fiscal Years: SRC Phase 2 will announce finalists in January 2021 and announce final winners in September 2021. A Phase 3 for SRC is not planned at this time.

C.7.25. Spacesuit User Interface Technologies for Students (SUITS)[181]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate (EVA Office)

Authority: Other authority (51 U.S.C. 20113(e))

Status:

FY19: Completed

FY20: Completed

[181] The website for Spacesuit User Interface Technologies for Students (SUITS) is accessible at http://go.nasa.gov/nasasuits and http://stem.nasa.gov/artemis.

Competition Summary: NASA Spacesuit User Interface Technologies for Students (SUITS) is a mission-driven project that challenges U.S. undergraduate and graduate students to design and create spacesuit information displays within augmented reality (AR) environments. For exploration, it is essential that crewmembers on spacewalks are equipped with the appropriate human-autonomy-enabling technologies necessary for the elevated demands of lunar surface exploration and extreme terrestrial access. Teams seeking to participate must submit a proposal. Participating teams design software code in Unity providing an audiovisual, possibly tactile, AR environment interface for future spacesuit informatics concept development. Teams must submit the following deliverables as part of participation: team roster; team introduction video; media release; software design review; travel poll; graphical user interface software code; poster; final report (including technical and outreach components); and peer-reviewed report publications or conference proceedings. Student contributions inform the work of NASA's Human Interface branch. Specifically, the optimization of astronaut efficiencies while performing an extravehicular activity (EVA) contributes to the shift in autonomy and operational control schema for extra-terrestrial surface exploration operations. The addition of a dynamic visual display system on the Exploration Extravehicular Mobility Unit helmet uses AR technology as a tool to help provide astronauts with systematic instructions on tasks, support scientific tasks, visualize consumables, enable interfacing with lunar payloads, streamline crew-to-crew communication, support Mission Control Center (MCC) interaction methods, and navigate terrain. SUITS teams explore solutions for path planning and navigation and advanced camera/imagery processing functions that contribute to efficiencies in collecting scientific data during EVAs.

Budget and Resources: Hardware support equipment, Software licenses, (0.5) Work-year equivalent (WYE) Support from NASA STEM Pathway Activities-Consortium for Education (NSPACE) Education Coordinator, Internships, Web development, Consumables, Test scenario materials and set up, Team lunches during the onsite experience, Promotional materials, Audiovisual support. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Database development; Discovery and design support; Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Software development; Web portal or app development and support	Data entry/analysis; Database development; Discovery and design support; Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Software development; Web portal or app development and support
FTEs	1	1
Funding Estimate	$200,000	$250,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination

Problem or Opportunity Addressed: The challenge is to provide astronauts with systematic instructions on tasks and allow them to support scientific tasks, visualize consumables, enable interfacing with lunar payloads, streamline crew-to-crew communication, support MCC interaction methods, and navigate terrain using AR technology as the platform to optimize astronaut efficiencies while performing an EVA. NASA technical community questions to be investigated by SUITS include: How can we best use emerging AR technologies to present data in the most effective and nonobtrusive manner, while keeping crewmembers safe? Which type of spacesuit data should be considered essential and necessary to collect? How can we most efficiently collect this data and display it? What kind of solutions does AR aid in path planning and navigation? What added functionality do we get from registered AR? What will the shift in control structure/autonomy for terrestrial EVAs look like? What advanced camera/imagery processing functions help complete science objectives?

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	04-19-2019
2	$0	0	0	06-11-2020

No Prize Purse Information Reported by Fiscal Year.

Non-Cash Prizes Include: Opportunities to work with mentor engineers at NASA, experience work environments within unique NASA facilities at the Johnson Space Center (JSC), and explore creative and innovative ideas with real-world applications. Opportunities to identify STEM career pathways and internships while developing professional network contacts. Enhancing student abilities to conduct scientific and engineering research and development, including authorship of technical reports for publication in journals and conference proceedings.

Participants:

FY19: 19 teams

FY20: 19 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-30-2018	10-30-2018	04-19-2019	19
2	08-26-2019	10-25-2019	06-11-2020	21

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Software or computer code; Creative media
2	Proposal or concept; Prototype device or object; Software or computer code; Creative media

Submissions: Teams must submit the following deliverables as part of participation: team proposal; team roster; team introduction video; media release; software design review; graphical user interface (GUI) software code; poster; final report (including technical and outreach components); and peer-reviewed report publications or conference proceedings.

Evaluation of Submissions: SUITS uses a proposal process for selecting teams to participate on site or virtually in the challenge. Teams submit proposals that are scored based on 70% technical and 30% outreach requirements. Technical reviewers include internal NASA experts in the EVA office so that design proposals are evaluated by NASA team members working on projects that might directly benefit from student designs. Reviewers provide anecdotal feedback for teams. Outreach reviewers are from Office of STEM Engagement. Project proposals are then ranked holistically to account for the potential utility of ideas, in addition to considering the rubric score, which permits selection flexibility. Teams are selected to participate in on site design evaluations using NASA's unique facilities and assets. Students interact with NASA mentors, engineers, and scientists at a poster session, subject matter experts (SME) presentations, and shark tank-style exit pitches for a mixed panel of EVA SMEs and external partner (Microsoft) SMEs.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Microsoft	Private Industry	None reported	$50,000	None reported

Advancement of Agency Mission: Student contributions to NASA are multi-dimensional in nature, including innovative solutions, the ability to demonstrate the utility of new technologies, and the resources trained interns provide to NASA. The research and development conducted by participants in this activity is contributing to the overall research base for the uses of AR and initiating new opportunities for research funding at higher education institutions. New research conducted by the

higher education institution students and faculty informs the work of the NASA Community and the STEM workplace at large. Because AR is a nascent area of technological development for NASA, students provide opportunities for low-cost, low-risk options for pursuing untested innovations. SUITS interns have also been credited with intellectual contributions. For example, one intern created a telemetry system that is now in use at NASA and is included in NASA's open source repository. SUITS has supported projects for twelve student interns in collaboration with the Human Interface, Informatics and Subsystems SMEs. SUITS provides a high-quality internship and NASA workforce development experience resulting in a pipeline of new hires, including ten Universities Space Research Association (USRA) interns (eight technical and two Office of STEM), three students completing a Pathways conversion to civil service with NASA, and two NASA civil service hires.

Plan for Upcoming Two Fiscal Years: As NASA pursues Artemis, landing American astronauts on the Moon by 2024, the agency is accelerating investments in surface architecture and technology development. For exploration, it is essential that crewmembers on spacewalks are equipped with the appropriate human-autonomy-enabling technologies necessary for the elevated demands of lunar surface exploration and extreme terrestrial access. The SUITS Artemis Student Challenge targets key aspects of the Artemis mission and is expected to continue engagements in both FY21 and FY22. The EVA community will continue to drive the technical requirements of the challenge to ensure that student solutions contribute to and inform the work of the NASA Community and the STEM workplace at large.

C.7.26. Student Launch Challenge[182]

Sponsoring Agency and Office: Office of STEM Engagement

Authority: Other authority (51 U.S.C. 20113(e))

Status:

FY19: Completed

FY20: Completed

Competition Summary: The NASA Student Launch Challenge is a research-based, competitive, experiential exploration activity. It provides relevant, cost-effective research and development of reusable or recoverable rocket vehicle and payload systems. Additionally, Student Launch connects learners, educators, and communities in NASA-unique opportunities that provide authentic STEM experiences. NASA-unique missions and propulsion assets provide opportunities for students that do not exist elsewhere. The activity reaches a broad audience of middle schools, high schools, colleges and universities across the Nation through an eight-month commitment to design, construct, and fly payloads and vehicle components. The teams launch the experiments on high-power rockets and share the research results, which could be used in future design and development of NASA projects.

Budget and Resources: NASA funds were used for Work year equivalent (WYE) support, conference and meeting room space, buses, certified team mentor travel stipends, and supplies necessary to conduct Launch Week events. The following table indicates the budget and resources to support the activity.

[182] The website for Student Launch Challenge is accessible at https://www.nasa.gov/stem/studentlaunch/home/index.html.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Web portal or app development and support	Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Purchase of consumable materials; Purchase or rental of equipment; Web portal or app development and support
FTEs	1.05	0
Funding Estimate	$547,000	$633,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination

Problem or Opportunity Addressed: Student teams develop unique hardware, consisting of both rockets and payloads, to solve science and engineering problems/challenges. During the activity, teams are required to conduct educational outreach in their communities. High school and middle school teams design payloads that relate directly to their school's curriculum. The college and university payload challenge changes each year and is based on current and future NASA missions. The FY20 challenge involved designing a planetary lander capable of surviving a rocket flight, travelling to a sample collection area, collecting a sample of simulated planetary ice, and carrying the sample away from the collection site.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$10,000	20	20	05-16-2019
2	$12,000	18	18	07-23-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$10,000	$10,000
FY20	$12,000	$12,000

Non-Cash Prizes Include: The following awards are announced at the conclusion of each activity year (phase): College/University Division Overall Winner Award (top 10 announced), Rookie Award (top three announced), Best Vehicle Design Award (top three announced), Payload Design Award (top three announced), Safety Award (top three announced), Project Review Award (top three announced), STEM Engagement Award (top three announced), Altitude Award (top three announced), Social Media Award (top three announced), Rocket Fair Display Award (top three announced), Best Looking Rocket Award (top three announced), Team Spirit Award (top three announced), High School/Middle School Division Judges' Choice Award (top three announced), STEM Engagement Award (top three announced), Altitude Award (top three announced), Social Media Award (Top 3 announced), Rocket Fair Display Award (top three announced), Best Looking Rocket Award (top three announced), and Team Spirit Award (top three announced).

Participants:

FY19: 52 teams

FY20: 64 teams

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Other (Middle School students)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-22-2018	09-19-2018	05-16-2019	68
2	08-22-2019	09-18-2019	07-23-2020	73

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data
2	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Creative media; Analysis or visualization of data

Submissions: Teams first submit a proposal. Following the proposal award, teams submit three documents at each of the three design milestones: a report (250 page maximum, each), a PowerPoint presentation, and a Flysheet (detailed performance predictions). Upon completion of the final launch, teams submit a Post Launch Assessment Report. Additionally, teams prepare and submit STEM Engagement reports after each STEM Engagement activity conducted. The STEM Engagement reports analyze the activity conducted and the evaluation data received.

Evaluation of Submissions: A team of judges scores all submissions against a set of rubrics. The judges are all civil servants and contractors supporting NASA.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Northrop Grumman	Private Industry	$50,000	$50,000	None reported
National Space Club - Huntsville	Nonprofit Organization (excluding Academic Institutions)	$5,000	$5,000	None reported

Advancement of Agency Mission: Teams provided new and innovative ideas that could be utilized by NASA in future exploration missions. Additionally, students gained valuable experience in the NASA Design Cycle and were prepared for a future career at NASA or in the private sector.

Plan for Upcoming Two Fiscal Years: None reported

C.7.27. Swarmathon[183]

Sponsoring Agency and Office: Mission Support Directorate (Office of STEM Engagement - MUREP)

Authority: Other authority (51 U.S.C. 20113(e))

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The Swarmathon is a swarm robotics programming challenge that engages college students from minority-serving institutions in NASA's Journey to Mars. Teams compete by programming a group of robots to search for, pick up, and drop off resources in a collection zone. The Swarmathon produces prototypes for robot swarms that would collect resources on the surface of Mars. Robots operate completely autonomously with no global map, and each team's algorithm must be sufficiently flexible to effectively find resources from a variety of unknown distributions. The Swarmathon includes physical and virtual competitions. For the 2019 competition, the student teams tested their algorithms on robots they build at their schools. The teams upload their code, which is then tested in a simulated environment. The top 15 teams were able to move on to a physical competition. Their code had to run autonomously on identical robots in an outdoor arena. Participants had significant gains in both interest and core robotic competencies that were equivalent across gender and racial groups, suggesting that the Swarmathon is effectively educating a diverse population of future roboticist.

[183] The website for Swarmathon is accessible at www.swarmathon.com.

Budget and Resources: Funding is provided through a grant from the NASA Minority University Research Program within the NASA Office of STEM Engagement to the University of New Mexico, as a cooperative agreement. Expenses are paid by UNM through the grant. The grantee was funded to provide administrative and technical support for the competition. The competition was only funded for 3 years, however, in the fourth year, the grantee requested a no-cost extension and the funds were utilized for a smaller-scale competition, similar to the first 3 years. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Purchase of consumable materials; Software development	None reported
FTEs	0.5	None reported
Funding Estimate	$60,000	None reported

Goal Types: Generate innovative ideas/designs/concepts; Education/training

Problem or Opportunity Addressed: The Swarmathon is a challenge to develop cooperative robotics to revolutionize space exploration, enhancing the operations and efficiency of algorithms for autonomous swarming robotics operations. Students from Minority Serving Institutions (MSIs) are challenged to develop search algorithms for robotic swarms. Swarmathon participation is designed to (1) improve students' skills in robotics and computer science and (2) further advance technology for future NASA space exploration missions. The Swarmathon project uses small, robotic vehicles called *Swarmies* to challenge programming skills of students at select minority-serving institutions. Swarmies are small robotic vehicles equipped with a Wi-Fi antenna, GPS, webcam, and sensors. Swarmies are developed to search for resources and have the potential to be used in space exploration. For the competition, the resource was cubes.

Justification for Using Prizes and Challenges: Incentivize a larger number of submissions; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$4,300	5	5	06-12-2019

FY	**Prize Purse Offered**	**Prize Purse Awarded**
FY19	$4,300	$4,300
FY20	None reported	None reported

Non-Cash Prizes Include: Certificates for all participants, and for 1st, 2nd, and 3rd place winners. Robots are capable of carrying out many tasks in space more safely and more cheaply than humans

can. Robots also require roboticist, computer programmers, and engineers. This competition has set hundreds of students, who would not normally have access to a robotics environment, on a career path in robotics.

Participants:

FY19: 18 teams

FY20: No participants reported.

Intended Participants: Undergraduate College/University/Technical students

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
08-01-2018	05-30-2019	18

Solicitation of Submissions: Email

Submission Types: Software or computer code; Analysis or visualization of data

Submissions: software code; technical conference style poster

Evaluation of Submissions: Student teams are challenged to develop search algorithms for robotic swarms. These algorithms are written in Robot Operating System (ROS) with Java and C++. Teams submit their code about 4 weeks before the actual competition. These search algorithms are run on house Swarmies on the week of competition. The objective is to find resources (in the form of cubes with software tags on them). Judges monitor the software and the robots during their runs, which are 20-40 minutes long. Winning teams obtain and return the most resources to the home collection nest.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
University of New Mexico	Academic Institution	$0	None reported	None reported

Advancement of Agency Mission: In situ resource utilization is a priority for long-term exploration on other planets, as well as robotic missions. Swarming robotics is still a relatively new field, including the algorithms utilized for autonomous operations. In situ resource utilization of water or ice to provide hydrogen and oxygen for fuel, breathing, and drinking and other resources on planetary bodies in support of human missions to the Moon and Mars is a stated goal of the agency. Being able to send robots to gather these resources rather than sending the tons of fuel, oxygen, and water required to support extended missions makes them not just cheaper but, in many cases, feasible. To make robots a realistic option for supporting human missions we have to understand how to organize teams of lightweight robots so they can find and collect resources efficiently. This competition has allowed universities and colleges to submit their ideas on how best to accomplish that task using real

robots. The increase in team performance over the course of the competition in solving the task is impressive.

Plan for Upcoming Two Fiscal Years: None reported

C.7.28. Vascular Tissue Challenge[184]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Other authority (51 U.S.C. 20144)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The goal of the Vascular Tissue Challenge (VTC) is to break through one of the critical obstacles in developing medically useful 3D-engienered heart, lung, kidney, liver and pancreas tissues for pharmaceutical research, organ bandages and ultimately organ transplants on Earth or in space. Specifically, the VTC goal is to inspire the successful creation of thick (1 cm x 1 cm) human vascularized organ tissue in an engineered environment while maintaining the function of the tissues similar to those within the human body throughout a 30-calendar day survival period. Teams must demonstrate three successful trials with at least a 85% trial success rate to win an award. Current state of the art is 2mm for tissue size with no vascular system or a vascular system where tissues do not behave as they do in the body. No one has achieved the combination of increase in size with a vascular system that functions as organ tissues do in the body. Because there are data indicating that engineered tissues can grow larger and more medically relevant in space, the winning team may be offered the opportunity to fly its solutions on the International Space Station.

Budget and Resources: Funds were used to administer the prize for the support from Subject Matter Experts and for time needed for judging entries/applications. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration
FTEs	1	1
Funding Estimate	$294,000	$241,000

[184] The website for Vascular Tissue Challenge is accessible at https://www.nasa.gov/directorates/spacetech/centennial_challenges/vascular_tissue.html and https://test.neworgan.org/vtc-prize.php.

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Other (Advance scientific research, stimulate a market and provide lifesaving medical advances)

Problem or Opportunity Addressed: Teams must create thick, metabolically functional human vascularized organ tissue in a controlled Earth laboratory environment. Related cells joined together are collectively referred to as tissue, and these cells work together to accomplish specific functions as organs in the human body. Blood vessels around the cells vascularize, providing nutrients to the tissue to keep it healthy. The vascularized, thick-tissue models resulting from this challenge will function as organ models that can be used to study deep-space environmental effects, such as radiation, and to develop strategies to minimize the damage to healthy cells. Studying these effects will help us mitigate negative effects on humans during long-term, deep-space missions. On Earth, the vascularized tissue could be used in pharmaceutical testing or disease modeling. The challenge could also accelerate new research and development to advance the capabilities needed to significantly reduce the organ shortage in a near future.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$500,000	3	None reported	05-14-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$500,000	None reported
FY20	$500,000	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 14 teams

FY20: 22 teams

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Small businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
09-13-2016	04-30-2021	22

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Presentations and Publications of professional papers)

Submission Types: Analysis or visualization of data; Other (Scientific, Science and Technology Breakthrough in medically important 3D tissue engineering)

Submissions: Teams will undergo laboratory tests, with check-ins by judges at the 10, 20, and 30 day periods, growing one or more of these tissue types: heart, liver, kidney, lung, muscle or pancreas. A successful trial and one that meets the criteria for scoring is one in which the selected tissue survives over a 30 calendar day period in vitro and meets the performance on the evaluation criteria for the specific tissue being grown. A tissue is defined to have survived if equal to or greater than 85% of the parenchymal cells have remained functioning and producing the stated, natural functions of that tissue at the conclusion of the trial with no more than 20% variability from a naturally functioning tissue. The tissue sample being evaluated must be greater than or equal to 1-centimeter minimum thickness in all dimensions at the beginning of the trial.

Evaluation of Submissions: The Vascular Tissue Challenge offers a $500,000 prize to be divided among the first three teams that successfully create thick, metabolically-functional human vascularized organ tissue in a controlled laboratory environment. These criteria for success are explained in an earlier section of this record. This competition is a first to succeed, first to win challenge with the first place team receiving $300,00 and second and third place teams receiving $100,000 each.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Methuselah Foundation/New Organ Alliance	Nonprofit Organization (excluding Academic Institutions)	$150,000	$150,000	None reported

Advancement of Agency Mission: NASA's objective for this Challenge is to produce technologies capable of creating viable thick (greater than or equal to 1 cm) metabolic tissues that can be used to advance research on human physiology, fundamental space biology and medicine taking place both on Earth and in space. These technology innovations may enable the growth of de novo tissues and organs on orbit, which could improve general crew health and enhance crew performance on future, long-duration missions, as well as offer the potential for advancing research on organ transplants for earth applications. Its goals align with the mandate in the 1958 Space Act, as amended in Public Law 111-314- Dec 18, 2010, requiring NASA to direct science and engineering systems to assist in bio-engineering research, development and demonstration programs designed to alleviate and minimize the effects of disability.

Plan for Upcoming Two Fiscal Years: This competition will end in April 2021. If solutions are found, winning teams will be announced in May 2021.

C.7.29. Watts on the Moon Challenge[185]

Sponsoring Agency and Office: Space Technology Mission Directorate (Centennial Challenges Program)

Authority: Other authority (51 U.S.C. 20144)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: As NASA works to extend human exploration of the solar system, unprecedented capacity for energy distribution, management, and storage will be needed to support sustained human presence and the beginning of industrial activity. Solar energy is abundant on the surface of the Moon, but extended night hours (350 consecutive hours) and the extreme environmental temperature change from daylight to nighttime, create problems for solar power use. Earth also addresses similar issues, where demand for additional renewable energy generation, including solar, is rising, but additional power management, distribution, and energy storage solutions are needed to address issues such as intermittency and resiliency. NASA's Watts on the Moon Centennial Challenge seeks solutions for energy distribution, management, and/or storage that address NASA technology gaps and can be further developed for space flight and future operation on the lunar surface. Not only could novel solutions make a difference in lunar and space exploration, but technologies discovered during NASAs Watts on the Moon competition could help facilitate new power options on Earth.

Budget and Resources: Funds were used to secure the time of Subject Matter Experts and consultants to develop the challenge and deliver the final rules. Contractors were used to manage the administration of the participants. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	None reported	1.5
Funding Estimate	None reported	$421,000

Goal Types: Other (Challenge just launched/opened)

[185] The website for Watts on the Moon Challenge is accessible at https://www.nasa.gov/directorates/spacetech/centennial_challenges/watts-on-the-moon/index.html and https://www.herox.com/WattsOnTheMoon.

Problem or Opportunity Addressed: NASA seeks to incentivize flexible, robust energy distribution, management and storage solutions to power future Moon missions with the Watts On The Moon Centennial Challenge.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$500,000	7	0	05-20-2021

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$500,000	None reported

Non-Cash Prizes Include: The Phase 1 prize purse will awarded in 2021 and is up to $500,000. If we proceed to Phase 2, the prize purse will be up to $4.5 Million. No non-monetary incentives were advertised.

Participants:

FY19: No participants reported.

FY20: No participants reported.

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses; Other (Anyone 18 years or older that is a US Citizen)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	09-25-2020	03-25-2021	05-20-2021	None reported

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Presentations and Publications of professional papers)

Submission Types:

Phase	Submission Type
1	Proposal or concept; Creative media

Submissions: A technical concept design and video.

Evaluation of Submissions: NASA will select a panel of judges from NASA, Industry and Academia. Each Phase 1 Submission should include the following elements: Concept Design Paper that includes a Title, Technical Abstract, Technology Readiness Level (TRL), Technical Approach, Intellectual Property (IP), Addresses the Mission Scenario and Mission Activities, Development Plan, Terrestrial Impacts and Environmental Sustainability. The submission should include a 90 second video to introduce the team and pitch the proposed solution.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
Air Force	Federal Agency or Office	None reported	None reported	None reported
NREL	Federal Agency or Office	None reported	None reported	None reported

Advancement of Agency Mission: The NASA Watts On The Moon challenge is part of the roadmap to get humankind back to the Moon. Once we have sustained human presence on the Moon, it will be vital to have flexible, robust energy distribution, management and storage solutions.

Plan for Upcoming Two Fiscal Years: The NASA Centennial Challenges Program is currently working on three challenges that will go through FY22. NASA's Watts On The Moon Challenge opened 9/25/2020, NASA's Break the Ice Lunar Challenge will open in November, 2020 and NASA's Deep Space Food Challenge will open in January, 2021. Each of these challenges is expected to last around three years.

C.8. National Science Foundation (NSF)

C.8.1. The NSF 2026 Idea Machine[186]

Sponsoring Agency and Office: Office of Integrative Activities

Authority: Other authority (NSF Act of 1950, as amended)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: NSF priorities require bold approaches built on innovative research. For NSF's long-term agenda to have the greatest effect, it must venture beyond traditional paradigms to invite

[186] The website for The NSF 2026 Idea Machine is accessible at https://www.nsf.gov/news/special_reports/nsf2026ideamachine/index.jsp.

input from trusted stakeholders as well as new and unconventional partners. In this way, NSF ensures that its future research themes are inclusive, innovative, and in touch with the interests and priorities of the American people. In the summer of 2018, NSF invited the scientific community, industry, nonprofits, and the public at large to participate in the NSF 2026 Idea Machine, a competition to help set the U.S. agenda for fundamental research in science and engineering. The Idea Machine encouraged individuals from all walks of life, age 14 or older, to submit pressing "grand challenges" in fundamental research or STEM education that have potential for great impact. NSF received about 800 entries from nearly every state in the U.S. Entries were submitted by established researchers, undergraduate and graduate students, teachers on behalf of their classes, and even high school and middle school students. Through multiple review stages—including inviting video pitches of top entries, which were made available for public comment, and review by a blue-ribbon panel comprised of external broad thinkers—four top entries were awarded the Grand Prize of $26,000 per team and three entries were awarded the Meritorious Prize, receiving $10,000 per team. This was an out-of-the-box contest based on big ideas and foresight. From these submissions, NSF seeks compelling research questions that can be developed into thoughtful, cross-cutting research agendas that bridge recognized gaps in our existing knowledge.

Budget and Resources: National Science Foundation sought a turnkey solution to properly design, efficiently operate, build awareness and drive participation in the NSF 2026 Idea Machine Challenge through a contract that was awarded in FY18. Most expenses, including the prize purse (monetary awards) were covered under that contract (i.e., with the FY18 funds). The contract included tasks such as project planning, online platform preparation, receiving submissions and supporting the review/selection stages, prize distribution, and final reporting and data delivery. Addition agency funds were used to support the blue-ribbon panel in FY19 and award ceremony (non-monetary award expenses) in FY20. In addition, research funds were used in both FY19 and FY20 to support research proposals that align with the top running NSF 2026 Idea Machine entries (but these proposals are not part of the NSF 2026 Idea Machine prize competition). An evaluation project was initiated in FY20 to assess the NSF 2026 Idea Machine competition. Most of the funds used for this competition were obligated in FY 2018 for a contract issued in FY 2018. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support	Federal personnel (FTE); Operations or administrative support; Purchase of consumable materials; Transportation of participants
FTEs	0.5	0.25
Funding Estimate	$25,000	$12,000

Goal Types: Generate innovative ideas/designs/concepts; Outreach/information dissemination; Build or strengthen a community; Other (improve public understanding of the NSF mission)

Problem or Opportunity Addressed: In the nearly 70 years since it was founded, NSF has played a critical role in establishing U.S. leadership in fundamental STEM research and education, advancing knowledge and creating innovations that drive the nation's economy and enhance its security, and in training the next generation of scientists and engineers. The NSF 2026 Idea Machine is NSF's way of asking the public and research community for input on the nation's long-term research agenda. NSF

wants to hear from all interested stakeholders including the general public about the most important and potentially transformative basic research questions.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Most cost-effective approach; Low-risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area.

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	0	0	02-07-2020
2	$0	0	0	02-07-2020
3	$0	100	100	02-07-2020
4	$0	33	33	02-07-2020
5	$11,000	48	11	02-07-2020
6	$134,000	1	7	02-04-2020

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$145,000	$145,000

Non-Cash Prizes Include: The participants in the top seven winning teams each received a trophy and an NSF Director-signed award certificate. They were also invited to attend an award ceremony at the NSF headquarters and met with the National Science Board (NSB) members. The top 33 winning entry submitters each received a thank-you letter from NSF leadership. Approximately the top 100 entries received public recognition by being posted on the Idea Machine website.

Participants:

FY19: 800 teams

FY20: 7 teams

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Retiree; Small businesses; Large businesses; Other

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	08-31-2018	10-26-2018	02-07-2020	800

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
2	11-01-2018	01-31-2019	02-07-2020	333
3	03-13-2019	05-14-2019	02-07-2020	100
4	05-31-2019	07-23-2019	02-07-2020	33
5	07-23-2019	09-16-2019	02-07-2020	14
6	11-25-2019	01-29-2020	02-04-2020	7

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (agency website)

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept
3	Proposal or concept
4	Proposal or concept; Creative media
5	Proposal or concept; Creative media
6	Proposal or concept; Creative media

Submissions: NSF sought submission of ideas that address a compelling research challenge in fundamental STEM or STEM education that is large in scope, innovative in character, and requires a long-term commitment (i.e., ten years or more) to address. The submission would be in the form of a narrative that addresses the following questions: What is the compelling question or challenge? What do we know now about this Big Idea and what are the key research questions we need to address? Why does it matter? What scientific discoveries, innovations, and desired societal outcomes might result from investment in this area? If we invest in this area, what would success look like? Why is this the right time to invest in this area?

Evaluation of Submissions: Most reviewers for various phases were internal reviewers, including Program Directors, Science Assistants, American Association for the Advancement of Science (AAAS) Science and Technology Policy fellows, and others. Public comments were invited for the video clips submitted by the top 33 entry teams. One blue ribbon panel of external reviewers from different organizations was assembled to evaluate the top 14 entries.

Partnerships: There were no partners other than the contractor that provided the competition platform.

Advancement of Agency Mission: NSF priorities require bold approaches, built on innovative research. For NFS's long-term agenda to have the greatest effect, it must venture beyond traditional paradigms to invite input from trusted stakeholders as well as new and unconventional participants. The NSF 2026 Idea Machine is a new, creative way to engage and seek input from a broad range of contributors. It complements the existing channels NSF uses to ensure future research themes are inclusive, innovative, and in touch with the interests and priorities of the American people.

Plan for Upcoming Two Fiscal Years: None reported

C.9. Office of the Director of National Intelligence (ODNI)

C.9.1. Geopolitical Forecasting Challenge[187]

Sponsoring Agency and Office: Intelligence Advanced Research Projects Activity (IARPA)

Authority: Unknown

Status:

FY19: Launched

FY20: Completed

Competition Summary: We are on a mission to improve the accuracy and timeliness of geopolitical forecasts by advancing the science of forecasting. Are you up to the challenge? The second Geopolitical Forecasting Challenge (GF Challenge 2) presents Solvers with questions ranging from political elections to disease outbreaks to macro-economic indicators and asks for innovative, programmatic solutions that can include any combination of human forecasts and their own data sources and models into accurate, timely forecasts. This is your chance to test and showcase your forecasting methods and prove yourself against other state-of-the-art methods. GF Challenge 2 offers Solvers the opportunity to advance your research, contribute to global security and humanitarian activities, and enhance the science of forecasting, as part of a collaborative community.

Budget and Resources: Agency funds were used to contract with a team for challenge administration, publicity, technical infrastructure, and analysis of the results. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Database development; Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Data entry/analysis; Database development; Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.1	0.1
Funding Estimate	$892,028	None reported

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Develop/demonstrate technology

[187] The website for Geopolitical Forecasting Challenge is accessible at https://www.iarpa.gov/index.php/working-with-iarpa/prize-challenges/1158-geopolitical-forecasting-challenge-2-gf-challenge-2.

Problem or Opportunity Addressed: Existing methods of geopolitical forecasting include human judgment-intensive methods, such as prediction markets, and data-intensive approaches, such as statistical models, and this challenge seeks to push the limits of those methods to find new breakthroughs. GF Challenge 2 Solvers, participating as individuals or teams, will develop solutions capable of producing forecasts to a series of closed-ended questions that concern specific, objectively-verifiable geopolitical events with deadlines and locations.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$250,750	47	47	2020-01-22

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$15,000	$15,750
FY20	$235,000	$235,000

Non-Cash Prizes Include: Recognition on a challenge leaderboard.

Participants:

FY19: 36 team(s)

FY20: 36 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	None reported	None reported	None reported	None reported
2	2019-05-15	2019-11-29	2020-01-22	36

Solicitation of Submissions: Social media; Email; Press release; Posted on challenge.gov

Submission Types:

Phase	Submission Type
1	None reported
2	Proposal or concept; Other

Submissions: The primary submissions were daily probabilistic forecasts for 304 prospective forecasting questions. Prize winners were required to provide a short document summarizing their approaches.

Evaluation of Submissions: Submissions were scored objectively for accuracy using Brier scores. Scores were first averaged across the days of a forecasting question to determine a question score. These question scores were then averaged to obtain an overall score for the submission. Scoring functions were performed by the contractor team administering the challenge and the IARPA Government Program Manager had final approval authority.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: Geopolitical forecasting provides strategic advantages in maintaining global security, predicting economic trends, and directing the need for humanitarian efforts. Embracing non-traditional sources, encouraging novel approaches, and harnessing the collective community, we will increase the accuracy and accelerate the timeliness of geopolitical forecasting, while advancing the overall science of forecasting.

Plan for Upcoming Two Fiscal Years: None reported

C.9.2. OpenCLIR (Open Cross-Language Information Retrieval)[188]

Sponsoring Agency and Office: Intelligence Advanced Research Projects Activity (IARPA)

Authority: Unknown

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The goal of the OpenCLIR (Open Cross-Language Information Retrieval) Challenge is to seek novel methods to automatically locate information in speech and text documents in low-resource languages, using English queries. This capability is expected to be one of several to support effective triage and analysis of large volumes of data in a variety of less-studied languages for monolingual speakers. Open to all researchers, the OpenCLIR Challenge was a simplified, smaller-scale evaluation of the evaluation that was conducted for the ODNI IARPA MATERIAL (Machine Translation for English Retrieval of Information in Any Language) Program (https://www.iarpa.gov/index.php/research-programs/material) that included more tasks and more languages. By making the challenge public, OpenCLIR hoped to find new ideas and perspectives outside of the BAA (Broad Agency Announcement) process. The National Institute of Standards and Technology (NIST) conducted the OpenCLIR Challenge on behalf of IARPA (Intelligence Advanced Research Projects Activity), who sponsored the challenge.

Budget and Resources: Agency funds were used to pay for operational and administration costs, including FTEs who oversaw, implemented, and conducted the challenge, computing and storage server costs, website domain registration fee, and administrative overheads. The following table indicates the budget and resources to support the activity.

[188] The website for OpenCLIR (Open Cross-Language Information Retrieval) is accessible at https://www.nist.gov/itl/iad/mig/openclir-challenge.

Funding	FY19	FY20
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Software development; Web portal or app development and support	Not applicable
FTEs	0.2	Not applicable
Funding Estimate	$60,000	Not applicable

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Build or strengthen a community

Problem or Opportunity Addressed: The OpenCLIR Challenge hoped to find new ideas outside of the IARPA MATERIAL Program BAA process. The high entry bar set by an IARPA Program BAA process sometimes may limit smaller, less well-funded research groups from participation. By making the challenge public with none of the administrative hurdles, OpenCLIR facilitated entries from these smaller groups. With a modest prize purse and leveraging the data resources and infrastructure already invested in MATERIAL, OpenCLIR was cost-effective with potentially high reward. Even if no new ideas resulted from the challenge, it served as a low-cost validation against the work of funded contractors.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$10,000	2	1	2019-11-08

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$30,000	$10,000
FY20	None reported	None reported

Non-Cash Prizes Include: Non-monetary prize included a press release as well as publicity through a social media platform such as Twitter from the sponsoring agency.

Participants:

FY19: 5 team(s)

FY20: No teams reported

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2018-07-12	2019-07-12	27

Solicitation of Submissions: Social media; Email

Submission Types: Other (system output and system description paper)

Submissions: Participants were asked to process the test data locally and submitted their system output to NIST, where the output was compared against the answer key. Participants were also required to submit a paper describing their system. Their paper was reviewed by three external peers.

Evaluation of Submissions: Participants were asked to process the test data and submit their system output following a specified format. Each system output was compared against the answer key, and a score was computed according to the metric specified in the evaluation specification document. Participants were also required to submit a paper describing their system. Each paper was peer-reviewed by three independent external reviewers and was given a score based on the judging criteria also given in the evaluation specification document. Teams with the system score that met the target threshold would be eligible for the prize. The team with the highest combined system and paper score would be declared the winner of the given track.

Partnerships: The prize competition involved 1 partner. The following table lists this partner and its contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution	Partner Contribution Types
IARPA	Federal Agency or Office	$30,000	None reported	Prize purse (monetary award); Non-monetary award(s); Publicity, advertising, outreach, and/or communications; Other (training, development, and test data)

Advancement of Agency Mission: The OpenCLIR Challenge enabled more researchers to work on the sponsoring agency's problem at very little cost since it leveraged infrastructure and data resources created for the sponsors' funded program MATERIAL. By making the challenge open to everyone, it attracted a diverse set of researchers to help build the critical mass needed to generate innovative new ideas to solve and advance cross-language information retrieval.

Plan for Upcoming Two Fiscal Years: There is no plan for a prize competition in FY21. However, we are in the middle of a leaderboard style challenge where the results of the challenge will be published but no monetary prize will be awarded.

C.10. U.S. Agency for International Development (USAID)

C.10.1. Artisanal Mining in the Amazon Grand Challenge[189]

Sponsoring Agency and Office: Peru Environment and Sustainable Growth (ESG) Office

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: Artisanal and small-scale gold mining (ASGM) is a major threat to biodiversity across the Amazon region, causing habitat destruction, sedimentation, and mercury bioaccumulation that harms human health and ecosystems. With Conservation X Labs, U.S. Agency for International Development (USAID) will engage with regional innovators and the private sector in developing and implementing solutions to help make ASGM operations more environmentally responsible and socially equitable. Conservation X Labs (CXL) will launch a new Amazon Region focused Grand Challenge in partnership with USAID to find new innovations to address extractive activities in the Amazon basin. This activity will complement ongoing USAID bilateral efforts related to artisanal and small-scale gold mining. Awardees will show how the innovation will help reduce threats to biodiversity and demonstrate demand, a customer base, and a plan to ensure financial stability and sustainability for the innovation. The activity will be designed with many points for entry, from providing seed funding for early stage innovations to larger prize amounts for mid- and late stage innovations. For innovations that move forward to later stages, CXL will work with their global partners and local Amazon basin organizations to design, adopt, test, improve, and scale these ideas. It is anticipated that local NGO partners will help innovators pilot and field test solutions, then help implement the innovations under real world conditions. In order to scale, CXL will provide eight to ten innovators with accelerator support to help assess and prioritize the scaling needs of early stage companies. At the close of the activity, it is expected that three to five solutions will be fully funded for the accelerator and scale services that fit their needs. The Global Development Alliance (GDA) will leverage significant investments made by the Gordon and Betty Moore Foundation, Microsoft, and Esri.

Budget and Resources: None to report currently.

Funding	**FY20**
Agency Fund Use	None reported
FTEs	0.2
Funding Estimate	$0

[189] The website for Artisanal Mining Grand Challenge is accessible at https://www.artisanalminingchallenge.com/amazonia.

Goal Types: Other (None yet as it has not started)

Problem or Opportunity Addressed: Artisanal and small-scale gold mining (ASGM) is a major threat to biodiversity across the Amazon region, causing habitat destruction, sedimentation, and mercury bioaccumulation that harms human health and ecosystems. With Conservation X Labs, USAID will engage with regional innovators and the private sector in developing and implementing solutions to help make ASGM operations more environmentally responsible and socially equitable.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$700,000	None reported	None reported	None reported

Non-Cash Prizes Include: No non-cash prizes awarded yet.

Participants:

FY19: No teams reported

FY20: No teams reported

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2020-11-01	2021-04-01	None reported	Not applicable
2	2021-04-01	2021-08-01	None reported	Not applicable

Solicitation of Submissions: Other (None yet as it has not begun)

Submission Types: None reported

Submissions: Open innovation means that good ideas can come from anyone. Grand Challenges are open innovation competitions that source solutions from individuals and teams with diverse and complementary backgrounds, leading to new and exciting ideas. Grand Challenges do more than just identify a solution to a specific problem: they help to set aspirational goals, attract new people to solve problems, build new and diverse solver communities, draw global attention, and inspire partnerships that leverage resources to help scale solutions. Conservation X Labs (CXL) Amazon

Region focused Grand Challenge in partnership with USAID will find new innovations to address extractive activities in the Amazon basin. Awardees will show how the innovation will help reduce threats to biodiversity and demonstrate demand, a customer base, and a plan to ensure financial stability and sustainability for the innovation.

Evaluation of Submissions: The challenge is not yet open for submissions.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
USAID	Federal Agency or Office	None reported	$2,200,000
Conservation X Labs	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
Moore Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	$3,325,000
Esri	Private Industry	None reported	$1,850,000
Microsoft	Private Industry	None reported	$360,000

Advancement of Agency Mission: The purpose of the Artisanal Mining in the Amazon Grand Challenge is to engage the private sector in the development and implementation of innovations to make artisanal, small-scale and informal gold mining operations more environmentally responsible and socially equitable in the countries where USAID's Amazon Regional Environment Program operates. This activity will complement ongoing USAID bilateral efforts related to artisanal and small-scale gold mining (ASGM). By focusing the ASM Grand Challenge on the Amazon basin, innovators can be supported to advance solutions, reach new markets, and secure partnerships, bringing awareness of potential solutions for artisanal mining to governments and institutions throughout the Amazon. Finally, promising innovations will be scaled via an accelerator program to have impact throughout the Amazon basin.

Plan for Upcoming Two Fiscal Years: In FY21 and FY22, USAID will continue the ASGM Grand Challenge. It is a two-year project that began in July 2020.

C.10.2. Begin with Books[190]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Center for Education)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

[190] The website for Begin with Books is accessible at https://allchildrenreading.org/competition/begin-with-books/.

FY19: Launched

FY20: Ongoing

Competition Summary: Learning to read is transformative and impacts a child's lifelong opportunity to reach their full potential. However, around 250 million children of primary school age around the world are unable to recognize basic letters and numbers, even though half of the students have spent at least four years in school. Despite the importance of books in boosting foundational literacy skills, there is a global shortage of books for children in many other languages. For the estimated 19 million children globally that are blind or have low vision or the millions of children with other disabilities that impact their use of traditionally printed material, the shortage of quality books in accessible formats is even more severe. With a mission devoted to ensuring all children have access to books, All Children Reading: A Grand Challenge for Development is collaborating with the Global Book Alliance (GBA) to launch the Begin With Books Prize, a competition challenging global innovators to assemble cost-effective packages of high quality, accessible titles in more than 30 underserved spoken and signed languages. Winning innovators will upload the titles to the Global Digital Library (GDL), a free web-based platform that will make high-quality early learning resources available in more than 100 languages.

Beginning with books, we can ensure more children are prepared to reach their full potential—while simultaneously accelerating progress across multiple development goals.

Budget and Resources: Agency funds were used to support ACR GCD in funding the prize purse for Begin with Books, which was then awarded to the winners to implement their innovative solutions. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award)	None reported
FTEs	2	2
Funding Estimate	$300,000	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Solvers have the opportunity to assemble cost-effective packages of high quality, accessible digital books for beginning readers in more than 30 designated underserved languages (spoken and signed) used in more than 15 countries for each year of a child's literacy development (including Pre-Primary, Kindergarten, Grades 1 and 2) and upload them to the Global Digital Library for free global access. Awardees anticipate creating 2,318 books in 21 languages (including 19 underserved languages and 9 sign languages).

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$900,000	4	4	2020-03-05

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$900,000	$930,000
FY20	$0	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: 4 team(s)

FY20: 4 team(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-10-07	2019-11-15	34

Solicitation of Submissions: Social media; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Other (website; blogs; eblast to ACR listserv)

Submission Types: Proposal or concept

Submissions: The challenge seeks global innovators to assemble cost-effective packages of high quality, accessible titles in more than 30 underserved spoken and signed languages with innovators uploading titles to the Global Digital Library (GDL), a free web-based platform that will make high-quality early learning resources available in more than 100 languages.

Evaluation of Submissions: A platform called Submittable was used to review proposals that came in from solvers. A points-based system was used to rate proposals. There was a mix of judges, drawn from the ACR GCD partnership as well as externally.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
World Vision	Nonprofit Organization (excluding Academic Institutions)	$310,000	None reported
Department of Foreign Affairs and Trade (Australia)	Other	$310,000	None reported
Global Book Alliance	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported

Advancement of Agency Mission: Begin with Books advances USAID's mission by focusing on solutions that empower local actors to create reading materials in local languages, which in turn supports the building of foundational skills needed in education for children to learn to read so that they can read to learn. Education is the bedrock of human capital development and helps save lives, reduce poverty, and strengthen democratic governance.

Plan for Upcoming Two Fiscal Years: None reported

C.10.3. BetterTogether Challenge[191]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Innovation Pillar)

Authority: Other authority (Foreign Assistance Act of 1961, as Amended)

Status:

FY19: Launched

FY20: Ongoing

Competition Summary: The BetterTogether Challenge is a global initiative to crowdsource, fund, and scale forward-thinking solutions from Venezuelans, wherever they are, and innovators worldwide to support Venezuelans and host communities affected by the regional crisis. The U.S. Agency for International Development (USAID) and the InterAmerican Development Bank launched this Challenge in October 2019 in order to: elevate Venezuelan voices and ingenuity to convey and answer their needs across the region; connect Venezuelans, host communities, and the world's collective genius to develop innovative solutions; expand networks across communities and countries to promote relationships and collaboration; fund, test, and scale solutions; and build a marketplace of tested, market-ready solutions.

Budget and Resources: Sixty percent of USAID funds were delivered as awards, ten percent went to acceleration support services, ten percent to monitoring and evaluation, and 20 percent to provide

[191] The website for BetterTogether Challenge is accessible at https://juntosesmejorve.org/.

administrative support. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support	Data entry/analysis; Discovery and design support; Federal personnel (FTE); Non-monetary award(s); Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	3	6
Funding Estimate	None reported	$800,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Venezuela's political, humanitarian, and economic crisis has driven nearly 5.5 million people to flee the country, the largest external displacement of people in the Western Hemisphere's history. The situation has led to severe shortages of food, electricity, medicine, water, and other basic needs. This outflow of Venezuelans has had a growing social and economic impact on neighboring countries in Latin America and the Caribbean, including effects on public services, labor markets, community relations, and infrastructure. The BetterTogether Challenge was designed to identify, test, and scale forward-thinking solutions from Venezuelans, wherever they are, and innovators worldwide to support Venezuelans and host communities affected by the regional crisis.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$6,356,000	29	29	Multiple
2	$2,000,000	5	5	Multiple

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$6,356,000	None reported
FY20	$2,000,000	$6,356,000

Non-Cash Prizes Include: Technical assistance and acceleration services were provided to grantees, significant due diligence assessment was delivered in some instances, and third-party monitoring options were also provided.

Participants:

FY19: 200 team(s)

FY20: 1,115 team(s)

Intended Participants: Master/PhD students; Small businesses; Large businesses; Other (Non-Governmental Organizations; Universities; Foundations)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2019-10-21	2020-09-30	2020-10-21	1,132
2	2020-09-30	2020-10-30	2021-01-19	183

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept

Submissions: Submissions include a five-page concept paper outlining relevant facts including: Innovative Approach, Anticipated Outcomes, Monitoring and Evaluation Plan, Budget, and Organizational Capacity.

Evaluation of Submissions: The evaluation process consisted of three stages: The initial review included an eligibility screening, the second phase reviewed concept note submissions, and the third phase included a robust evaluation of final application profiles. Over 160 technical experts from across Latin America, including a mix from the United States Government, the InterAmerican Development Bank, associated BetterTogether Challenge partners, the private sector, and academia helped rigorously evaluate applications.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
InterAmerican Development Bank	Other	$3,000,000	$0

Advancement of Agency Mission: The BetterTogether Challenge was launched by USAID in partnership with the InterAmerican Development Bank to achieve critical humanitarian and development goals around the Venezuelan regional crisis.

Plan for Upcoming Two Fiscal Years: USAID remains committed to leveraging future prize and challenge competitions.

C.10.4. Book Boost: Access for All Challenge[192]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Center for Education)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: All Children Reading: A Grand Challenge for Development (ACR GCD) and Pearson's Project Literacy launched the Book Boost: Access for All Challenge to drive innovation in the publishing space to solve for gaps in the book production chain. The challenge sought business models rooted in optimizing and increasing the number of accessible books in the title development phase of the book value chain. The competition partners believe innovative solutions in title development will improve the overall book value chain, resulting in a more cost-efficient process. An efficient value chain will increase the number of new, quality, accessible titles available to stakeholders involved in book distribution.

Budget and Resources: Agency funds were used to support ACR GCD in funding the different phases of the Book Boost competition's prize purse which was then awarded to the winners to implement their innovative solutions. The following table indicates the budget and resources to support the activity.

Funding	FY19
Agency Fund Use	Prize purse (monetary award)
FTEs	2
Funding Estimate	$50,000

[192] The website for Book Boost: Access for All Challenge is accessible at https://allchildrenreading.org/competition/bookboost/.

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency

Problem or Opportunity Addressed: The Book Boost: Access for All Challenge sought innovative business models that incorporate accessibility components from the onset, thus reducing the costs of retrofitting an inaccessible book after production and creating a more efficient and cost-effective process. This optimization of the title development phase of the book value chain can contribute to an increased number of accessible titles as well as the quality of accessible titles.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Incentivize a larger number of submissions; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Target audience could not have been reached through traditional mechanisms; Required by executive policy or congressional legislation

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
3	$150,000	2	2	2018-04-04

Non-Cash Prizes Include: None reported

Participants:

FY19: 2 team(s)

FY20: No teams reported

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
3	2017-10-3	2018-01-19	2018-04-04	4

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Other (Publicity efforts from vendors/contractors; website; blogs; eblast to ACR listserv)

Submission Types:

Phase	Submission Type
3	Prototype device or object

Submissions: Ensuring children have books in the language(s) they use and understand and in formats they can access is critical to building foundational literacy skills and learning to read. The Book Boost: Access for All Challenge sought innovative business models that incorporate accessibility components from the onset, thus reducing the costs of retrofitting an inaccessible book after production and

creating a more efficient and cost-effective process. This optimization of the title development phase of the book value chain can contribute to an increased number of accessible titles as well as the quality of accessible titles. In alignment with the Business Model Enhancement Plan requirements, successful applicants demonstrated strategies to optimize content creation by using innovative, cost-effective strategies that illustrate potential production growth in quality, accessible titles.

Evaluation of Submissions: Solvers' business plans were evaluated by a mixed group of judges with various areas of expertise. The proposals that were selected to advance to the next phase were invited for pitch presentations. Solvers were scored based on a rubric and deliberation among judges based on their presentations. Judges were from ACR GCD partners as well as other resource partners participating in the prize.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
World Vision	Nonprofit Organization (excluding Academic Institutions)	$41,666	None reported
Department of Foreign Affairs and Trade (Australia)	Other	$41,666	None reported
Pearson	Private Industry	$125,000	None reported

Advancement of Agency Mission: Book Boost advances USAID's mission primarily by seeking innovative business models that incorporate accessibility components from the onset. The hope is to influence publishers and the book production chain to ensure that all learners, including those with disabilities, have access to the books they need to build foundational skills in education to learn to read so that they can read to learn. Education is the bedrock of human capital development and helps save lives, reduce poverty, and strengthen democratic governance.

Plan for Upcoming Two Fiscal Years: None reported

C.10.5. Brucellosis Vaccine Challenge Project[193]

Sponsoring Agency and Office: Washington (Bureau for Resilience and Food Security)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Ongoing

[193] The website for Brucellosis Vaccine Challenge Project is accessible at https://agresults.org/projects/brucellosis-global; https://brucellosisvaccine.org/.

Competition Summary: Prevalent in developing countries, *Brucella melitensis* is a strain of *Brucellosis* that particularly affects small ruminants such as goats and sheep. The *Brucellosis* Vaccine Challenge Project is a $30,000,000 Pay-for-Results prize contest launched in 2016 that aims to incentivize animal health companies to develop a vaccine against *Brucella melitensis*. Eligible companies can receive three milestone payments at different stages that could add up to a total of $26,000,000 for one entrant over the span of up to ten years.

Budget and Resources: AgResults is a multi-donor trust fund, to which USAID contributed $8 million in FY13 funds. Prize design, management, verification, award payouts, and evaluation are funded out of the trust.

Goal Types: Other (Vaccine development)

Problem or Opportunity Addressed: Across the developing world, smallholder farmers rely heavily on livestock as a source of vital income and an essential source of food. However, livestock herds are often threatened by a highly infectious disease known as *Brucellosis*, which causes abortions, infertility, and decreased milk production. *Brucellosis* can significantly limit a smallholder farmer's potential to earn, support their family, and break free of poverty. Because *Brucellosis* is zoonotic, meaning it can infect across species, the disease also threatens the health of farmers. Although vaccines currently exist, they require complex management techniques that are not appropriate for developing country environments. As a result, the disease remains endemic across much of Africa, Asia, and the Middle East. This challenge aims to incentivize the development of a vaccine that is appropriate for developing country environments.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$4,000,000	$0
FY20	$4,000,000	$0

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: No teams reported

Intended Participants: Small businesses; Large businesses

Participation: None reported

Solicitation of Submissions: Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors; Other (Industry publications and conferences)

Submission Types: None reported

Submissions: AgResults is awaiting the first four Phase 2 submissions demonstrating safety and efficacy of a scale-ready vaccine that meets the competition's requirements.

Evaluation of Submissions: All Competition entries will be reviewed at each Milestone by the Judging Panel. The Judging Panel will consist of five experts with experience in the field of animal health, biological research, and vaccine development, including regulatory affairs and vaccine commercialization. The Judging Panel will use detailed criteria, as set out in the full Appendices attached to the official Competition Rules, to evaluate Competition entries. The judging panel is external to the Agency.

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**
Foreign, Commonwealth and Development Office (United Kingdom)	Other	None reported	None reported
Global Affairs Canada (Canada)	Other	None reported	None reported
Department of Foreign Affairs and Trade (Australia)	Other	None reported	None reported
Bill and Melinda Gates Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
World Bank	Other	None reported	None reported
Deloitte	Other (Implementing Partner)	None reported	None reported
GALVmed	Other (Implementing Partner)	None report	None reported

Advancement of Agency Mission: The project aims to spur the development of a vaccine that will benefit rural households in developing countries by reducing the incidence of *Brucella melitensis* among small ruminants. Specifically, the project will encourage the creation of a vaccine that meets the MVP and potentially Best-in-Class requirements. With lower rates of *Brucellosis*, abortion and infertility rates are expected to go down while milk production will rise. Because *Brucella melitensis* is zoonotic and causes 90 percent of human cases, decreased disease incidence should improve the health of the livestock producing households.

Plan for Upcoming Two Fiscal Years: AgResults is currently awaiting Phase 2 submissions.

C.10.6. CLA Case Competition[194]

Sponsoring Agency and Office: Washington (Bureau for Policy, Planning & Learning)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The annual Collaborating, Learning and Adapting (CLA) Case Competition captures real-life case studies of USAID staff and implementing partners using a CLA approach for organizational learning and better development outcomes. The objectives of the CLA Case Competition are to capture examples of CLA in action; identify enablers and barriers to CLA integration; and contribute to the evidence base for CLA. In addition, the CLA Case Competition is an annual opportunity to check in on what is happening with CLA integration throughout USAID's programs. This is not a call for traditional success stories—it is an opportunity to share what is working well, what partners and staff are struggling with, and what these partners and staff have learned along the way. The cases can be about a large initiative or about one small practice that made an important difference. All entries are available through a searchable database (https://usaidlearninglab.org/cla-cases).

Budget and Resources: An institutional support contractor, funded by USAID, assisted in organizing and publicizing the case competition, both to encourage submissions and to showcase winning entries. Support contract staff maintained the website that accepted submissions, did troubleshooting with applicants, and publicized the competition on social media and in newsletters and events. After the entry period closed, the contractor sorted submissions and managed and provided personnel for the first round of judging. After winners were selected, the contractor edited entries for clarity, made them 508 compliant, posted them on the website (usaidlearninglab.org), and updated the database of cases. USAID staff oversaw the process and managed internal communications and messaging on the competition. USAID staff served on the second judging panel, reading cases and meeting to discuss them. USAID staff also participated in acknowledging winning submitters, by meeting with them and sharing their cases. The following table indicates the budget and resources to support the activity.

Funding	**FY19**
Agency Fund Use	Database development; Non-monetary award(s); Operations or administrative support; Publicity, advertising, outreach, or/and communications
FTEs	0.33

[194] The website for CLA Case Competition is accessible at https://usaidlearninglab.org/cla-case-competition.

Funding	FY19
Funding Estimate	$1,500

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: Collaborating, Learning and Adapting (CLA) is USAID's approach to organizational learning and adaptive management. It is a set of practices that help USAID and its implementing partners improve the effectiveness of development. Learning has always been a part of USAID's work and most USAID staff and partners are already practicing CLA in some way. The aim now is to make CLA more systematic and intentional throughout programming and to dedicate the resources necessary to make it happen. As CLA was introduced to USAID, many staff and partners asked for examples of what it might look like in practice. The CLA Case Competition was an opportunity to collect and share a number of examples, generate excitement for the approach, and recognize good practice and early adopters.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$0	10	10	2019-09-30

Non-Cash Prizes Include: As there are no monetary prizes associated with the CLA Case Competition, the only incentives offered are non-monetary. Winning cases are featured on a USAID-sponsored website (usaidlearninglab.org) and shared through the website's newsletter and social media channels. In previous years, winning cases were also celebrated in a webinar, winners were introduced to each other at an informal reception, and/or winners were presented with an award at an annual conference on CLA.

Participants:

FY19: 98 team(s)

FY20: No teams reported

Intended Participants: Other (USAID staff and USAID partner organizations)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-03-04	2019-04-12	97

Solicitation of Submissions: Social media; Email; Publicity efforts from vendors/contractors

Submission Types: Other (Case story)

Submissions: The competition asks for examples of Collaborating, Learning and Adapting (CLA) in action as part of a development program. Entrants fill a template for their submission, which includes a summary and information on the challenge they faced, the approach they used, and how that approach affected their development results and organizational effectiveness.

Evaluation of Submissions: There were two rounds of judging. In the first round, USAID's support contractor had a panel of judges who read and judged every submission. Each question on the entry form has a number of points associated with it; the judges assign points based on the quality of the response to each question. The judges met for a selection meeting and chose the top 20 highest scoring submissions as finalists. The 20 finalists were sent to a second panel of judges composed of five staff from USAID. The USAID judges read the 20 submissions and, similarly, awarded points to each question on the submission form based on the quality of the answer. The judges met for a selection meeting and agreed on the top 10 submissions, considered the winners.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: USAID provides development assistance to help partner countries on their own development journey. The CLA Case Competition captures real-life examples of USAID staff and implementing partners using CLA approaches in their work to support partner countries and achieve better development outcomes. In addition to better amplifying good examples and better understanding how USAID staff and partners are implementing CLA approaches, the FY19 case competition asked submitters to explicitly describe how the CLA approach they used contributed to self-reliance. The data from submissions was analyzed and shared and has contributed to the USAID's learning agenda (see: https://usaidlearninglab.org/lab-notes/what-cla-case-competition-winners-tell-us-about-journey-self-reliance).

Plan for Upcoming Two Fiscal Years: USAID did not conduct a CLA case competition in FY 20, due to the COVID-19 pandemic and changes in the institutional support available. USAID plans to resume the competition in FY21 and FY22.

C.10.7. Creating Hope in Conflict: a Humanitarian Grand Challenge[195]

Sponsoring Agency and Office: Washington (Bureau for Humanitarian Assistance)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Creating Hope in Conflict: A Humanitarian Grand Challenge (HGC) is a partnership of the U.S. Agency for International Development (USAID), the U.K. Foreign, Commonwealth & Development Office (FCDO), and the Government of the Netherlands Ministry of Foreign Affairs, with support from Grand Challenges Canada. Through this Grand Challenge, the HGC seeks to support groundbreaking, local solutions that will significantly improve—and in many cases,

[195] The website for Creating Hope in Conflict: a Humanitarian Grand Challenge is accessible at https://humanitariangrandchallenge.org/.

save—the lives of the most vulnerable and hardest-to-reach people affected by humanitarian crises caused by conflict. The HGC's goal is to find solutions that allow communities to respond more nimbly to complex emergencies and create better lives for themselves. The HGC specifically identifies, pilots, and scales new solutions that have the potential to create wider changes within the humanitarian sector in order to provide energy; safe water and sanitation; life-saving information; and health supplies and services to help conflict-affected people. The HGC envisions a world where new systems, processes, technologies and other solutions equip conflict-affected communities to mitigate the impacts of humanitarian crises caused by conflict.

Budget and Resources: USAID funds were used to support the implementing partner, Grand Challenges Canada (GCC), execute on the Creating Hope in Conflict: A Humanitarian Grand Challenge. Through GCC, USAID funds were used to support GCC staff working on the Creating Hope in Conflict program, including fringe benefits; short-term non-employee labor, including accelerator support, venture advisors, monitoring and evaluation consultants, and event planners; travel and transport; other direct costs, including public and cohort event costs, dissemination of research, and due diligence. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Transportation of participants; Web portal or app development and support	Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Transportation of participants; Web portal or app development and support
FTEs	0.5	0.5
Funding Estimate	$444,500	$1,176,000

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Today, more than 201 million people around the world live in areas experiencing humanitarian crises. Millions of these people are unreachable by traditional humanitarian aid delivery due to armed conflict. As the length, frequency, and scope of the world's conflicts increase, it is becoming more difficult to reach affected people in insecure areas with life-saving and life-improving humanitarian assistance. Affected populations and the international humanitarian community need new solutions that respond to the needs of vulnerable, inaccessible communities yet, less than one percent of humanitarian aid is focused on investing in the innovations necessary to reach them.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific

community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$9,185,575	29	25	2018-09-25
2	$7,847,409	30	27	2020-08-18
3	$4,949,687	5	4	2020-11-01

Non-Cash Prizes Include: Acceleration program as well as partnership and mentorship support.

Participants:

FY19: 25 team(s)

FY20: 31 team(s)

Intended Participants: Other (People affected by conflict, regardless of education level)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2018-02-19	2018-04-12	2018-09-25	615
2	2019-05-21	2019-07-16	2020-08-18	648
3	2020-04-09	2020-04-22	2020-11-01	98

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Analysis or visualization of data
2	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Analysis or visualization of data
3	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Analysis or visualization of data

Submissions: We seek life-saving or life-improving innovations with the potential to create wider changes within the humanitarian sector, that can engage the private sector and that involve input from affected communities, to help people hardest-to-reach in humanitarian crises.

Evaluation of Submissions: All applications and Letters of Intent are screened on the basis of eligibility criteria outlined in each Request for Proposal. Applications that do not meet the eligibility criteria are removed from the competition. Applications that do meet the eligibility criteria then go through an Innovation Screen, which determines whether applications are innovative and relevant. For seed proposals that pass the Eligibility and Innovation Screens, a Review Committee of scientific, ethics, social and business reviewers, including humanitarian experts and people affected by humanitarian crises, advise on the merit of proposals. For Transition to Scale applicants that are invited to submit a full application, a Review Committee of subject matter experts, including people affected by humanitarian crisis, advises on the merit of proposals.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
UK Foreign, Commonwealth & Development Office	Other	$868,000	$1,660,000
Netherlands Ministry of Foreign Affairs	Other	$15,700	$476,000
Grand Challenges Canada	Academic Institution	$0	$0

Advancement of Agency Mission: The Creating Hope in Conflict: A Humanitarian Grand Challenge identifies and supports groundbreaking solutions that engage the private sector and draw from the experiences of affected communities in order to significantly improve and in many cases, save the lives of vulnerable people affected by conflict. The goal is to identify solutions that allow communities to respond more nimbly to complex emergencies and take steps to create better lives for themselves, which is directly in line with USAID's efforts to improve the efficiency and effectiveness of its humanitarian assistance activities, support the implementation of USAID's Private Sector Engagement strategy, and achieve the goals established in USAID's Journey to Self-Reliance.

Plan for Upcoming Two Fiscal Years: None reported

C.10.8. Foot and Mouth Disease Vaccine Challenge Project[196]

Sponsoring Agency and Office: Washington (Bureau for Resilience and Food Security)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: No activity occurred during FY19

FY20: Launched

[196] The website for Foot and Mouth Disease Vaccine Challenge Project is accessible at https://agresults.org/projects/fmd-vaccine; https://www.galvmed.org/foot-and-mouth-project/.

Competition Summary: The AgResults Foot and Mouth Disease (FMD) Vaccine Challenge is a $17,680,000 prize competition that encourages the development and use of high-quality FMD vaccines tailored to meet the needs of Eastern Africa. The prize is structured as a cost-share that reduces the cost-per-dose for buyers, enabling public and private sector actors to better combat FMD through more consistent purchases of the new vaccines. This enables the project to create a market around effective vaccine solutions that can improve animal health and strengthen farmer livelihoods for years to come.

Budget and Resources: AgResults is a multi-donor trust fund, to which USAID contributed $8,000,000 in FY13 funds. Prize design, management, verification, award payouts, and evaluation are funded out of the trust. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	None reported
FTEs	0.04
Funding Estimate	None reported

Goal Types: Launch or scale up the use of an enterprise/promote commercialization; Other (Vaccine Development)

Problem or Opportunity Addressed: FMD control in East Africa is hindered by two interconnected challenges: a need for high-quality solutions and for stronger distribution networks. First, FMD strains vary significantly in the region, making it difficult to develop an appropriate vaccine. Neither of the two vaccines currently available in East Africa are tailored to these strains; furthermore, they are poor quality and too costly. Second, the private sector has struggled to establish distribution networks. National governments currently control FMD vaccine purchases and are often reactive, creating unreliable market demand and hinging on political priorities. These factors combine to limit profitability and discourage investment among potential private sector players to manufacture and distribute vaccines.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: No teams reported

Intended Participants: Small businesses; Large businesses

Participation:

None reported

Solicitation of Submissions: Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Other (Industry publications and conferences)

Submission Types: None reported

Submissions: In order to meet the needs in Eastern Africa, AgResults is looking for animal health companies with experience in the development and commercialization of FMD vaccines to develop and register vaccines that are safe, efficacious and viable for use against the currently circulating strains of the four serotypes of FMD in the region's cattle.

Evaluation of Submissions: Vaccines registered in at least two of the AgResults target countries that meet all the requirements set out in the Target Product Profile will be eligible to participate in this cost-share initiative.

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**
U.K. Foreign, Commonwealth & Development Office	Other	None reported	None reported
Global Affairs Canada	Other	None reported	None reported
Australia Department of Foreign Affairs and Trade	Other	None reported	None reported
Bill and Melinda Gates Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
World Bank	Other	None reported	None reported
Deloitte	Other (Implementing Partner)	None reported	None reported
GALVmed	Other (Implementing Partner)	None report	None reported

Advancement of Agency Mission: The project is expected to incentivize manufacturers to support long-term efforts to control FMD by showing them the economic benefits of investing in the development and distribution of an effective vaccine. By developing a stable market around FMD control, smallholder farmers should more easily access the vaccine, in turn reducing losses in productivity and livestock among smallholder farmers. The project should impact vaccine users as well as public and private sector buyers: Demand for the vaccine among smallholder and commercial farmers is expected to rise as they see the merits of an effective solution. Similarly, both public and private sector buyers are expected to invest in developing distribution networks to reach the growing market.

Plan for Upcoming Two Fiscal Years: On July 1, 2020, AgResults released the Request for Applications (RFA), providing the manufacturers with guidelines to apply for the competition. AgResults anticipates that it will take at least two years for potential solvers to develop a qualifying vaccine.

C.10.9. Global LEAP Solar E-Waste Challenge[197]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Technology Pillar)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Global LEAP Solar E-Waste Challenge provides grant funding to companies with innovative approaches to managing solar lanterns, solar home systems, and solar-powered appliances at their end of life (solar e-waste). The challenge is an initiative of the Efficiency for Access Coalition supported by the U.S. Agency for International Development (USAID) as part of its commitment to the Scaling Off-Grid Energy (SOGE) Grand Challenge for Development. SOGE is a global partnership founded by the U.S. Agency for International Development, Power Africa, the U.K. Department for International Development, the African Development Bank, and the independent charity Shell Foundation. By optimizing the collective resources and expertise of its partners, SOGE accelerates the growth of a dynamic, commercial off-grid energy market to provide clean, modern, and affordable energy access to the millions of households and businesses beyond the grid in sub-Saharan Africa. The specific objectives of the challenge are to provide funding for pilot and early-stage projects that: (1) Fill critical information and data gaps on corporate end-of-life product management that will inform longer-term deployment of public funds to address solar e-waste at a systemic level; (2) Address key logistical challenges faced by solar distributors and service providers related to take-back and collection of solar e-waste; (3) Improve and strengthen operational processes at e-waste processing facilities to increase solar e-waste recycling capacity across sub-Saharan Africa.

Budget and Resources: Administrative costs of this funding supported implementing partner CLASP as the operating agent and administrator of the challenge. The following table indicates the budget and resources to support the activity.

[197] The website for Global LEAP Solar E-waste Challenge is accessible at https://globalleapawards.org/e-waste.

Funding	FY19	FY20
Agency Fund Use	Operations or administrative support; Prize purse (monetary award)	Operations or administrative support; Prize purse (monetary award)
FTEs	2	2
Funding Estimate	$150,000	$150,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Industry leaders are exploring potential e-waste management solutions, such as product repair initiatives and preventative maintenance, but these efforts remain nascent and under-resourced. The Global LEAP E-Waste Challenge recognizes the role of waste reduction in the initial product design stage, and seeks to support more sustainable product design as part of broader efforts to promote sustainable solar e-waste management across the off-grid sector.

Justification for Using Prizes and Challenges: Flexibility to implement project design and achieve project goals; Most cost-effective approach; Identify and work with new innovators; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$2,300,000	12	12	2020-02-18

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$1,200,000	$1,200,000
FY20	$1,100,000	$1,100,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 12 team(s)

FY20: 12 team(s)

Intended Participants: Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2019-10-15	2019-12-15	2020-02-18	159

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Proposal or concept

Submissions: The objective of the challenge was to provide funding for pilot or early-stage projects that focused on data gaps, logistical challenges, and operational processes.

Evaluation of Submissions: A mixed selection panel evaluated proposals on the following criteria: relevance to program objectives; viability; potential impacts; scalability and/or replicability.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Department for International Development (DFID)	Other	$750,000	$750,000
GOGLA	Private Industry	None reported	None reported

Advancement of Agency Mission: E-waste generated by the off-grid solar sector represents less than 0.1 percent of global e-waste streams, but investment now will ensure the industry's growth is sustainable over the long term and further enhance the sectors reputation as a leader in environmental responsibility.

Plan for Upcoming Two Fiscal Years: None reported

C.10.10. Household Solar Workforce Development Challenge[198]

Sponsoring Agency and Office: Washington (US Global Development Lab)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

[198] The website for Household Solar Workforce Development Challenge is accessible at https://competitions4dev.org/solarworkforce/.

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Household Solar Workforce Development Challenge will award up to $350,000 in grant funding to support scalable, innovative, third-party training solutions to the off-grid solar home system sector's workforce needs in sub-Saharan Africa. USAID, as part of its commitment to the Scaling Off-Grid Energy (SOGE) Grand Challenge for Development, is supporting the Household Solar Workforce Development Challenge run by the ResilientAfrica Network (RAN).

Budget and Resources: USAID was the sole funder of the challenge and managed it in partnership with a local Ugandan research partner, the ResilientAfrica Network (RAN). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	1	1
Funding Estimate	None reported	$350,000

Goal Types: Generate innovative ideas/designs/concepts; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Off-grid solar home systems (SHS) are an emerging solution to provide access to electricity in sub-Saharan Africa. With continued growth, the sector could support up to 1.3 million full time equivalent jobs by 2022. Hiring and retaining qualified employees has been challenging for many SHS companies. Challenges include lack of candidates with appropriate technical and soft skills, lack of relevant and context-based curricula on off-grid systems at the certificate level, the inability of the sector to compete for fresh graduates with higher-paying established companies, high-performing employees being poached by competitors, and a lack of capital to invest in the continued training and professional development of current employees. Furthermore, in Africa, SHS solutions are often deployed in rural and remote areas where it can be even harder to attract and retain staff.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$350,000	2	2	2020-10-16

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	$0
FY20	$350,000	$350,000

Non-Cash Prizes Include: USAID recognition and technical support (prize purse was the primary incentive).

Participants:

FY19: No teams reported

FY20: 2 team(s)

Intended Participants: Small businesses; Large businesses; Other (for-profit and nonprofit organizations; social enterprises; programs under academic institutions and non-government organizations (NGOs) with demonstrated capabilities and programs in energy workforce development and capacity building that are ready to scale.)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-10-16	2019-12-15	199

Solicitation of Submissions: Social media; Email; Partnership with outside organizations

Submission Types: Proposal or concept; Business or commercial development plan

Submissions: This call seeks third-party training providers that are designed with features including, but not limited to, initiatives that train management staff, technicians, or sales agents for the off-grid solar home system sector.

Evaluation of Submissions: All judges signed confidentiality agreements and conflict of interest statements. There was an internal technical evaluation conducted by the funders of all initial 199 submitted applications with each application reviewed by a minimum of two internal reviewers, which narrowed the pool to 22 applications. These applications were reviewed by an external panel of 18 reviewers, which produced four finalists; the funders narrowed these down to two awardees after several rounds of due diligence.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
The ResilientAfrica Network (RAN)	Academic Institution	$0	$150,000

Advancement of Agency Mission: Third-party organizations that focus on training workers for the off-grid solar home system sector offer a viable, and potentially more efficient and effective, workforce development solution, but are not yet widely supported or utilized. The specific objectives of this funding window are to identify and support scalable, innovative, third-party training solutions to the off-grid solar home system sector's workforce needs in sub-Saharan Africa.

Plan for Upcoming Two Fiscal Years: None reported

C.10.11. Human Resources for Health 2030 Health Workforce Resilience Prize[199]

Sponsoring Agency and Office: Washington

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: No activity occurred during FY19

FY20: Completed

Competition Summary: Health workers are the backbone of our health systems and often show remarkable ingenuity and innovation to provide health services for their communities. In recognition of health worker adaptability and resourcefulness, the Human Resources for Health 2030 (HRH2030) Health Workforce Resilience Prize was launched to identify successful solutions that strengthen the resilience of human resources for the health workforce. The prize competition received nearly 500 applicants ranging from individuals and civil society, community- and faith-based organizations, government, non-governmental, private sector, academia, and volunteer groups. Ninety-nine applications from 31 countries met the qualifications and were reviewed by a panel of judges. Proposed approaches to support health worker resilience ranged from job aids, online games, and capacity building approaches to new data tracking tools. Two winners from lower- or middle-income countries were identified and awarded $50,000 in prize money for their proposals to design or develop a tool, method, or approach that improves or enhances health worker resilience. The first winner was TNH Health, a Brazil-based social impact venture that applies innovative technologies to traditional therapy and health coaching. They have created artificial intelligence (AI)-powered virtual health assistants which can monitor health workers' mood and stress levels. Information collected from this app can be aggregated and used to improve work conditions or refer the health worker to an in-app psychologist to improve their mental health.The second winner was Nyaya Health Nepal, which is developing a sustainable model of healthcare that can be integrated into the national health system and implemented throughout the country. By using technology to facilitate the coordination of care

[199] The website for Human Resources for Health 2030 Health Workforce Resilience Prize is accessible at https://hrh2030program.org/health-workforce-resilience-prize/.

and integration of data, their innovation, NepalEHR, is transforming the provision of health services by ensuring health workers have more information to be confident in their treatment plans.

Budget and Resources: USAID funds were obligated to the Human Resources for Health 2030 project to design the award instrument and implement the prize. The implementing partner, in consultation with USAID, developed the award criteria and the evaluation process. The implementing partner heavily advertised the prize on their websites, social media, and through health workforce networks and professional associations. Once the application acceptance period closed, the implementing partner reviewed applications to ensure compliance with the criteria. A team was established to review the accepted candidates and interviews were conducted with seven finalists. Once the winners were identified, a virtual prize ceremony was hosted to announce the winners and promote their innovations. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration
FTEs	0.3
Funding Estimate	$35,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Other (highlight innovative approaches, tools or methods to improve health workforce resilience)

Problem or Opportunity Addressed: The Human Resources for Health 2030 (HRH2030) Health Workforce Resilience Prize was designed to identify new organizations that are improving the resilience of the health workforce in innovative ways. These new partners would not have been identified without the prize. The work of these organizations will be amplified and scaled to increase the reach of these tools. By building health workforce resilience, health systems can provide better quality routine and emergency care creating healthier populations and helping countries on their journey to self-reliance.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$50,000	2	2	2020-06-24

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$50,000	$50,000

Non-Cash Prizes Include: Non-monetary incentives included a certificate of recognition and promotion through USAID, the implementing partner websites and social media.

Participants:

FY19: No teams reported

FY20: 500 team(s)

Intended Participants: No specific intended group

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2020-02-24	2020-04-15	500

Solicitation of Submissions: Social media; Email; Press release; Live video streaming announcement

Submission Types: Proposal or concept; Creative media

Submissions: Applicants were required to propose strategies, tools, methods, approaches, resources, and/or new ideas that demonstrated effective ways to strengthen health workforce resilience in low- and middle-income countries (LMICs). Applicants applied via online platform or hard copy. Submissions included basic eligibility criteria and information about the organization. The key section of the application included brief descriptions of the technical approach, the impact on health worker resiliency, ability to scale, and sustainability.

Evaluation of Submissions: The applicants were reviewed to ensure they met the criteria for the award determined by the application instructions. A panel of judges was established. The panel included one USAID representative, the project director, and a country director from the project. The evaluation criteria and rating system was shared with the panel. Each applicant was reviewed for how well they met the criteria, including impact on health workforce resilience, sustainability, and ability to scale. The top seven applicants were chosen for an interview with standardized questions and a time for specific clarifications. Based on the interviews and previous review, the panel identified the top three applicants and voted on the two final winners.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Chemonics	Private Industry	None reported	$0

Advancement of Agency Mission: The prize supports strengthening health systems and the journey to Self-Reliance. The health workforce is an integral component of USAID's global health programs and

central to meeting our health priorities of preventing maternal and child deaths, controlling the HIV/AIDS epidemic and combating infectious disease. By building health workforce resilience, health systems can provide better quality routine and emergency care creating healthier populations and helping countries on their journey to self-reliance.

Plan for Upcoming Two Fiscal Years: None reported

C.10.12. Inclusive Health Access Prize[200]

Sponsoring Agency and Office: Washington (Bureau for Global Health, Office of Health Systems)

Authority: Other authority (Innovation Incentive Award Authority)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: USAID's Office of Health Systems (OHS) recognizes that optimal health systems ensure that people receive the health care they need in ways they trust without having to pay too much or travel too far. The private commercial sector, small and women-owned businesses, and civil society can provide new approaches that break down barriers to accessing health services and optimize health systems. In turn, a strengthened health system can deliver better health outcomes at lower cost and help counteract the negative effects of poor economic conditions on health. This helps USAID-supported partner countries on their journey toward self-reliance. USAID's Inclusive Health Access Prize is a global call for proven successes in expanding access to life-saving basic health care in low- and middle- income countries. This prize will recognize and incentivize work that demonstrates how integration and partnership between the public and private sectors expands access to affordable, accountable, and reliable health services for poor and vulnerable groups. The aim is also to celebrate and spur a broad range of approaches that are sustainable, scalable, and replicable.

Budget and Resources: Funds were used for operations, administrative support, database development, data entry and analysis, publicity, and advertising. These funds were provided to the implementing partner and: supported the design of the prize and concept notes; drafted an implementation plan for the prize period including announcement, launch, applicant management and award; developed communication and outreach strategy to reach target audiences for participation in the prize; developed landing page for announcement phase and established a prize specific webpage under the OHS website; procured an online platform to host the call and application intake and management processes; conducted research and pricing for a UN General Assembly side event to announce winners; secured interpretation services during the final interview process, as needed; updated changes to prize website, including, but not limited to FAQs, milestone updates, finalist page, and winner page; enabled social media toolkits to be drafted and circulated for clearance and implementation; provided technical assistance to winners to improve their capacity to

[200] The website for Inclusive Health Access Prize is accessible at https://competitions4dev.org/healthaccessprize; https://www.usaid.gov/healthaccessprize#:~:text=Background,%2D%20and%20middle%2Dincome%20countries.

communicate about their project; and provided logistical support, transport and accommodation arrangements for winners to travel and participate in UNGA side event. Two USAID staff members utilized 50 percent level of effort (LOE) over a six month period to manage, plan and implement the prize process; one staff member utilized 25 percent LOE over a six month period to provide communication, outreach and media support; and office staff contributed approximately 100 hours in total for the reviewing and ranking the preliminary submissions for further consideration. The following table indicates the budget and resources to support the activity.

Funding	**FY19**
Agency Fund Use	Data entry/analysis; Database development; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Transportation of participants
FTEs	0.7
Funding Estimate	$181,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Other (Improved access to health care)

Problem or Opportunity Addressed: Despite many years of commitments from national governments and global health partners to improve access to and quality of primary health care, vulnerable populations in low- and middle-income countries (LMIC) continue to face barriers to achieving better health outcomes. In 2019, many LMIC health systems remained under-resourced and over-burdened, leaving many people without access to quality basic health care services. Private sector innovations and work are often overlooked in terms of contributing to the larger public health system, so USAID proposed this prize to discover and reward proven locally-led private approaches that improved affordable, accountable, accessible, and reliable health services through collaboration and partnership with the public sector and incentivized sustainable scaling and replication of these approaches.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Most cost-effective approach; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	**Awards Available**	**Awards Given**	**Winners Announcement Date**
$150,000	6	5	2019-09-24

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$150,000	$150,000
FY20	None reported	None reported

Non-Cash Prizes Include: Post-prize award incentives included network connections to Missions, other donors; platforms to present their organizations, innovations, and project method/success through USAID (and other donor/partner) webinars and conferences; and one year of targeted technical assistance (through a separate funded USAID technical assistance partner) to advance winning companies' priorities (business development; expansion planning; proposal writing, etc.).

Participants:

FY19: 350 team(s)

FY20: No teams reported

Intended Participants: Small businesses; Large businesses; Other (local private organizations or companies that had not worked with USAID before)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-05-14	2019-08-26	350

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov; Other (Mission Public Affairs/USAID DOC)

Submission Types: Prototype device or object; Business or commercial development plan; Other (health access proof of concept)

Submissions: Submissions came from LMICs around the world and showcased locally-led private approaches that improved affordable, accountable, accessible and reliable health services through integration with the public sector. These submissions were also asked to include sustainable scaling and replication plans for the approaches. A prize submission platform allowed applicants to answer set questions, upload supporting documents, and share their innovative solutions to a health-related development challenge in their country.

Evaluation of Submissions: Forty judges, primarily internal to USAID and including several external judges from other development partners, were randomly assigned applications to review. Judging was based on a 0-5 scale in the areas of locally-led solution, scale-up/replication plan, public health system integration, capable health systems, and strengthening systems and primary health care across multiple fronts or technical areas. After ranking the applications that met minimum criteria, the submissions were narrowed down to 11 finalists. A smaller group of judges then held interviews with the 11 finalists to rank them according to the best innovations and ideas to address primary health care gaps or barriers. Five winners were selected and announced in September 2019.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Resonance Global	Private Industry	$181,000	None reported
Management Sciences for Health	Nonprofit Organization (excluding Academic Institutions)	$10,000	None reported

Advancement of Agency Mission: USAID recognizes that optimal health systems ensure that people receive the health care they need in ways they trust without having to pay too much or travel too far. The private commercial sector, small and women-owned businesses, and civil society can provide new approaches that break down barriers to accessing health services and optimize health systems. In turn, a strengthened health system can deliver better health outcomes at lower cost and help counteract the negative effects of poor economic conditions on health. This advances USAID's goals of supporting partner countries on their journey toward self-reliance, and contributes to advancing other goals, including: (1) Ending Preventable Child and Maternal Deaths; (2) Creating an AIDS-free Generation; and (3) Protecting Communities from Infectious Diseases, while simultaneously building resilient and sustainable health systems in partner countries.

Plan for Upcoming Two Fiscal Years: None reported

C.10.13. Intelligent Forecasting Competition[201]

Sponsoring Agency and Office: Washington (Bureau of Global Health, Office of Population and Reproductive Health)

Authority: Other authority (Innovation Incentive Award Authority)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

Competition Summary: In low- and middle-income countries (LMIC) around the world, health systems struggle to accurately predict the quantities of contraceptives that are needed at each public sector service delivery site for use by clients seeking family planning services. This leads to inefficient ordering and distribution of contraceptives to service delivery sites, and can ultimately result in stockouts, stock shortages, or overstock. This under- and over-stocking leads to reduced access to contraceptives for users, inefficient allocation of resources in the supply chain, and potential loss of product due to expiration. There are many reasons why predictions about consumption of contraceptives at facilities may be flawed; these include: limited availability or low-quality data,

[201] The website for Intelligent Forecasting Competition is accessible at https://competitions4dev.org/forecastingprize/.

limited staff capacity, limited staff time, and weak business processes. Across most LMIC public sector health systems, one key limitation is that historically, facilities have ordered based on calculations that primarily or exclusively rely on logistics data from previous time periods to predict future consumption. However, evolving health systems and digital infrastructure have created an opportunity to utilize advanced methods to more accurately predict future contraceptive needs, even for short-term forecasts for service delivery sites. The Intelligent Forecasting Competition seeks to encourage innovation and drive progress through intelligent forecasting methods to predict contraceptive consumption at the service delivery level of the public sector health system in Côte d'Ivoire.

Budget and Resources: Agency funds were utilized for agency staff and agency contractors to: (1) develop the concept for the prize; (2) develop the prize call and competition documents; (3) communicate about the prize and respond to questions from the community; (4) develop a webpage for communications; (5) customize and manage a web portal for application submission and management; (6) assess all aspects of the prize, including eligibility, model performance, and model validation; and (7) communicate about the award of the prize. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	Data entry/analysis; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	1
Funding Estimate	$121,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Greater access to contraceptives enables couples and individuals to determine whether, when, and how often to have children. Contraceptive access is vital to safe motherhood, healthy families, and prosperous communities. In low- and middle-income countries (LMIC) around the world, health systems are often unable to accurately predict the quantity of contraceptives necessary for each health service delivery site, in part due to insufficient data, limited staff capacity, and inadequate systems. When too few supplies are ordered, service delivery sites may run out, limiting access to contraceptives and family planning. When too much product is ordered, it leads to unused contraceptives that are wasted if they are left to expire. Accurate forecasting of contraceptive consumption can save lives, money, and time by ensuring health service delivery sites have what they need when they need it and by reducing waste in the supply chain.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$25,000	2	2	2020-11-12

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$25,000	$0

Non-Cash Prizes Include: Opportunity to compete for a $195,000 grant. Opportunity to participate in a co-creation activity for said grant. Opportunity for promotional and reputational benefit of winning a prize. Opportunity to support a social good.

Participants:

FY19: No teams reported

FY20: 40 team(s)

Intended Participants: Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2020-07-14	2020-09-08	40

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Posted on challenge.gov

Submission Types: Software or computer code

Submissions: Competitors submit a mathematical model that accurately forecasts future consumption (i.e., products dispensed) of contraceptives at the service delivery level of Côte d'Ivoire's public health system. The prizes were awarded to the two models (among eligible competitors) that most accurately predicted monthly consumption of 11 contraceptives across 156 health facilities in Côte d'Ivoire. Competitors must also submit an expression of interest describing characteristics of their model and their process, however these are for informational purposes only and are not evaluated when making the prize awards.

Evaluation of Submissions: After conducting an eligibility screen, USAID reviewed the predicted values submitted. The metric used to evaluate the models is the mean absolute scaled error (MASE) of the predictions. The error was calculated for each prediction in the submission and then averaged across all site level predictions for each contraceptive; lower scores are better than higher scores. Best performing models were evaluated to ensure they met competition rules. Judges were internal to the agency, with support from external experts and contractors.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Center for Global Development	Nonprofit Organization (excluding Academic Institutions)	None reported	$5,000
Bahman Rostami-Tabar (Ph.D.) Cardiff Business School, UK	Academic Institution	None reported	$3,000

Advancement of Agency Mission: The USAID Office of Population and Reproductive Health (PRH) supports voluntary family planning and reproductive health programs in nearly 40 countries. A key component in this work is to support Ministries of Health and service delivery partners to better predict, procure, allocate, transport, and distribute contraceptives. Greater access to contraceptives enables couples and individuals to determine whether, when, and how often to have children. Contraceptive access is vital to safe motherhood, healthy families, and prosperous communities. Accurate forecasting of contraceptive consumption can save lives, money, and time by ensuring health service delivery sites have what they need when they need it and by reducing waste in the supply chain. The prize competition is expected to improve the ability to accurately forecast contraceptive needs at service delivery points, and to supply appropriate quantities of contraceptives.

Plan for Upcoming Two Fiscal Years: First place ($20,000) and second place ($5,000) prizes will be announced and awarded for the Intelligent Forecasting Competition in FY21 (using FY19 funds). No other activities are currently planned by USAID specifically in the area of family planning supply chain.

C.10.14. Kenya On-Farm Storage Challenge Project[202]

Sponsoring Agency and Office: Washington (Bureau for Resilience and Food Security)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Completed

FY20: No activity occurred during FY20

Competition Summary: The AgResults Kenya On-Farm Storage Challenge was a $12,000,000 program that used a pay-for-results prize competition to motivate private sector competitors to develop, market, and sell on-farm storage devices to smallholder farmers in Kenya's Rift Valley and Eastern Regions. Competing storage solution companies could become eligible for prizes by reaching an

[202] The website for Kenya On-Farm Storage Challenge Project is accessible at https://agresults.org/projects/kenya.

established sales threshold to promote purchases of improved devices among smallholder farmers. In doing so, the project reduced post-harvest loss and boosted farmer incomes.

Budget and Resources: AgResults is a multi-donor trust fund, to which USAID contributed $8,000,000 in FY13 funds. Prize design, management, verification, award payouts, and evaluation are funded out of the trust. The following table indicates the budget and resources to support the activity.

Funding	FY19
Agency Fund Use	None reported
FTEs	0.04
Funding Estimate	None reported

Goal Types: Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Eastern Africa grows nearly 20 percent of the grain produced in sub-Saharan Africa, yet the region suffers from post-harvest grain losses that cost about USD1.6 billion per year (13.5 percent of the total value of grain production). Because many smallholder farmers are not aware of the benefits and do not have access to on-farm storage (OFS), they are often forced to sell their crops right after harvest. This reduces their income and requires them to purchase maize later in the season. In the cases where they do decide to store maize, they must recur to expensive pesticides during storage. The peak supply periods around harvest drive down the market price, reducing potential income. If farmers opt to use traditional methods to store their crops, especially in Kenya, they still run into trouble: the grains often fall victim to larger grain borers and other pests.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$4,000,000	None reported	3	2018-11-09

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$4,000,000	$4,000,000
FY20	None reported	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 9 team(s)

FY20: No teams reported

Intended Participants: Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
2	None reported	None reported	2018-11-09	None reported

Solicitation of Submissions: Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
2	Other

Submissions: Eastern Region: competitors that reached the 21,000 metric ton (MT) sales threshold of any single storage device type that is Large Grain Borer (LGB) proof shared USD3,000,000, proportionally distributed based on the capacity sold to smallholder farmers. Rift Valley: the first five competitors that attained the 21,000 MT sales threshold of any single storage device type received a $750,000 performance-based grant. All competitors that reached the 21,000 MT sales threshold of any single storage device type shared $1,000,000, proportionally distributed based on the capacity sold to smallholder farmers.

Evaluation of Submissions: Competitors in the Eastern Region had their storage devices independently tested to confirm that the devices were resistant to larger grain borers. Winners in both regions were awarded based on sales data that was independently verified.

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
U.K. Foreign, Commonwealth & Development Office	Other	None reported	None reported
Global Affairs Canada	Other	None reported	None reported
Australia Department of Foreign Affairs and Trade	Other	None reported	None reported
Bill and Melinda Gates Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
World Bank	Other	None reported	None reported
Deloitte	Other (Implementing Partner)	None reported	None reported
Tanager International	Other (Implementing Partner)	None reported	None reported

Advancement of Agency Mission: The project aimed to improve smallholder food security by raising awareness about the role of OFS in reducing post-harvest losses and expanding access to more effective storage devices. Adoption of improved devices was expected to reduce grain loss and make more grain available for consumption. It would also reduce smallholder household's pesticide exposure since most of the storage technologies do not require pesticide dusting. Finally, because OFS technology enables smallholder farmers to safely store grain for longer periods, they could sell their grain at higher prices and increase their revenue. The competition achieved the following results: A total of 328,554 smallholder farmers purchased 1,390,777 devices, unlocking 413,265 MT of improved storage. Nine competitors invested an estimated $4,857,130 in their businesses to reach this new customer base.

Plan for Upcoming Two Fiscal Years: None reported

C.10.15. Nigeria Aflasafe(TM) Challenge Project[203]

Sponsoring Agency and Office: Washington (Bureau for Resilience and Food Security)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: The Nigeria Aflasafe(TM) Challenge Project was a five-year, $12,680,000 million Pay-for-Results prize competition that incentivized private sector actors to work with smallholder farmers to adopt Aflasafe(TM) to reduce contamination of their maize harvests. AgResults offered a per unit payment premium to aggregators and grain traders for each metric ton of high-Aflasafe(TM) maize (i.e., maize grains containing high proportion of beneficial fungi). By motivating the use of Aflasafe(TM) and providing technical assistance, aggregators helped smallholder farmers to produce safer maize.

[203] The website for Nigeria Aflasafe(TM) Challenge Project is accessible at https://agresults.org/projects/nigeria.

Budget and Resources: AgResults is a multi-donor trust fund, to which USAID contributed $8,000,000 in FY13 funds. Prize design, management, verification, award payouts, and evaluation are funded out of the trust. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	None reported	None reported
FTEs	0.04	0.04
Funding Estimate	None reported	None reported

Goal Types: Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Aflatoxins are one of the world's most carcinogenic substances. They are produced by a group of molds known as the *Aspergillus* fungi that often contaminate grains, such as maize. Aflatoxin-contaminated food can increase the risk of cancer and is associated with childhood stunting. In Nigeria, where smallholder farmers produce over 70 percent of the nation's maize crop, aflatoxins compromise livelihoods and endanger lives. Technologies to combat aflatoxin contamination have been sought for decades. In Nigeria, an environmentally safe technology called Aflasafe(TM) has been developed to reduce aflatoxin contamination of crops. Aflasafe(TM) uses beneficial fungi that displace toxigenic fungi. However, various barriers, including low consumer awareness and a lack of contamination limits, have prevented its widespread adoption.

Justification for Using Prizes and Challenges: Incentivize a larger number of submissions; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
5	$182,022	None reported	17	2019-06-19
6	$31,555	None reported	16	2019-10-08

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	$1,002,037
FY20	None reported	$31,555

Non-Cash Prizes Include: None reported

Participants:

FY19: 20 team(s)

FY20: 24 team(s)

Intended Participants: Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
5	None reported	None reported	2019-06-19	None reported
6	None reported	None reported	2019-10-08	None reported

Solicitation of Submissions: Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
5	Other
6	Other

Submissions: Competitors received $18.75 per MT of Aflasafe(TM)-treated maize sold. When tested, the maize needed to have at least a 70 percent Aflasafe(TM) level.

Evaluation of Submissions: Laboratory testing verified the prevalence of Aflasafe(TM) in maize to provide payments.

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
U.K. Foreign, Commonwealth & Development Office	Other	None reported	None reported
Global Affairs Canada	Other	None reported	None reported
Australia Department of Foreign Affairs and Trade	Other	None reported	None reported
Bill and Melinda Gates Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
World Bank	Other	None reported	None reported

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Deloitte	Other (Implementing Partner)	None reported	None reported
International Institute of Tropical Agriculture (IITA)	Other (Implementing Partner)	None reported	None reported

Advancement of Agency Mission: The project was expected to engage private maize aggregators and encourage them to supply aflatoxin-reduced maize while raising awareness of aflatoxins as a problem and Aflasafe(TM) as an effective control. Increased awareness would drive up demand for aflatoxin-free maize among smallholder farmers and value chain actors, improving health as people consume safer maize. Smallholder farmers were also expected to benefit from increased yields and increased market demand and/or any direct financial incentives that maize aggregators provided them. AgResults achieved the following: Forty-one competitors scaled Aflasafe(TM) to 75,788 smallholder farmers, resulting in 315,333 MT of high-Aflasafe(TM) maize aggregated with lower aflatoxin levels. On average, aflatoxin-reduced maize sold in the formal market earned a market premium of 10.7 percent.

Plan for Upcoming Two Fiscal Years: None reported

C.10.16. Powering Agriculture: an Energy Grand Challenge[204]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Center for Environment, Energy and Infrastructure)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Powering Agriculture: An Energy Grand Challenge for Development (Powering Agriculture, or PAEGC) was a partnership of U.S. Agency for International Development (USAID), the Government of Sweden through the Swedish International Development Cooperation Agency (Sida), the Government of Germany through Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Duke Energy Corporation, and the Overseas Private Investment Corporation (OPIC). It was launched by the Founding Partners in 2012 and began implementation in 2013 to support the development and deployment of clean energy innovations that stimulate low-carbon economic growth in the agriculture sectors of developing countries to help end extreme poverty and extreme hunger. December 2019 marked the conclusion of its formal phase of implementation. To solve the challenges described above, Powering Agriculture has supported clean energy innovations across the

[204] The website for Powering Agriculture is accessible at https://www.usaid.gov/energy/powering-agriculture?.

agricultural value chain, including: (1) On-farm productivity; (2) Cold storage; (3) Transport; (4) Post-harvest agriculture processing; and (5) Agriculture waste for energy applications.

Budget and Resources: Agency funds continue to be used for: overall program management; to provide business acceleration support to innovators (including a final convening and showcase); grant disbursements for the completion of milestones or in the case of cooperative agreements, reimbursement for expenditures, and knowledge management; and communications products such as as a final program evaluation, the final report, and webinars on lessons learned. Donor funds were pooled and therefore were used across program expenditures. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Operations or administrative support; Publicity, advertising, outreach, or/and communications; Solution acceleration	Operations or administrative support; Publicity, advertising, outreach, or/and communications; Solution acceleration
FTEs	1	1

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Powering Agriculture was designed to source solutions within the clean energy-agriculture nexus that (1) enhance agricultural yields/productivity; (2) decrease post-harvest loss; (3) improve farmer and agribusiness income generating opportunities and revenues; and/or (4) increase energy efficiency and associated savings in farm or agribusiness operations while stimulating low-carbon economic growth within developing countries agriculture sectors.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$12,883,303	None reported	13	2015-11-01

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$0	None reported
FY20	$0	None reported

Non-Cash Prizes Include: Innovators were provided with training, technical assistance in implementation and gender integration, business acceleration support, and referrals/partnership connections.

Participants:

FY19: 12 team(s)

FY20: 4 team(s)

Intended Participants: Small businesses; Large businesses; Other (Nonprofit organizations; research institutions; and private for-profit companies ranging from newly incorporated start-ups to established companies with mature product lines.)

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
2	2014-11-01	2015-11-01	2015-11-01	871

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations

Submission Types:

Phase	Submission Type
2	Proposal or concept; Prototype device or object; Business or commercial development plan; Analysis or visualization of data

Submissions: Powering Agriculture supported innovators that: (1) increased the visibility of clean energy solutions, (2) developed new clean energy product prototypes using technologies unavailable in developing markets or modified existing products in developed markets for use in developing markets, (3) increased access to clean energy asset financing, and (4) pushed the boundaries on viable clean energy business model creation.

Evaluation of Submissions: After applications were screened initially for eligibility and completeness, there were three stages to the PAEGC Applicant selection process: (1) Concept Note Submission, (2) Full Proposal Submission, and (3) Presentation to Innovator Evaluation Board (IEB). Applicants deemed ineligible or who submitted incomplete applications did not progress through the selection process. Evaluators were from USAID and other Federal agencies as well as external from the PAEGC partners and other experts drawn from universities, implementing partners, and consulting firms.

Partnerships: The prize competition involved four partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Government of Sweden	Other	$0	$0
Government of Germany	Other	$0	$0
Duke Energy	Private Industry	$0	$0
The Overseas Private Investment Corporation (OPIC)	Federal Agency or Office	$0	$0

Advancement of Agency Mission: The Grand Challenge is consistent with USAID's mission to establish effective and sustainable service providers and institutions that can operate, maintain, and renew facilities that serve as critical foundations for achieving broader development goals. USAID's approach to infrastructure, which includes energy programs, also emphasizes identification and application of best practices and learning based on evidence of effectiveness. The Grand Challenge is building organizations' capacities to deploy clean energy solutions that positively impact agriculture by documenting their experiences in the field and sharing those lessons learned in the form of technical papers, toolkits, and other publications. Infrastructure, which includes energy programs, is a critical foundation of inclusive, sustainable growth and is essential to achieving USAID's development objectives across a wide range of sectors, including health, economic growth, education, and the environment.

Plan for Upcoming Two Fiscal Years: Several Powering Agriculture innovators are participating in a new Water and Energy for Food (WE4F) Grand Challenge, which was launched in late FY20.

C.10.17. Promoting Justice Project (PROJUST)[205]

Sponsoring Agency and Office: Overseas (USAID/Mexico)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: PROJUST was a five-year, $68.2 million initiative that supported Mexico's landmark reform of its criminal justice system from an inquisitorial to an adversarial system. Activities provided technical assistance to primarily state authorities, with some federal assistance, to develop the skills-operative framework necessary to successfully complete the transition. In doing so, the initiative built on prior USAID investments and additionally focused on Mexico's persistently high rates of impunity, particularly for crimes that have an outsized impact on citizen perceptions of government performance. It recognized that significant institutional "stove-piping" impeded efficiency gains and drove impunity, and innovated new ways of strategic planning, data analysis, and information sharing, as well as joint efforts between courts, police, business, and civil society.

[205] There was no website provided for Promoting Justice Project (PROJUST).

Budget and Resources: Agency funds supported technical assistance and training for justice operators, principally to acquire the new skills necessary to investigate and prosecute crimes under Mexico's new criminal justice system. In the context of USAID's "100-Day Challenge" activities, funds were used to identify, recruit, and organize local operators and interested parties, including civil society and business, to work together to address priority criminal phenomena. Funds were used to organize workshops to plan and innovate new interventions that use existing local resources, and assess progress. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Operations or administrative support	Operations or administrative support
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: PROJUST, now closed, sought to consolidate reforms to Mexico's criminal justice system from an inquisitorial to an adversarial system akin to that of the United States. This involved not just structural reform, but also the necessity to bring skills, protocols, and operations in line with the goals of the new system. Unfortunately, impunity was and still remains extraordinarily high, due to factors as diverse as political corruption, inefficiency, and bureaucratic obstacles and incentives that prevent security and justice institutions from cooperating with one another.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

Non-Cash Prizes Include: None reported

Participants:

FY19: 12 team(s)

FY20: 12 team(s)

Intended Participants: Other (Local officials; prosecutors; police; civil society; and business)

Participation:

Submissions Open Date	**Submissions Close Date**	**Number of Submissions**
None reported	None reported	None reported

Solicitation of Submissions: Partnership with outside organizations.

Submission Types: Other (Group Challenge)

Submissions: The "100-Day Challenges" used a competitive yet collaborative element to foster group communication and teamwork toward a goal. Members were a self-selected group, representing local officials, prosecutors, police, business, and civil society, whose cooperation was vital to address high-impact crime in local communities. The call for applications was in January 2018.

Evaluation of Submissions: Each group was assigned to address a high-impact crime in their local area, such as vehicle theft or gender-based violence, and used baseline data and aspirational targets to guide their work over the course of 100 days. This data-based approach enabled members to calibrate and adjust their approach after 50 and 75 days, to meet or generally exceed their targets.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Tetra Tech DPK	Other	$0	$0
Management Sciences International	Other	$0	$0
Rapid Results Institute	Other	$0	$0

Advancement of Agency Mission: PROJUST directly supported the U.S. objectives of a safe, more prosperous Mexico, by improving the efficacy of its justice system. The activity provided technical assistance to improve the individual skills of justice operators and institute organizational reforms. Following a mid-term evaluation that identified bureaucratic "stove-piping" as a principal obstacle to the reforms, the activity employed innovative and iterative "100-Day Challenges" to facilitate greater information sharing and cooperation among the many actors involved in criminal justice.

Plan for Upcoming Two Fiscal Years: Successes utilizing "100-Day Challenge" methodology in USAID's and Mexico's justice portfolio, as well as in other activities such as crime and violence prevention, served as a model that USAID plans to incorporate in new activities in FY21 and FY22. USAID and Mexico recently launched a new five-year justice activity to build on the foundation of reforms achieved under PROJUST. This new justice activity will incorporate the same challenge methodology as means—not an end—to build confidence and cooperation of new communities seeking to address high-impact crime. Specifically, the challenges will be a strategic tool to address the drivers of impunity, particularly as it affects citizen confidence in Mexico's justice system.

C.10.18. RISE Challenge[206]

Sponsoring Agency and Office: Washington (Development, Democracy, and Innovation Bureau/Gender Equality and Women's Empowerment Hub)

Authority: Other authority (Foreign Assistance Act of 1961, as amended (grants under contract)

Status:

[206] The website for RISE Challenge is accessible at https://competitions4dev.org/risechallenge.

FY19: Ongoing

FY20: Ongoing

Competition Summary: USAID's Gender Equality and Women's Empowerment Hub (GenDev) is hosting the Resilient, Inclusive, & Sustainable Environment (RISE) Challenge to fund the innovative application of promising or proven interventions to address gender-based violence (GBV) in environmental programming. The RISE Challenge aims to: spur greater awareness of the intersection between environmental degradation and GBV; test new environmental programming approaches that incorporate efforts to prevent GBV and provide support to survivors of GBV; widely share evidence of effective interventions and policies; elevate this issue and attract commitments from other organizations; and include implementing partners and donors, for collaboration and co-investment. The RISE Challenge selected the first five winners in 2020 to do critical work in Colombia, the Democratic Republic of Congo, Fiji, and Uganda. All five activities are designed to address GBV in environmental programs and generate evidence on promising interventions.

Budget and Resources: RISE Challenge funds were used for: a co-creation workshop with 35 stakeholders from the environment and gender sectors to co-design the challenge statement; a systems summit workshop that brought together RISE Challenge winners to build their capacities and a strong cohort; programmatic and operational support to implement and manage the RISE grantees; technical assistance in the areas of monitoring, evaluation and learning, gender analysis, activity design, and sustainable natural resource management; the development of communication products to advertise the challenge and share winners. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications	Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications
FTEs	0.17	0.5
Funding Estimate	$7,000	$60,000

Goal Types: Generate innovative ideas/designs/concepts; Build or strengthen a community

Problem or Opportunity Addressed: GBV is estimated to affect more than one in three women worldwide. This widespread problem takes a variety of forms, including sexual, psychological, community, economic, institutional, and intimate partner violence, and in turn affects nearly every aspect of a person's life, including health, education, and economic and political opportunities. At the same time, environmental degradation, loss of ecosystem benefits, and unsustainable resource use are creating complex crises worldwide. As billions of people rely on these natural resources and ecosystems to sustain themselves, the potential human impacts are dire, with disproportionate effects on women and girls. GBV and environmental issues are interlinked and their interactions are complex. In some contexts, they form feedback loops where gender-based attacks, harassment, and

discrimination worsens the loss of biodiversity and ecosystem resources, and this environmental deterioration triggers new, more damaging forms of violence.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivized a larger number of submissions; Flexibility to implement project design and achieve project goals; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

Prize Purse	Awards Available	Awards Given	Winners Announcement Date
$1,240,000	5	5	2020-06-16

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$1,240,000	$1,240,000
FY20	$600,000	None reported

Non-Cash Prizes Include: Not applicable

Participants:

FY19: 190 team(s)

FY20: 239 team(s)

Intended Participants: Other (Organizations focused on the environment and gender.)

Participation:

Submissions Open Date	Submissions Close Date	Number of Submissions
2019-08-15	2019-10-08	190

Solicitation of Submissions: Social media; Email; Partnership with outside organizations

Submission Types: Proposal or concept

Submissions: The Request for Applications (RFA) sought innovative applications of proven or promising GBV interventions in environmental programs that focuses on the access, use, control and/or management of natural resources. This challenge aims to fund organizations to innovatively adapt and implement promising or proven interventions or practices that have been used to effectively prevent GBV and support survivors of GBV in other sectors to environmental programming, or to integrate GBV interventions into existing environmental programming. Activities implemented through this challenge will contribute to the evidence base for strategies, policies, programs, and interventions that reduce GBV within a range of environmental sectors.

Evaluation of Submissions: Applications went through a multi-tiered review process, which included three stages. All evaluations were completed on the SMApply system and are documented and on file: (1) Eligibility screening to ensure compliance with the terms and conditions of the RFA, completed by the Catalyst team; (2)Judging by three judges with relevant environmental and gender expertise evaluated each eligible application; (3) technical evaluation committee (TEC) to review the top 21 applications and select nine Finalists; (4) Finalist interview of the top nine candidates by the TEC using standardized questions and including an evaluation of each Finalist based on standard criteria.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Resonance Global	Private Industry	$0	$0
International Union for Conservation of Nature (AGENT Project)	Nonprofit Organization (excluding Academic Institutions)	$30,000	$30,000

Advancement of Agency Mission: Responding to GBV can provide opportunities for both enhanced environmental action and women's empowerment, but tackling one issue without addressing the other is unlikely to succeed. USAID's RISE Challenge aims to identify and implement interventions to prevent and reduce GBV in environmental programming. This challenge aims to fund organizations to innovatively adapt and implement promising or proven practices that have been used to effectively prevent and respond to GBV in other sectors to environmental programming. The challenge will draw insights from other development and humanitarian sectors that have proven or promising practices to address GBV. It incentivizes partnerships between environmental organizations, local communities, indigenous people's organizations, and gender and GBV experts who can help bridge knowledge gaps and work to build an evidence base of effective GBV interventions. RISE also celebrates and spurs a broad range of interventions that are sustainable and integrable into USAID and partners' environmental programming and investments.

Plan for Upcoming Two Fiscal Years: Funds permitting, USAID would like to launch RISE FY21 and FY22.

C.10.19. Saving Lives at Birth[207]

Sponsoring Agency and Office: Washington (Bureau for Global Health, Center for Accelerating Impact and Innovation and the Office of Maternal and Child Health and Nutrition)

Authority: Other authority (Federal Acquisition Regulations (FAR) Part 35.016 (c))

Status:

FY19: Ongoing

FY20: Ongoing

[207] The website for Saving Lives at Birth is accessible at www.savinglivesatbirth.net.

Competition Summary: Summary Saving Lives at Birth (SL@B) is a global partnership between USAID, the Government of Norway, the Bill & Melinda Gates Foundation, Grand Challenges Canada, the U.K. Department for International Development (DFID), and the Korea International Cooperation Agency (KOICA). SL@B issued its first global call for groundbreaking innovations to be used around the time of birth to reduce maternal and newborn deaths and prevent stillbirths in poor, hard-to-reach communities. Saving Lives at Birth seeks innovative solutions that are affordable, accessible, sustainable, and of high quality across three focus areas: science and technology, service delivery, and demand creation. The partnership chose its first awardees in 2011 and has issued a call for applications and chosen new award recipients in each subsequent year through 2018. In its eight rounds, Saving Lives at Birth has funded 118 innovative tools and approaches already benefiting 3 million women and children, saving more than 11,500 lives, and over 155,00 lives improved worldwide, with the potential to save 150,000 lives by 2030.

Budget and Resources: No agency funds were used in FY19 or FY20 but USAID managed the distribution of SL@B partnership funds during this time. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	None reported
FTEs	2	2
Funding Estimate	None reported	None reported

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Through SL@B, USAID and its partners sought groundbreaking prevention and treatment approaches for pregnant women and newborns in poor, hard-to-reach communities around the time of childbirth. The challenge identified and supported innovative ideas that could leapfrog conventional approaches to address inequities and inequalities of care, which are critical in surmounting these gaps. In order to accelerate substantial and sustainable progress in reducing maternal and newborn deaths and stillbirths at the community level-and contribute to the goals and targets of Ending Preventable Maternal Mortality and the Every Newborn Action Plan, USAID and the SL@B partners supported prevention and treatment approaches that increased access to improved: (1) science and technology; (2) service delivery; and (3) demand-side innovation. Selected innovators received funding and acceleration support to develop, validate, and scale-up solutions that address pressing challenges around the time of birth for women and their babies.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Develop solutions in a quick timeframe; Low risk approach and/or pay-for-performance structure; Identify and work with new innovators; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area; Previous success with a prize competition; Other (Leverage a milestone based approach to fixed amount awards (FAAs))

Cash Prize Purses and/or Non-Cash Prize Awards: None reported

Non-Cash Prizes Include: Saving Lives at Birth grantees were offered acceleration support, which includes participation in the Accelerating SL@B (a-SL@B) program, attending an Xcelerator Workshop and DevelopmentXChange or Grand Challenges Annual Meeting events.

Participants:

FY19: No teams reported

FY20: No teams reported

In FY19-FY20 there were no new open call participants. Prior year awards however are still underway.

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adult not affiliated with higher education; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
8	None reported	None reported	2018-06-30	None reported

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Other (Because Saving Lives at Birth announced calls for applications on an annual basis up until a few years ago, many organizations knew that the call would open in January each year and we would rely on the network we built and the network of our partners to spread the word about the calls. For each call, USAID prepared a communications plan, which included social media toolkits for the rest of the Saving Lives at Birth funding partners, engaged national and international media outlets, and published blogs and newsletters promoting the call and highlighting the impact of Saving Lives at Birth grantees.)

Submission Types:

Phase	Submission Type
8	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan; Analysis or visualization of data

Submissions: There have been no calls for applications during this reporting period. The eighth and last call for applications was in January 2018.

Evaluation of Submissions: During each open call, eligible applicants submit Expressions of Interest (EOI), which are reviewed by experts from USAID and the partner organizations on the basis of innovation, sustainability, and potential for scale. If eligibility screening indicates the merits of further consideration, selected organizations or consortia may be invited, individually or in combination, to submit proposals, which are reviewed. Successful applicants will be invited to discuss their proposals with the Saving Lives at Birth partners for co-creation and further due diligence. This process results in applicants being invited to submit concept notes and attend the Development XChange in Washington, DC in July, which brings development actors together in one place. Finalists display their innovations/innovative ideas in an open marketplace. As part of this event, finalists will have the

opportunity to network with each other, with other development experts and innovators, and other potential funders.

Partnerships: The prize competition involved five partners: Grand Challenges Canada (GCC), The Bill and Melinda Gates Foundation, Government of Norway (Norad), Korean International Cooperation Agency (KOICA), and the UK Department for International Development (DFID), who committed to providing almost $100 million to support the scale up of innovative tools and approaches to improve the lives of mothers and newborns during their most vulnerable hours.

Advancement of Agency Mission: This challenge addresses a key priority of the agency and complements existing USAID programmatic efforts to dramatically reduce maternal and newborn deaths around the world. The innovations in the Saving Lives at Birth portfolio aim to directly save the lives of women and babies around the time of birth or contribute to this important goal. Implementing at scale is critical to the sustained success of innovative solutions and a clear understanding of how to address maternal and newborn mortality within the context of the larger health system is of critical importance to the success of the SL@B program. In order to harness scientific / technological, social, and business ingenuity, and to catalyze successful implementation at a sustained scale, the challenge encourages innovators to (1) Develop partnerships that bring together diverse competencies, including from private sector (with co-funding) and government partners (2) Form dedicated multidisciplinary/cross-sectoral teams; and (3) focus on leadership of local partners and key influencers. Since 2016, there has been a focus to increase applicants based in low-and middle-income countries. As such, this challenge has brought new local partners to USAID, advanced the agency's goals, promoted private sector engagement, and reinforced countries' journeys to self-reliance.

Plan for Upcoming Two Fiscal Years: There are no additional open innovation rounds planned under SL@B. USAID and its SL@B partners are discussing ways to support and scale the most promising maternal and newborn health innovations.

C.10.20. Scaling Off-Grid Energy[208]

Sponsoring Agency and Office: Washington (Development, Democracy, and Innovation Bureau/Innovation, Technology and Research Hub & Power Africa)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Scaling Off-Grid Energy (SOGE) is a platform for leading donors and investors to develop Africa's off-grid energy sector and coordinate investments to connect more households and businesses to electricity, faster. Scaling Off-Grid Energy aims to incentivize technological innovation, fund early stage companies, and support critical elements of the off-grid ecosystem. Scaling Off-Grid Energy has accelerated growth in the off-grid energy market to provide millions of

[208] The website for Scaling Off-Grid Energy is accessible at http://www.scalingoffgrid.org/.

households and businesses in sub-Saharan Africa with access to modern, clean, and affordable electricity. This initiative aimed to spur a vibrant marketplace of enterprises providing off-grid energy solutions that meet the needs of low-income consumers across the African continent. SOGE includes founding partners USAID, the U.K. Foreign, Commonwealth & Development Office, Power Africa, the African Development Bank, and the Shell Foundation.

Budget and Resources: $9.5 million in funding from DDI/ITR, $25 million from Power Africa, and contributing amounts from donor partners across a three-year Grand Challenge. (No direct awards during this date). The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Discovery and design support; Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support	Data entry/analysis; Discovery and design support; Non-monetary award(s); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	5	3
Funding Estimate	None reported	None reported

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: More than 600 million people in sub-Saharan Africa live without access to electricity. Most countries are unlikely to connect their entire population to grid electricity for years, if not decades. As a result, many households rely on expensive, dangerous, pollution-causing kerosene, and diesel fuel for their energy needs. Scaling Off-Grid Energy will accelerate growth in the off-grid energy market to provide millions of households and businesses in sub-Saharan Africa with access to modern, clean, and affordable electricity. The vision is to spur a vibrant marketplace of enterprises that provide off-grid energy solutions that meet the needs of low-income consumers across the African continent.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards: None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: No teams reported

Intended Participants: No specific intended group

Participation: None reported

Solicitation of Submissions: Social media; Email; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
3	Proposal or concept; Prototype device or object; Business or commercial development plan; Analysis or visualization of data

Submissions: None reported

Evaluation of Submissions: None reported

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Shell Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
African Development Bank	Other	None reported	None reported
Department for International Development (DFID)	Other	None reported	None reported

Advancement of Agency Mission: Provides meaningful, scaled energy solutions to poor and underserved communities in African countries.

Plan for Upcoming Two Fiscal Years: None reported

C.10.21. Securing Water for Food: a Grand Challenge for Development[209]

Sponsoring Agency and Office: Washington (Development, Democracy, and Innovation Bureau/Innovation Pillar)

[209] The website for Securing Water for Food: a Grand Challenge for Development is accessible at securingwaterforfood.org.

Authority: Other authority (Section 635(d) of the Foreign Assistance Act)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Securing Water for Food: A Grand Challenge for Development (SWFF) helped farmers around the world grow more food using less water, enhance water storage, and improve the use of saline water and soil to produce food by ensuring that the entrepreneurs and scientists behind groundbreaking new approaches are getting the support they need to apply and expand their solutions around the world. Since 2013, USAID, Sweden through the Swedish International Development Cooperation Agency (Sida), the Government of South Africa, and the Ministry of Foreign Affairs of the Kingdom of the Netherlands have invested $34 million and provided critical acceleration support to promote science and technology solutions that enable the production of more food with less water and/or make more water available for food production, processing, and distribution.

Budget and Resources: USAID supported costs related to the overall management of the program, as well as communications, platforms, events, and external monitoring and evaluation. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Database development; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support	Data entry/analysis; Database development; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity, advertising, outreach, or/and communications; Solution acceleration; Web portal or app development and support
FTEs	1	0.48
Funding Estimate	$985,000	$0

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: Securing Water for Food: A Grand Challenge for Development helped farmers around the world grow more food using less water, enhance water storage, and improve the use of saline water and soil to produce food by ensuring that the entrepreneurs and scientists behind groundbreaking new approaches are getting the support they need to apply and expand their solutions around the world.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Most cost-effective approach;

Low risk approach and/or pay-for-performance structure; Less burdensome to design and execute than alternatives; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
4	$5,450,000	None reported	10	2017-09-11

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$1,775,000	$1,775,000
FY20	$2,275,000	$2,275,000

Non-Cash Prizes Include: SWFF provided financial and acceleration support through the SWFF Technical Assistance (TA) Facility, an enterprise accelerator supported by a $10.76 million contract awarded to The Kaizen Company. Innovators received services from the TA Facility's SWFF Rapid Vendor Procurement Mechanism (RVPM), which at the end of the program was comprised of 27 firms and individuals that provided business acceleration support to SWFF innovators in 21 distinct service categories. Over six years of the RVPM, the TA Facility engaged a total of 34 vendors based all over the world. The purpose of the RVPM was to provide technical assistance that was not available through the TA Facility or USAID, and in those cases, niche service providers were solicited through the RVPM to develop customized and cost-effective proposals in response to the innovator's needs. To learn and grow, SWFF periodically performed a program-level analysis of poverty, gender, and environmental sustainability. SWFF influenced farmer behaviors, improved livelihoods, helped alleviate and create resilience to poverty, and stimulated gender-inclusive strategies and activities.

Participants:

FY19: 10 team(s)

FY20: 7 team(s)

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
4	None reported	None reported	2017-09-11	None reported

Solicitation of Submissions: Social media; Email; Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
4	Proposal or concept; Business or commercial development plan

Submissions: The Securing Water for Food (SWFF) partners fund game-changing innovations that produce more food using less water and help to address water scarcity, one of the most pressing development challenges of the early 21st century. This round, which focused on innovations that benefit the poor and women, received 555 applications from universities, startups, and NGOs in more than 80 countries, of which 70 percent of the applicants and winners were from developing countries. Innovations ranged from novel technologies to simple concepts, with an increase in innovations that are women-oriented and pro-poor. The ten award winners stood out as exceptional initiatives with high potential for transformative impact.

Evaluation of Submissions: The International Investment Advisory Committee (IIAC) was a critical component of the SWFF ecosystem and a unique advisory board in international development. It was created to aid in the selection of the SWFF innovators and to provide input on innovator technical and financial milestones for initial and future funding tranches. The IIAC was comprised of world-class technical experts, business specialists, sustainable development experts, and researchers with extensive experience in water and agricultural innovation. The committee's critical contributions helped the SWFF Founding Partners ensure that the program supported the most technically sound, commercially viable, and sustainable innovations.

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Sweden, through the Swedish International Development Cooperation Agency	Other	None reported	None reported
Foreign Ministry of the Netherlands	Other	None reported	None reported
South African Department of Science and Technology	Other	None reported	None reported

Advancement of Agency Mission: USAID aims to be a catalytic actor driving development results. USAID's work advances U.S. national security and economic prosperity, demonstrates American generosity, and promotes a path to recipient self-reliance and resilience. SWFF supported that mission.

Plan for Upcoming Two Fiscal Years: None reported

C.10.22. Sign On for Literacy Prize[210]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Center for Education)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Completed

Competition Summary: Acquisition of a first language is essential for early childhood development and a building block for learning to read. Literacy is linked to success across development sectors and contributes to psycho-social health, employment opportunities, economic growth, and breaking the cycle of poverty. Globally, for children who are deaf, hard of hearing, and deafblind, access to and education in a local sign language is often limited or absent. Without access to the whole language with frequent and daily input to an accessible and natural language, the foundations of literacy, children are prevented from reaching their full potential. In developing countries and low-resource contexts, literacy outcomes for children who are Deaf are particularly substandard. As such, All Children Reading: A Grand Challenge for Development (ACR GDC) launched the Sign On For Literacy (SOFL) Prize, which seeks technology-based innovations to increase access to local sign languages and develop literacy interventions for children who are Deaf in low-resource contexts. Winning innovations must be novel, while utilizing technology to make a significant impact upon learning and literacy in the Deaf Community.

Budget and Resources: Agency funds were used to support ACR GCD in funding the different phases of the Sign On for Literacy competition's prize purse which was then awarded to the winners to implement their innovative solutions. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award)	None reported
FTEs	2	2
Funding Estimate	$220,000	$0

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Outreach/information dissemination; Build or strengthen a community

[210] The website for Sign On for Literacy Prize is accessible at https://allchildrenreading.org/competition/sign-on-for-literacy-prize/.

Problem or Opportunity Addressed: The SOFL Prize works to develop innovative Ed Tech (Education Technology) solutions that address the problem of low to no access to language and literacy that deaf, hard of hearing, and deafblind individuals all over the world face.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Most cost-effective approach; Less burdensome to design and execute than alternatives; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
3	$450,000	3	3	2019-02-05

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$450,000	$450,000
FY20	None reported	None reported

Non-Cash Prizes Include: None reported

Participants:

FY19: 3 team(s)

FY20: 3 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
3	2017-11-08	2018-02-16	2019-02-05	3

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Live video streaming announcement; Partnership with outside organizations, Publicity efforts from vendors/contractors; website; blogs; eblast to ACR listserv

Submission Types:

Phase	Submission Type
3	Prototype device or object

Submissions: The focus of the competition is on finding technologies that enable the creation of resources to improve access to, and education in, local sign language for children who are deaf in low-

resource settings. Innovations should increase language and reading skills, be cost effective for developing country contexts and have the potential for scale. ACR GCD recognizes that in some settings there is no documented sign language, and to create such resources, language documentation is necessary. As such, solutions that use technology for this crucial first step of documentation will also be considered for awards.

Evaluation of Submissions: Solvers were invited for pitch presentations to advance to Phase 2 and 3. Solvers were scored based on a rubric and deliberation among judges based on their presentations. Judges were from the ACR GCD partnership as well as other resource partners participating in the SOFL Prize.

Partnerships: The prize competition involved five partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**
World Vision	Nonprofit Organization (excluding Academic Institutions)	$220,000	None reported
Australia Department of Foreign Affairs and Trade	Other	$220,000	None reported
World Federation of the Deaf	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
Nyle DiMarco Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
Deaf Child Worldwide	Nonprofit Organization (excluding Academic Institutions)	None Reported	None Reported

Advancement of Agency Mission: Sign On for Literacy advances USAID's mission primarily by focusing on solutions that work on empowering local actors to change attitudes and beliefs about sign languages and how language acquisition firmly bridges to reading in local languages, which in turn supports the building of foundational skills needed in education for children to learn to read so that they can read to learn. Education is the bedrock of human capital development and helps save lives, reduce poverty, and strengthen democratic governance.

Plan for Upcoming Two Fiscal Years: The challenge has ended. All books are available on the Global Digital Library and awardees are continuing to promote and improve their funded solutions.

C.10.23. Small and Medium Enterprise Activity Challenge Fund[211]

Sponsoring Agency and Office: Overseas (USAID/Pakistan)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The Small and Medium Enterprise Activity Challenge Fund (SMEA-CF) is providing support for the creation and diffusion of innovative, sustainable, and scalable business solutions to the competitiveness challenges facing Pakistani small and medium enterprises (SMEs). The SMEA-CF is designed to help identify key challenges in specific sectors that are hampering growth within the private sector, and then invite innovators to design and implement solutions. Private sector entities are encouraged to apply as they design and launch these services on a commercial basis, ensuring sustainability. New participants in the value chain, in the form of these innovators, also allow for out of the box thinking that is not hampered by preconceived notions of the sector participants who have, over time, accepted the sector's challenges and limitations.

Budget and Resources: Monetary awards were given as reimbursement of expenses incurred by the awardee. These were fixed amount awards and disbursed in tranches against completion of previously agreed milestones. This primarily covered the equipment, human resources, marketing, and other development costs. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award)	Prize purse (monetary award)
FTEs	5	6
Funding Estimate	$125,000	$100,000

Problem or Opportunity Addressed: The SMEA-CF identifies key challenges in specific sectors that are hampering growth, then invites innovators to design and implement solutions. Private sector entities are encouraged to apply as they design and launch the service on a commercial basis, ensuring sustainability. New participants in the value chain, in the form of these innovators, also allow for out of the box thinking that is not hampered by the pre-conceived notions of the sector participants who have, over time, accepted the sector's challenges and limitations.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Identify and work with new innovators

Cash Prize Purses and/or Non-Cash Prize Awards:

[211] There was no website provided for the Small and Medium Enterprise Activity Challenge Fund.

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$350,000	20	20	2018-11-30
2	$850,000	25	25	2019-03-31
3	$1,400,000	40	40	2020-05-31
4	$1,200,000	5	0	2020-12-31

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$1,300,000	$1,300,000
FY20	$2,600,000	$1,400,000

Non-Cash Prizes Include: Potential applicants were invited for a co-creation workshop. Shortlisted applicants after first evaluation were then invited for a build-a-business workshop. Co-creation workshops encourage and facilitate potential applicants through visual thinking and constituting a human-centered approach, offering entrepreneurs of any type a chance to deeply understand the people they are looking to serve, and create innovative new solutions rooted in people's actual needs. Participants include innovators and businesses from relevant SMEA sectors who then form working groups. Businesses present problems and innovators are challenged to design solutions around the problem. The idea is to provide potential applicants with first-hand knowledge of challenges faced by the businesses or in any specific sector or industry. After co-creation workshops, applicants may submit applications. Shortlisted applicants are invited for a two-day build-a-business workshop to assist them in developing final proposals with a clear and comprehensive design for the Business-to-Business linkage, which lays out provisions to ensure smaller firms in the value chain benefit from the linkage. The workshops are highly experiential, mentorship-driven programs designed to visually facilitate participants through the universal steps required to start and build a viable business.

Participants:

FY19: 1,007 team(s)

FY20: 2,000 team(s)

Intended Participants: Small businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2018-04-01	2018-09-30	2018-11-30	207
2	2018-10-15	2019-01-31	2019-03-31	1007
3	2019-09-01	2020-03-31	2020-05-31	1158
4	2020-07-01	2020-08-31	2020-12-31	850

Solicitation of Submissions: Social media; Email; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors; Other (Newspaper advertisements)

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept
3	Proposal or concept
4	Proposal or concept

Submissions: None reported

Evaluation of Submissions: Applications are evaluated by a panel of private sector/industry experts including business, financial and sector experts. Cumulative scores from all three judges form the basis for a shortlist. Shortlisted applicants are then invited for a final pitch session, which is attended by senior project management and USAID representative(s). Final applicants are selected on the basis of cumulative scores from the pitch session and first evaluation completed by the three judges.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Chemonics International	Private Industry	$0	$0

Advancement of Agency Mission: The Small and Medium Enterprise Activity Challenge Fund encourages firms to develop and market new technologies to enhance firm productivity and efficiencies for both domestic and export markets, testing and piloting new ideas and bringing successfully demonstrated new ideas to fruition. SMEA-CF also leverages lessons from similar funds launched elsewhere by USAID.

Plan for Upcoming Two Fiscal Years: In FY21, SMEA plans to distribute 30-35 new awards to innovators under the SMEA-CF.

C.10.24. Tanzania Dairy Productivity Challenge Project[212]

Sponsoring Agency and Office: Washington (Bureau for Resilience and Food Security)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Launched

[212] The website for Tanzania Dairy Productivity Challenge Project is accessible at https://agresults.org/projects/tanzania-dairy.

FY20: Ongoing

Competition Summary: The AgResults Tanzania Dairy Productivity Challenge is a $4.9 million prize competition that aims to increase dairy productivity in Tanzania by encouraging private sector input suppliers to deliver products to smallholder farmers. By providing a prize for each bundle of high-quality inputs delivered, this competition will increase animal productivity, boost smallholder farmers incomes, and strengthen connections between dairy producers and the formal dairy sector.

Budget and Resources: AgResults is a multi-donor trust fund, to which USAID contributed $8,000,000 in FY13 funds. Prize design, management, verification, award payouts, and evaluation are funded out of the trust. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	None reported
FTEs	0	0.04
Funding Estimate	None reported	None reported

Goal Types: Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: The Tanzanian dairy sector, which is dominated by smallholder farmers, struggles for a variety of reasons: approximately 97 percent of Tanzania's dairy cattle are low-yield breeds, poor management practices are prevalent, and there are seasonal fluctuations in the availability of forage and feed. This precludes many smallholder farmers from accessing affordable extension or veterinary services. The lack of high-quality inputs, such as parasite control, nutritious feed, vaccines, and artificial insemination, is at the heart of the problem.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

Non-Cash Prizes Include: None reported

Participants:

FY19: No teams reported

FY20: 6 team(s)

Intended Participants: Small businesses; Large businesses

Participation: None reported

Solicitation of Submissions: Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types: None reported

Submissions: The project is designed to incentivize private sector input suppliers to package and deliver input bundles comprising a combination of parasite controls, high quality feed or fodder, vaccines, and/or artificial insemination inputs to smallholder dairy farmers.

Evaluation of Submissions: Competitors applied to participate and then will receive a prize payment based on the number of inputs sold and the kind of input sold.

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	**Partner Type**	**FY19 Contribution**	**FY20 Contribution**
U.K. Foreign, Commonwealth & Development Office	Other	None reported	None reported
Global Affairs Canada	Other	None reported	None reported
Australia Department of Foreign Affairs and Trade	Other	None reported	None reported
Bill and Melinda Gates Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
World Bank	Other	None reported	None reported
Deloitte	Other (Implementing Partner)	None reported	None reported
Land O'Lakes Venture37	Other (Implementing Partner)	None reported	None reported

Advancement of Agency Mission: By encouraging suppliers to provide input bundles and advisory services to smallholder farmers, the project will address a variety of current weaknesses in Tanzania's dairy value chain. As farmers gain access to these materials and receive regular training, their knowledge of livestock management will improve as will their use of vaccines and health inputs, in turn boosting the nutrition of cows. Healthier and more productive cows will improve the quality of the milk, positioning smallholder farmers to participate more fully in formal markets. Accessing these markets will drive up smallholder farmer's incomes and cement their relationships with key value chain actors. AgResults expects to achieve the following by the end of the project: Approximately 23 million liters of additional milk production; $9.4 million in additional farmer revenue; $4.14 million in competitor revenue; and 22 percent market penetration in the number of dairy farmers in the target region(s) reached.

Plan for Upcoming Two Fiscal Years: In the next two years, competitors will be developing and selling input bundles to smallholder farmers and receive incentive payments on an annual basis based on sales.

C.10.25. UnrestrICTed Challenge[213]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, DDI/ Center for Education)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: No activity occurred during FY19

FY20: Launched

Competition Summary: More than 93 million children globally have a disability. Of those children with disabilities who reside in countries with high poverty levels, at least 90 percent do not attend school, and fewer girls with disabilities attend school than boys. A lack of suitable transportation and infrastructure, inadequate teacher training, insufficient learning support, and a dearth of quality learning resources prevent children with disabilities from attending or fully participating in school, leaving them further behind their peers in academic and social development. The COVID-19 pandemic has exacerbated these challenges, and deepened the need for quality information and communication technology solutions (ICT) to support learning for all children in and out of school. All Children Reading: A Grand Challenge for Development (ACR GCD) seeks to scale ICT for education solutions that will ensure children with disabilities benefit from language, literacy, and learning support grounded in Universal Design for Learning (UDL) at home and at school. The three focus area-specific goals for the UnrestrICTed Challenge are: (1) Children have access to and engage with ICT solutions, grounded in UDL principles, to develop language and literacy skills; (2) Teachers are better prepared to nurture language and literacy skills of children with disabilities through Universal Design for Learning principles and technologies; (3) Parents and communities have an increased understanding of how to support the language and literacy skills development of children with disabilities, and access to the tools to do so.

Budget and Resources: Agency funds were used to support ACR GCD in funding the UnrestrICTed competition's prize purse, which has yet to be awarded. The competition is still only in Phase 2, and USAID funds have not yet been used for this competition. The following table indicates the budget and resources to support the activity.

Funding	**FY20**
Agency Fund Use	Federal personnel (FTE); Prize purse (monetary award)
FTEs	2
Funding Estimate	$0

[213] The website for UnrestrICTed Challenge is accessible at https://allchildrenreading.org/competition/unrestricted-challenge/.

Goal Types: Develop/demonstrate technology; Education/training; Outreach/information dissemination; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: More than 93 million children globally have a disability. Of those children with disabilities who reside in countries with high poverty levels, at least 90 percent do not attend school, and fewer girls with disabilities attend school than boys. A lack of suitable transportation and infrastructure, inadequate teacher training, insufficient learning support, and a dearth of quality learning resources prevent children with disabilities from attending or fully participating in school, leaving them further behind their peers' academic and social development. The COVID-19 pandemic has exacerbated these challenges, and deepened the need for quality ICT solutions to support learning for all children in and out of school.

Justification for Using Prizes and Challenges: Incentivize a larger number of submissions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Develop solutions in a quick timeframe; Less burdensome to design and execute than alternatives; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
1	$0	12	9	2021-03
2	$3,000,000	3	3	2021-03

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$0	$0

Non-Cash Prizes Include: Not applicable

Participants:

FY19: No teams reported

FY20: 9 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	2020-06-25	2020-07-20	2020-08-15	44
2	2020-08-01	2020-10-30	2020-12-30	6

Solicitation of Submissions: Social media; Email; Partnership with outside organizations

Submission Types:

Phase	Submission Type
1	Proposal or concept
2	Proposal or concept; Prototype device or object; Creative media; Analysis or visualization of data

Submissions: ACR GCD seeks to scale ICT for education solutions that will ensure children with disabilities benefit from language, literacy, and learning support grounded in UDL at home and at school. The three focus area-specific goals for the UnrestrICTed Challenge are: (1) Children have access to and engage with ICT solutions, grounded in UDL principles, to develop language and literacy skills; (2) Teachers are better prepared to nurture language and literacy skills of children with disabilities through UDL principles and technologies; (3) Parents and communities have an increased understanding of how to support the language and literacy skills development of children with disabilities, and access to the tools to do so.

Evaluation of Submissions: The evaluation process is built into the different phases. Stage 1 is the expression of interest stage where solvers submit interest and ACR GCD partner organizations review proposals, ranking them against a set of criteria. The top three to four for each country context advance to the co-design phase where three to four organizations co-design in a workshop. Then, the organizations submit a ten-page concept paper outlining the proposed solution. Concept papers will be reviewed by a committee of technical experts from the partnership and elsewhere as needed. The Judging Committee will recommend which solver(s) advance to receive an award.

Partnerships: The prize competition involved two partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
World Vision	Nonprofit Organization (excluding Academic Institutions)	None reported	$1,000,000
Australia Department of Foreign Affairs and Trade	Other	None reported	$1,000,000

Advancement of Agency Mission: The UnrestrICTed Challenge advances USAID's mission primarily by seeking to build on past lessons learned in Ed Tech and intertwining them with principles of Universal Design for Learning to ensure that all learners, including those with disabilities, have access to quality, equitable and inclusive education they need to build foundational skills in education for children to learn to read so that they can read to learn. Education is the bedrock of human capital development and helps save lives, reduce poverty and strengthen democratic governance.

Plan for Upcoming Two Fiscal Years: Ready2Read launched on February 9, 2021 with submissions due March 9. More information can be found here. The Ready2Read Challenge will call on global solvers

(in FY21) to propose existing or adapted EdTech solutions and activities that enable marginalized children ages 4 to 6 to build foundational language and literacy skills at home and at school. In addition to targeting key foundational language and literacy skills—including alphabetic knowledge, phonological awareness, expressive vocabulary, and listening comprehension—solutions should also support parents, caregivers, teachers and/or facilitators with resources and tools to assist in filling gaps in early learning among children, especially due to COVID-19 and other crises.

C.10.26. Vietnam Emissions Reduction Challenge Project[214]

Sponsoring Agency and Office: Washington (Bureau for Resilience and Food Security)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The AgResults Vietnam Greenhouse Gas (GHG) Emissions Reduction Challenge Project is a four-year, $8 million prize competition that aims to develop, test, and scale up innovative technologies, tools, and approaches to increase yields and reduce GHG emissions in rice production. The project plans to lower GHG emissions, protect the environment, and ultimately reduce poverty among smallholder farmers in the region. Focusing on the Thai Binh province in the Red River Delta, the project uses results-based prize incentives to attract a diverse pool of private sector actors.

Budget and Resources: AgResults is a multi-donor trust fund, to which USAID contributed $8 million in FY13 funds. Prize design, management, verification, award payouts, and evaluation are funded out of the trust. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	None reported	None reported
FTEs	0.04	0.04
Funding Estimate	None reported	None reported

Goal Types: Education/training; Launch or scale up the use of an enterprise/promote commercialization

Problem or Opportunity Addressed: Current rice farming practices in South and Southeast Asia produce significant amounts of greenhouse gases (GHG), particularly non-carbon dioxide (CO2) emissions including methane (CH4) and nitrous oxide (N2O). These compounds are potent contributors to global GHG emissions that drive climate change-related extreme weather events, including droughts and

[214] The website for Vietnam Emissions Reduction Challenge Project is accessible at https://agresults.org/projects/vietnam.

floods. Smallholder rice farmers contributing to these emissions, including those in Vietnam, are particularly vulnerable to climate-related shocks.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Identify and work with new innovators; Engage a specific community

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$500,000	None reported	4	2020-02-18

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$1,000,000	$1,000,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 4 team(s)

FY20: 4 team(s)

Intended Participants: Small businesses; Large businesses

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
1	None reported	None reported	None reported	None reported
2	None reported	None reported	2020-02-18	None reported

Solicitation of Submissions: Press release; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types:

Phase	Submission Type
1	None reported
2	Other

Submissions: The project is designed to incentivize private sector rice companies to develop, test, and promote the use of improved rice farming technology packages that reduce GHG emissions and increase yields. Spurred by the prospect of prizes, companies will develop innovative strategies to market their solutions to as many smallholder rice farmers as possible.

Evaluation of Submissions: In Vietnam, verification is conducted differently in each phase. Phase 1 verification design relies on direct measurement of GHG emissions and rice yields for each technology and corresponding baseline. Phase 2 will largely use remote sensing data to verify emissions and yields and will employ existing models calibrated using field measurements of GHG emissions, rice yields, and crop production practices gathered in Phase 1.

Partnerships: The prize competition involved seven partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
U.K. Foreign, Commonwealth & Development Office	Other	None reported	None reported
Global Affairs Canada	Other	None reported	None reported
Australia Department of Foreign Affairs and Trade	Other	None reported	None reported
Bill and Melinda Gates Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported
World Bank	Other	None reported	None reported
Deloitte	Other (Implementing Partner)	None reported	None reported
SNV	Other (Implementing Partner)	None reported	None reported

Advancement of Agency Mission: The project is expected to engage private sector rice value chain actors to test and scale up the use of innovative rice farming technology packages that increase yields and reduce GHG emissions. Through this process, smallholder farmers will gravitate towards the most cost-effective technologies, increasing yields and improving livelihoods. The project will reduce GHG emissions, paving the way for wider uptake across Vietnam and potential monetization through carbon markets.

Plan for Upcoming Two Fiscal Years: The final cropping season is currently in progress. The competition will close following this final season award, verification, and evaluation.

C.10.27. Water and Energy for Food Grand Challenge[215]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Innovation Pillar)

Authority: Other authority (Section 635(d) of the Foreign Assistance Act of 1961 (FAA))

[215] The website for The Water and Energy for Food Grand Challenge is accessible at we4f.org.

Status:

FY19: Launched

FY20: Ongoing

Competition Summary: The Water and Energy for Food Grand Challenge (WE4F) is a joint international initiative of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Foreign Ministry of the Netherlands, Sweden through the Swedish International Development Cooperation Agency (Sida), and the U.S. Agency for International Development (USAID). The WE4F program capitalizes on the learnings from Powering Agriculture: An Energy Grand Challenge for Development (PAEGC) and Securing Water for Food (SWFF) Grand Challenge. The program is focused on environmentally sustainable innovations aiming to improve energy and water efficiency in the agricultural sector. The WE4F initiative will work with promising innovations that were identified and nurtured during the PAEGC and SWFF to support their next level of scaling. At the same time, the program will open up new calls for innovations within the water-agriculture-food nexus. WE4F will incorporate the Regional Innovation Hub (RIH) model used in PAEGC and the Technical Assistance Facility developed under SWFF. By combining these two successful key programmatic elements together, WE4F's decentralized approach will put a stronger focus on improving local framework conditions for innovations and facilitating end-user financing.

Budget and Resources: USAID funds under WE4F supported regional hubs in South and Southeast East Asia and the Middle East and North Africa (MENA) region. This also includes costs related to the overall management of the hubs through the USAID Secretariat, as well as communications, platforms, events, and external monitoring and evaluation. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Data entry/analysis; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support	Data entry/analysis; Database development; Discovery and design support; Federal personnel (FTE); Operations or administrative support; Publicity, advertising, outreach, or/and communications; Web portal or app development and support
FTEs	0.625	0.625
Funding Estimate	$2,350,000	$2,000,000

Goal Types: Outreach/information dissemination; Build or strengthen a community

Problem or Opportunity Addressed: WE4F aims to increase food production along the value chain through a more sustainable and efficient usage of water and/or energy; increase income for base of the myriad women and men in both rural and urban areas; sustainably scale innovators' solutions to meet the challenges in the WE4F nexus; and to promote climate and environmental resilience and biodiversity through the sustainable, holistic management of natural resources and ecosystems.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

FY	Prize Purse Offered	Prize Purse Awarded
FY19	None reported	None reported
FY20	$345,000	$345,000

Non-Cash Prizes Include: Co-creation technical assistance.

Participants:

FY19: Not available

FY20: Not available

Intended Participants: Master/PhD students; Small businesses; Large businesses

Participation:

None reported

Solicitation of Submissions: Social media; Email; Press release; Live event prior to the competition; Partnership with outside organizations; Publicity efforts from vendors/contractors

Submission Types: None reported

Submissions: None reported

Evaluation of Submissions: Not yet applicable

Partnerships: The prize competition involved three partners. The following table lists these partners and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
Sweden, through the Swedish International Development Cooperation Agency	Other	None reported	$7,500,000
Foreign Ministry of the Netherlands	Other	None reported	$3,258,000
German Federal Ministry for Economic Cooperation and Development (BMZ)	Other	None reported	None reported

Advancement of Agency Mission: USAID is a catalytic actor driving development results. USAID's work advances U.S. national security and economic prosperity, demonstrates American generosity, and

promotes a path to recipient self-reliance and resilience. WE4F is directly aligned with the USAID mission.

Plan for Upcoming Two Fiscal Years: Through its Regional Innovation Hubs, WE4F plans to release calls for innovation in early FY21 and announce winners by late FY21. Subject to the availability of funds, WE4F may also release calls for innovation in FY22.

C.10.28. Grand Challenge for Development: Expanding Women's Access to Commercial Finance[216]

Sponsoring Agency and Office: Washington (Gender Equality and Women's Empowerment Hub)

Authority: Other authority (Federal Acquisition Regulations (FAR))

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: Grand Challenges mobilize governments, companies, and foundations to solve development problems and source solutions, test ideas, and scale what works. Through these programs, USAID and public and private partners inspire and incentivize new voices from around the world to solve development problems. The new, dynamic Grand Challenge for Development: Expanding Women's Access to Commercial Finance will crowdsource innovative solutions that economically empower women and increase women's access to commercial finance, which barriers in laws, regulations, policies, and practices often restrict. With an investment of $5,000,000 for the first year, the Grand Challenge for Development: Expanding Women's Access to Commercial Finance will convene host governments, the private sector, civil society organizations, and women themselves to create action plans to improve the enabling environment and remove or reduce cultural barriers that preclude women from fully participating in economies. USAID will catalyze the private sector to fuel the Grand Challenge for Development: Expanding Women's Access to Commercial Finance to continue to break barriers in policies, laws, regulations, and practices to help women access capital and credit and ultimately participate in the economy as equal economic actors. The Grand Challenge for Development: Expanding Women's Access to Commercial Finance is supported by a women's economic empowerment fund at USAID.

Budget and Resources: Agency funds are being put toward staff time for design, implementation, messaging, partnership, monitoring, evaluation and learning support. In addition to the forthcoming awards, funds have also been outlaid in support of a communications strategy and tactics, a website, and a convening and facilitation service provider. The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Agency Fund Use	Discovery and design support; Federal personnel (FTE); Operations or administrative support; Prize purse (monetary award); Publicity,	None reported

[216] The website for Grand Challenge for Development: Expanding Women's Access to Commercial Finance was not provided.

Funding	FY19	FY20
	advertising, outreach, or/and communications; Web portal or app development and support	
FTEs	0.2	0.2
Funding Estimate	$500,000	None reported

Goal Types: Improve a process/procedure/service carried out by the sponsoring agency; Generate innovative ideas/designs/concepts; Launch or scale up the use of an enterprise/promote commercialization; Build or strengthen a community

Problem or Opportunity Addressed: The Grand Challenge for Development: Expanding Women's Access to Commercial Finance is intended to address and resolve barriers associated with women's access to commercial finance in developing countries, particularly in rural Colombia.

Justification for Using Prizes and Challenges: Activity required diverse expertise or interdisciplinary collaboration; Sought diverse and/or innovative solutions; Incentivize a larger number of submissions; Flexibility to implement project design and achieve project goals; Permitted cost and resource sharing with Federal and/or non-Federal partners; Identify and work with new innovators; Engage a specific community; Target audience could not have been reached through traditional mechanisms; Promote awareness of a specific topic or agency research area

Cash Prize Purses and/or Non-Cash Prize Awards:

No Prize Purse Information Reported.

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$4,500,000	None reported
FY20	None reported	None reported

Non-Cash Prizes Include: Networking, opportunity influence on a system, ability to showcase expertise and work.

Participants:

FY19: No teams reported

FY20: No teams reported

Intended Participants: Small businesses; Large businesses; Other (Government officials; civil society)

Participation:

None reported

Solicitation of Submissions: Live event prior to the competition; Live video streaming announcement; Other (Blog, solicitation)

Submission Types: None reported

Submissions: The Grand Challenge for Development: Expanding Women's Access to Commercial Finance has identified and engaged a regional coordinator/facilitator. This organization is researching the barriers to women's access to commercial finance in rural Colombia and then will invite the relevant local stakeholders, including women entrepreneurs, members of government, financial institutions, investors, professional associations, private sector partners, and civil society, to participate in a collaborative convening. The participants will co-develop an implementation agenda and associated work in support of that agenda (e.g., business or commercial development plans) that remove, reduce, or leapfrog barriers to women's access to commercial finance in rural Colombia. The Grand Challenge for Development: Expanding Women's Access to Commercial Finance will then fund the associated work it deems most aligned with its goals. It will also encourage partners to fund other associated work.

Evaluation of Submissions: To be determined.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The Grand Challenge for Development: Expanding Women's Access to Commercial Finance is putting out a call for and convening stakeholders from across Colombia, to collectively identify, analyze and pose solutions to address barriers to rural women's access to commercial finance. The stakeholders will draft an implementation agenda and USAID will fund work to deliver against this implementation agenda. This advances USAID's goals around strengthening Colombia's financial system and making it more inclusive, surfacing local solutions to local challenges, and engaging new and non-traditional partners to collaborate to advance global development.

Plan for Upcoming Two Fiscal Years: This is a Grand Challenge which, pending funding, envisions other similar women's economic empowerment and gender equality Grand Challenges, challenges, and prizes.

C.10.29. WomenConnect Challenge[217]

Sponsoring Agency and Office: Washington (Development, Democracy and Innovation Bureau, Technology Pillar)

Authority: Other authority (Foreign Assistance Act of 1961, as amended)

Status:

FY19: Ongoing

FY20: Ongoing

Competition Summary: The WomenConnect Challenge (WCC) was launched in 2018. Since then, USAID awarded nine innovators that are working to address barriers limiting women's access to technology and to connect nearly one million women in 12 countries. The WomenConnect Challenge is a global call for solutions to improve women's participation in everyday life by meaningfully changing the

[217] The website for WomenConnect Challenge is accessible at https://usaid.gov/wcc.

ways women access and use technology. While most of the world is becoming increasingly connected, the gender gap in mobile internet use in some countries is over 51 percent. Advancing women's digital connectivity is a key component to ensuring women's economic empowerment. As part of USAID's commitment to closing the gender digital divide, a third round of the WomenConnect Challenge was announced on August 11, 2020. These funding opportunities focus on scaling effective practices while supporting emerging technologies and policies and build on the programs and practices of Rounds 1 and 2. Round Three of the W-GDP WomenConnect Challenge aims to apply proven strategies for sustainable impact, focusing on four requirements: (1) Building upon Proven Strategies. Applicants were required to base their interventions on known and tested proven strategies that have closed the gender and technology gap. (2) Private Sector Participation. Applicants were required to include a private sector partner to facilitate partnerships between the private sector and organizations. (3) Reach at least 1 million women, 18 and above. Round Three will fund projects that will take these proven concepts and scale them ambitiously, using appropriate indicators and metrics. (4) Pathway to Sustainability. Round Three will fund projects that have the potential to develop into long-term, self-sustaining projects and businesses. USAID has partnered with Reliance Foundation to help bridge the gender digital divide in India. The Reliance Foundation and WomenConnect Challenge India supports new approaches that close this gap, expand business opportunities for women, and empower women to empower themselves and their communities. The new grantees, to be announced in early 2021, will focus on WomenConnect proven strategies to close the gender digital divide and increase women's economic empowerment through one of many ways: challenge social and cultural perceptions, develop skills and opportunities, build confidence, grow community advocates, and design creative women-centric technology. Building on these findings, USAID and Reliance Foundation are sponsoring this joint program across India to incorporate these efforts into programs that are designed for specific community-based interventions.

Budget and Resources: Agency funds outside of prize awards went to the implementing partner, DAI, as part of the Digital Frontiers Cooperative Agreement. DAI fully staffed and oversaw the WomenConnect Challenge. The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Agency Fund Use	Prize purse (monetary award); Solution acceleration	Prize purse (monetary award); Solution acceleration
FTEs	0.25	0.25
Funding Estimate	$1,500,000	$1,000,000

Goal Types: Generate innovative ideas/designs/concepts; Develop/demonstrate technology; Education/training; Build or strengthen a community

Problem or Opportunity Addressed: The WomenConnect Challenge aims to close what is called the "gender digital divide" and to encourage equitable technology and internet use by women. There is a significant mobile phone ownership gap between men and women and a much more pronounced mobile internet use gap. Common statistics put the mobile internet gender gap at 30 percent in developing countries writ large, with gaps over 50 percent in many countries. Thus, in many LMIC

communities, women do not have the same opportunities for economic empowerment and reliance-building strategies that men do, which the WCC aims to address.

Justification for Using Prizes and Challenges: Sought diverse and/or innovative solutions; Flexibility to implement project design and achieve project goals; Develop solutions in a quick timeframe; Identify and work with new innovators; Engage a specific community; Promote awareness of a specific topic or agency research area; Previous success with a prize competition

Cash Prize Purses and/or Non-Cash Prize Awards:

Phase	Prize Purse	Awards Available	Awards Given	Winners Announcement Date
2	$2,000,000	3	3	2019-11-15
3	$2,000,000	4	None reported	2020-02-01

FY	Prize Purse Offered	Prize Purse Awarded
FY19	$2,000,000	$2,000,000
FY20	$2,000,000	$2,000,000

Non-Cash Prizes Include: None reported

Participants:

FY19: 3 team(s)

FY20: 4 team(s)

Intended Participants: No specific intended group

Participation:

Phase	Submissions Open Date	Submissions Close Date	Winners Announcement Date	Number of Submissions
2	2019-06-05	2019-07-26	2019-11-15	223
3	2020-09-28	None reported	2020-02-01	None reported

Solicitation of Submissions: Social media; Email; Press release

Submission Types:

Phase	Submission Type
2	Proposal or concept; Prototype device or object; Software or computer code; Business or commercial development plan
3	Proposal or concept

Submissions: Submissions must identify and scale solutions that empower women to access and use digital technology in ways that advance women's economic empowerment through the following pillars: (1) Women Prospering in the Workforce: Increase women's global labor force participation and advancement in the workplace by providing women with quality education, training, and support, so they can secure and thrive in well-paying jobs in their local economies; (2) Women Succeeding as Entrepreneurs: Increase the access of women entrepreneurs and business owners to financing, market opportunities, and training to establish and grow their businesses; (3) Women Enabled in the Economy: Promote an enabling environment that increases women's economic empowerment by reducing barriers and enhancing protections in policies, laws, regulations and practices (public and private) to facilitate women's participation in the economy. Solutions must directly relate to the WomenConnect Challenge goals and funding requirements.

Evaluation of Submissions: Submissions underwent three reviews and mission concurrence. The first review was an eligibility review process that narrowed applications based on criteria established in the Request for Applications (RFA). This review team was made up of three domain-specific experts. The second review was a formal Technical Evaluation Committee, made up of USAID and DAI personnel, who reviewed the top 40 applications based on criteria published in the RFA. The final review was the financial and operational review conducted by DAI per the grant agreement to determine the fitness of the finalists.

Partnerships: The prize competition involved one partner. The following table lists this partner and their contributions:

Partner Name	Partner Type	FY19 Contribution	FY20 Contribution
DAI	Private Industry	$1,500,000	$1,000,000

Advancement of Agency Mission: The challenge supports USAID's mission to accelerate the transformation of the development enterprise by opening development to people everywhere with good ideas, promoting new and deepening existing partnerships, bringing data and evidence to bear, and harnessing scientific and technological advances.

Plan for Upcoming Two Fiscal Years: Winners for the third round of the WomenConnect Challenge will be announced in March 2021.

Appendix D. Crowdsourcing and Citizen Science under the American Innovation and Competitiveness Act

This Appendix provides agency-submitted summaries of crowdsourcing and citizen science activities conducted in FY19 and FY20 under the authority provided in the Crowdsourcing and Citizen Science Act. Please note that funding estimates in funding tables do not include FTEs.

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D.1. Department of Agriculture (USDA)

D.1.1. Developing a Citizen Volunteer Water Quality Monitoring Program in Alabama's National Forests[218]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The goal of this project is to establish a network of citizen scientists in the National Forests of Alabama (NFAL) who can assist with the collection of water data in priority watersheds identified through the USDA Forest Services Watershed Condition Framework. The project is streamlining the NFAL hydrology and aquatic ecology programs by providing a water quality monitoring and data collection workflow that supports both programs. To accomplish the project's goal, NFAL established a partnership with the Alabama Water Watch (AWW) program, a statewide volunteer water monitoring program that is based at the Auburn University Water Resources Center and is also supported by the Alabama Cooperative Extension System. AWW led recruitment and training of citizen scientists who were certified to conduct water chemistry and bacteriological water tests according to AWW's EPA-approved Quality Assurance Plans. Following certification, volunteer monitors chose strategically selected sampling sites from the priority watershed on each forest. The project provides volunteers with access to monitoring materials required for data collection. Monitors submit their water data on a monthly basis to the AWW Database through AWW's online data portal. In turn, the data is made public through the AWW Water Data Tools on the AWW webpage and is provided to NFAL for further analysis. Because of their engagement in the project as citizen scientists, participants now have an increased sense of appreciation of the NFAL. Furthermore, they are helping to establish a baseline of water quality observations within the priority watersheds in the NFAL that will be used to evaluate how management practices are resulting in clean water for the forests, their ecosystems, and the public and to develop a Watershed Restoration Action Plan (WRAP) to make better land management decisions within each forest.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported

[218] The website for Developing a Citizen Volunteer Water Quality Monitoring Program in Alabama's National Forests is accessible at https://storymaps.arcgis.com/stories/cc3320c26279475194e12403b41337af

Funding	FY19	FY20
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Other (Salary and travel support for partner project lead, salary for a seasonal GeoCorps member.)	Purchase of consumable materials; Purchase or rental of equipment; Other (Salary and travel support for partner project lead, salary for a seasonal GeoCorps member.)
FTEs	None reported	None reported
Funding Estimate	$21,308	$21,308

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Since 1992, Alabama Water Watch (AWW) has been successfully applying and refining their model of community-based, science-based water monitoring, earning them national and international recognition in the realm of citizen science. AWW staff members are highly experienced in volunteer recruitment, workshop coordination and facilitation, data management, and data interpretation. Training, certification of citizen scientists, and data collection and management rigorously follow EPA-approved quality assurance plans. AWW volunteer monitors collect thousands of water quality data records each year. AWW effectively manages an easy-to-use public online database providing tools for data entry, viewing, sharing, analysis, and interpretation.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 05-2019

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	0
FY20	51

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	National Forests in Alabama within: Bankhead National Forest, Double Springs, AL; Tuskegee National Forest, Tuskegee, AL; Conecuh National Forest, Andalusia, AL

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected

Results: This collaboration will help NFAL to determine if we are maintaining and restoring watershed productivity and resiliency in the associated aquatic ecosystems on National Forest lands. The results of this project will establish a baseline of water quality observations within priority watersheds in the NFAL to evaluate how different management practices result in clean water. Furthermore, it will better inform hydrologists/soil scientists when completing their environmental analysis for National Environmental Policy Act (NEPA)-related projects, updating the watershed condition assessments, and developing a Watershed Restoration Action Plan (WRAP). This data will also be kept in AWW's databases and will be provided to the Alabama Department of Environmental Management, who reports water quality to the U.S. Environmental Protection Agency.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://web.auburn.edu/aww/charts/DG/awwSiteGrid.aspx.

Product Description: Citizen volunteer monitors and the public can access AWW water chemistry and bacteriological monitoring data, displayed as line and bar graphs and mapped by the ten historic watersheds integrated into the AWW site codes.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Alabama Water Watch	Academic Institution	Personnel; Consumable resources; Online support	AWW lead project plan development, workshop coordination and facilitation, volunteer certification processing, distribution of supplies, and data processing. Additionally, they assist NFAL with supporting volunteers, selecting sampling sites, conducting data analyses and interpretation, and communicating results to the volunteers, general public, and other Forest Service project leads.	$4,039	$4,039

Advancement of Agency Mission: The Forest Service Watershed Condition Framework (WCF) has established a process for improving the health of watersheds on national forests and grasslands. One of WCF's national priorities encourages coordination with external partners in watershed management. This priority allows for NFAL to develop a new partnership with AWW to gather chemical and bacterial monitoring data on specific streams within three priority watersheds across three Ranger Districts. This collaboration will help NFAL to determine if we are maintaining and restoring watershed productivity and resiliency in the associated aquatic ecosystems on National Forest lands.

CCS Act Objectives: Collect and analyze data

D.1.2. Engaging citizen scientists in field research on American pika, an indicator species for alpine ecosystem integrity[219]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The American pika is a charismatic mammal that is sensitive to climate-driven variation in temperature, snowpack, and vegetation composition. Extirpation of pika populations has been linked to climate change in the Great Basin, Southern Utah, and California. The species may be

[219] The website for Engaging citizen scientists in field research on American pika, an indicator species for alpine ecosystem integrity is accessible at www.pikapartners.org.

more resilient to climate change in high-elevation habitats in Colorado. However, recent research predicts that pikas may be extirpated from Rocky Mountain National Park (RMNP) by 2100 under some climate change scenarios. There is a pressing need to assess the species' vulnerability to climate change across Colorado. The White River National Forest (WRNF) and the Front Range Pika Project (FRPP) are currently engaging citizen scientists in field surveys to determine the status of pika populations as an indicator of alpine ecosystem integrity. They are collecting data to determine pika distribution, improve understanding of environmental variables that limit pika distribution, and predict and track the species' response to climate change.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Data entry or/and analysis; Other (Partner salary and travel)	Web portal or application development and support; Data entry or/and analysis; Other (Partner salary and travel)
FTEs	None reported	None reported
Funding Estimate	$4,972	$4,971

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Partnering with the Front Range Pika Project (FRPP) to engage volunteers in conducting pika surveys across the WRNF is enabling staff to efficiently determine pika distribution and lay the baseline for monitoring changes in alpine ecosystems and pika distributions occurring due to climate change. Citizen science is the optimal method because large-scale monitoring is needed and research shows that volunteers can effectively monitor pika occupancy. This partnership is reducing WRNF operating costs and increasing wildlife program efficiency by saving staff time and costs for planning, field surveys, and data analysis. In addition, the partnership is adding value to resource management by providing credible data to discern the status of pika on the WRNF and engaging local volunteers to identify habitat management opportunities for this focal species.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Adults not affiliated with higher education

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 05-2018

Anticipated End Date: 11-15-2020

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	76
FY20	85

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Glenwood Springs, CO, White River National Forest

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: Prior to initiation of this project, available pika occurrence data on the WRNF was primarily anecdotal and limited in scope and usability. Pika occurrence data collected by the project substantially improved characterization of pika distribution across the White River National Forest. Volunteers and partner project staff conducted 76 pika occupancy surveys at 42 long-term monitoring sites. In addition to conducting formal occupancy surveys, volunteers also recorded many additional opportunistic pika observations across the WRNF. Partners also identified additional existing records of pika occurrence to complement data collected by the project and further improve characterization of pika distribution across the WRNF. We have analyzed the data to develop a baseline estimate of pika occupancy which will allow us to estimate site turnover between 2019 and 2020 following the 2020 field season, and annual site turnover in the future. These data can be used to model relationships between site occupancy probabilities and bioclimatic variables. Data will inform landscape-scale assessment of pika vulnerability to environmental change across the WRNF.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data will be open access on CitSci.org to researchers, managers, educational institutions, and the public. Data will be provided to relevant Forest Service and National Park Service units, and Colorado Parks and Wildlife.

Product Description: The data on CitSci.org compiles data collected by citizen scientists using an app in the field. This data includes geographic coordinates, observations, data on a range of site variables, and pictures. CitSci.org also has some built-in data visualization tools and members can download datasets.

Partnerships: The crowdsourcing or citizen science activity involved four partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Rocky Mountain Wild	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Consumable resources	Rocky Mountain Wild (RMW) will develop an opportunistic survey protocol and integrate it into an app, initiate a statewide survey, extend the project through 2020 (one additional field season), manage volunteers and partner organizations, develop online training for opportunistic surveys, and develop guidance and resources for project replication	$3,094	$4,784
Denver Zoo	Other	Funding; Personnel; Consumable resources	Denver Zoo will provide funding for salary/labor to assist RMW with the activities described above.	$1,180	$3,680
Colorado Mesa University	Academic Institution	Personnel	Colorado Mesa University will assist with opportunistic survey protocol development.	$0	$0
University of Colorado	Academic Institution	Personnel	University of Colorado will advise on updates to the long-term monitoring protocol and data analysis	$0	$0

Advancement of Agency Mission: The American pika became a White River National Forest (WRNF) focal species with the implementation of the 2012 Planning Rule. We are currently determining the status of American pika populations as an indicator of alpine ecosystem integrity. Pika occupancy surveys are needed to determine their current distribution and the most important biotic and abiotic factors limiting distribution patterns on the WRNF. This project will add an opportunistic pika survey component to improve landscape-scale characterization of pika distribution across the WRNF to inform statewide management. It will also provide guidance for other National Forests and National Parks to replicate our project. In summary, this project will provide vital data to discern the status of pika, increase understanding of climate change effects, and inform statewide management of pika and alpine ecosystems.

CCS Act Objectives: Collect and analyze data

D.1.3. Leveraging citizen science to map lamprey distributions in Oregon using eDNA methods[220]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: There are at least two native species of lamprey living in Oregon's coastal watersheds, yet very little information is known about their distributions and population size. Obtaining distribution and population-status information can be labor intensive (e.g., electrofishing, redd counts) and distinguishing adult Brook Lamprey and Pacific Lamprey ammocetes (lamprey larva) requires specialized expertise. These constraints, paired with a lack of prior management interest in lamprey population status has meant that lamprey data collection is often ancillary to other studies (e.g., salmonids). Environmental DNA (eDNA) is one technique that can help us obtain species-specific lamprey data to aid in the development of accurate fish distribution maps. Environmental DNA techniques also lend themselves to the use of volunteer networks to collect the necessary samples, since volunteers do not need to be experts in identification of juvenile lamprey. This project is developing a network of citizen scientists and testing several techniques for obtaining eDNA samples in targeted areas within the Coos watershed.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Contracted services	Purchase or rental of equipment; Contracted services
FTEs	None reported	None reported
Funding Estimate	$12,000	$37,200

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Citizen science is a natural avenue for the collection of eDNA samples. While attention to detail to avoid sample contamination is critical, simple methods for sampling can easily be shared with non-technical citizen scientists. Quality control of data sampling leads to highly repeatable and empirical results on the presence or absence of native lamprey that are difficult to find and identify. Community partners will help our science team formulate questions and determine best

[220] The website for Leveraging citizen science to map lamprey distributions in Oregon using eDNA methods is accessible at https://sloughvolunteers.wixsite.com/website/home.

locations and practices for sampling. Citizen science volunteers were included in the initial testing of methods and provided feedback to improve the program.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 05-2019

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	8
FY20	10

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Tributaries of the Coos, Coquille, Umpqua, Siuslaw, Alsea, and Yaquina River watersheds, including streams within and downstream of the Siuslaw and Siskiyou National Forests, Corvallis, OR.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: This project is providing high quality empirical data to support the Forest Service Watershed Condition Framework (2011) that includes representation of the presence or absence of native species. Further, this project fits within Goals 1, 3, and 4 of the Forest Service Rise to the Future: National Fish and Aquatic Strategy. Once the entire area is surveyed and detailed, empirically derived maps of lamprey distribution will be made. This meets the goal of conserving fish by filling a current information gap on the forests. Data collected from this project will contribute to foundational information for the Siuslaw National Forest and their resource conservation partners in planning restoration and protection activities in the Coos River watershed. Fifty sites of the 130 total potential sites have been sampled so far, and we have created maps of the spatial distribution of the two

lamprey species. We are starting to get a better understanding of where the two species of lamprey exist in the Oregon Coastal range. Pacific lamprey are more prevalent in smaller coastal streams than western brook lamprey and Pacific lamprey are present further up watersheds than initially expected.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The USDA-Forest Service National Genomics Center lab processes the samples and presents the results in their online geospatial database: https://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=b496812d1a8847038687ff1328c481fa.

Product Description: The USDA-Forest Service National Genomics Center lab presents a map of 12,753 sites with eDNA lab results for 53 species across the western United States.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
South Slough Reserve	State or Local Government	None reported	The South Slough Reserve staff implements the project and carries out the research and science related tasks. South Slough Reserve has been collaboratively collecting Pacific lamprey data on Winchester Creek since 1999 with the Oregon Department of Fish and Wildlife. A member of the South Slough team has been serving on the Pacific Lamprey Technical Workgroup.	$12,960	$19,661
Friends of South Slough Reserve, Inc.	Nonprofit Organization (excluding Academic Institutions)	Personnel	The Friends of the South Slough Reserve is the administrative partner.	$0	$0

Advancement of Agency Mission: Citizen science is a natural avenue for collecting eDNA samples. While avoiding sample contamination is critical, simple sampling methods can easily be shared with non-technical citizen scientists. Quality control of data sampling leads to highly repeatable and empirical results on the presence or absence of native lamprey that are difficult to find and identify. Detailed and accurate information collected throughout river networks contributes to efficient and accurate operations of forest staff conducting restoration and conservation projects in watersheds. Updated

native lamprey distribution maps will enable better management to protect occupied habitats. Because lamprey use fine-grained sandy substrate, they may be found in places that could be targeted for salmonid habitat restoration. This study could reveal ways that restoration for salmonids could also benefit lamprey.

CCS Act Objectives: Create and refine project design; Collect and analyze data

D.1.4. Location of plants traditionally used by American Indian tribes to improve management of Federal lands on the Four Forest Restoration Initiative[221]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: In consultations with the USFS, Arizona-based Indian Tribes requested information on traditionally used plants be collected in order to develop management protocols to conserve those species as part of restoration treatments conducted on the Four Forest Restoration Initiative (4FRI) project area. This project addressed this informational need by developing a citizen science program to collect location information on traditionally used plants. The project is therefore 1) enabling 4FRI managers to develop management protocols to ensure long-term sustainability and availability of these resources for tribes; 2) enhancing tribal access to traditionally-used plants; and 3) providing data to researchers to devise scientifically-based management and restoration protocols for these species. Partners are currently working to share this citizen science model with the agency by developing a document to guide project development based on their experience and by serving as informational support for other USFS units. The citizen science guide will be comprehensive, describing the process of project development from ideation to evaluation. It will also target the topic of fostering and sustaining public engagement, lack of which is frequently cited as a leading cause of project failure.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Training; Other (FTE staffing, partner salary, fringe benefits, travel, and indirect costs)	Training; Other (FTE staffing, partner salary, fringe benefits, travel, and indirect costs)

[221] The website for Location of plants traditionally used by American Indian tribes to improve management of federal lands on the Four Forest Restoration Initiative is accessible at https://www.inaturalist.org/projects/tribal-nations-botanical-research-collaborative.

Funding	FY19	FY20
FTEs	None reported	None reported
Funding Estimate	$10,000	$12,000

Goal Types: Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Locating traditionally used plants is challenging due to the size of the 4FRI lands and the need for experienced botanists to correctly identify plant species. By harnessing the natural history expertise of local tribes to identify populations of species of interest, the Agency can accommodate the needs of tribes with increased efficiency. This project also provides a unique perspective from the tribal community, and illustrates how citizen science data can be used to address an issue that receives very limited funding, but is of immense cultural and ecological importance, namely, the improved management and conservation of plants traditionally used by tribes.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: Indigenous populations

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 12-2018

Anticipated End Date: 10-15-2021

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	459
FY20	500

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Central Arizona (Apache-Sitgreaves, Coconino, Kaibab, and Tonto National Forests), Region 3

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: This project will add value to resource management by providing spatial data on the location of traditionally used plants on 4FRI lands to USFS land managers. In government-to-government consultation with local tribes regarding 4FRI, tribal authorities requested that the management of traditionally used plant species be considered during 4FRI planning to prevent population decline or extirpation during project execution. Spatial data on plant populations will allow the USFS to meet this request, as well as to identify traditional collection areas for which site-specific management protocols will be developed. Data will be used by 4FRI land managers for project planning and will be available upon request to tribal members and researchers.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Traditional plant data collected by citizen scientists is stored on iNaturalist: https://www.inaturalist.org/projects/tribal-nations-botanical-research-collaborative Georeferenced species data will be curated in the USFS's Forest Service Activity Tracking System (FACTS) database.

Product Description: Plant species and plant species location data is shared with USFS land managers, tribal members, and Northern Arizona University partners in real-time on iNaturalist. Data with obscured coordinates are available to the general public in order to prevent targeted harvest of culturally important species. The database contains at least 1,143 observation of 34 focal species.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Northern Arizona University	Academic Institution	Personnel	Northern Arizona University is responsible for developing a guide for citizen science project development, including the creation of training modules, training citizen science volunteers, maintaining availability to train other Forest Service units in citizen science project development, and the analysis of citizen science project success metrics.	$2,594	$2,594

Advancement of Agency Mission: As National Forests increasingly enlist citizen scientists to collect data, there is an urgent need to develop protocols and best practices. This project will address this need by developing an agency-wide guide for implementing citizen science projects on National

Forests. Through citizen science, project partners are also working to inform decision making by providing USFS land managers with data on the location of traditionally used plants to support the development of management strategies to protect these species. Additionally, this project strengthens partnerships between the USFS, Northern Arizona University, and federally recognized tribes. Finally, by protecting culturally, economically, and ecologically important species and sharing information with local tribes, this project will ensure that benefits flow from forests and grasslands to tribal communities and beyond.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data

D.1.5. Monitoring the status of the Columbia River Gorge (CRG) pika population after the Eagle Creek Fire[222]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Columbia River Gorge (CRG), which is within the Columbia River Gorge National Scenic Area (CRGNSA), is a unique habitat for pikas due to its abundance of vegetated talus at much lower elevations than is typical for this species (their more typical higher elevation distribution may make them particularly sensitive to environmental changes). The recent 2017 CRG Eagle Creek Fire (ECF) presents a unique opportunity to engage citizen scientists in post-fire monitoring because the resilience of pikas and other species of conservation concern is poorly understood. Having more data on post-fire recovery of CRG pika populations would therefore be invaluable. Additionally, this project provides a deeply engaging experience for diverse volunteers—their contributions not only leverage USFS resources but facilitate participants' investment in local natural resources and their conservation.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Contracted services; Federal employee travel; Training	Contracted services; Federal employee travel; Training
FTEs	None reported	None reported

[222] The website for Monitoring the status of the Columbia River Gorge (CRG) pika population after the Eagle Creek Fire is accessible at https://www.oregonzoo.org/cascades-pika-watch.

Funding	FY19	FY20
Funding Estimate	$8,129	$8,129

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: American pikas create an ideal platform for citizen science. In addition to being charismatic, easily identifiable, and residents of beautiful natural areas, pikas have been shown to be vulnerable to environmental changes in some areas. These factors have motivated diverse volunteers to participate in pika watches, from hikers and outdoorsmen to K-12 students and teachers. This project provides a deeply engaging experience for diverse volunteers. Their contributions not only leverage USFS resources but facilitate participants' investment in local natural resources and their conservation.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 07-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	155
FY20	0

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Columbia River Gorge National Scenic Area, Portland, OR

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: In the summer of 2019, Citizen Science participation was outstanding (155 volunteers participating; 245 site visits making up 1,620 hours). Pika were detected at 45 out of 52 sites with volunteers sitting near talus fields, and at 40 out of 60 sites with volunteers conducting abundance surveys. Citizen science volunteer training and pika data collection continued in 2020 with results still being compiled. The ECF provides a unique opportunity to both document pika recolonization dynamics in a nationally unique, refugial habitat and to determine the resilience of the CRG pika population in the face of a severe disturbance. It is likely that public visitation and recreational interest will continue to increase in the CRGNSA. Through citizen science, the Cascades Pika Watch (CPW) can inform the USFS about changes in pika populations. This, in turn, can assist CRGNSA staff in making informed decisions as they manage both resources and recreation.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Presence data (with exact locations) was given to CRGNSA (USFS) to be entered into the National Resource Information System (NRIS, which is housed in the National Resource Manager, NRM). Data will be freely available to management agencies following publication, allowing these agencies to make evidence-based decisions on how to manage pikas and their habitats.

Product Description: Presence data (with exact locations) was given to CRGNSA (USFS) to be entered into NRIS (which is housed in NRM). Data will be freely available to management agencies following publication, allowing these agencies (e.g., USFS, USFWS) to make evidence-based decisions on how to manage pikas and their habitat. Results are also shared through presentations to zoo visitors, school, and through social media.

Partnerships: The crowdsourcing or citizen science activity involved four partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Oregon Zoo	Other	None reported	Oregon Zoo helped found Pika Watch 7 years ago with the help of the scientists working on this project, other local wildlife biologists, and citizen scientists; Conducted volunteer training, data quality control, and data analysis; Supervised the project coordinator and volunteer manager and budget management and report writing.	$2,393	$2,393

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
USGS	Federal Agency or Office	Personnel	USGS is integrally involved in developing protocols for surveys, assisting with training, conducting data quality control studies, analyzing volunteer-collected data, and disseminating results at scientific conferences.	$0	$0
Colorado Mesa University	Academic Institution	Personnel	Colorado Mesa University is integrally involved in developing protocols for surveys, assisting with training, conducting data quality control studies, analyzing volunteer-collected data, and disseminating results at scientific conferences.	$0	$0
Clark College	Academic Institution	None reported	A Clark College professor trained his summer classes to do surveys, and then the classes implemented pika surveys.	$0	$0

Advancement of Agency Mission: The pika is currently listed as a Species of Conservation Concern in numerous U.S. Forest Service units. Relatively little is known about how CRG pikas might respond to contemporary environmental changes and disturbances caused by wildfire. This knowledge gap may hamper management, given that fires are predicted to increase in both frequency and severity. Through citizen science, CPW provides an early-warning system to inform the USFS about changes in pika populations. This, in turn, can assist CRGNSA staff in making informed decisions as they manage both resources and recreation. Importantly, this project provides a wealth of data on multiple ecosystem components and fire across a large area spanning two states. Cost efficiencies are created by the existing extensive network of volunteers, and process efficiencies reflect diverse partners that this project unites towards common goals.

CCS Act Objectives: Collect and analyze data

D.1.6. Neighbors to Nature: Cache Creek Study[223]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Neighbors to Nature: Cache Creek Study is designed to engage many local volunteers to improve conditions for wildlife and people, while also forging lasting partnerships that form the foundation of a wildlife-friendly community. These volunteers enable us to expand our reach and heighten our impact. With their help, wildlife/phenology/recreation-use data collection benefits wildlife, builds a community of stewards, collects and shares wildlife migration and observation data to support conservation, and educates the public on compatible coexistence between people and wildlife. This project expands a partnership between the Forest Service, Friends of Pathways, Jackson Hole Wildlife Foundation, and Wildflower Watch through the use of citizen science to better inform land management decisions in the heavily used Cache Creek drainage, directly adjacent to the town of Jackson, Wyoming. The project engages a youth crew from Friends of Pathways (FOP), citizen scientists/volunteers from the Jackson Hole (JH) Wildlife Nature Mapping program, and volunteers from Wildflower Watch to collect, analyze, and interpret plant, wildlife, and trail use data. This project also aims to improve the public dissemination of monitoring observations to illustrate how conditions are changing in Cache Creek and how the Cache Creek study area contributes to larger Nature Mapping Jackson Hole observations and climate data being collected throughout Teton County. This project also contributes to an interagency landscape-level assessment of recreation-wildlife coexistence throughout Teton County.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Other (Salary for project partner personnel)	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Other (Salary for project partner personnel)
FTEs	None reported	None reported

[223] The website for Neighbors to Nature: Cache Creek Study is accessible at https://jhwildlife.org/our-work/nature-mapping/neighbors-to-nature-cache-creek-study/.

Funding	FY19	FY20
Funding Estimate	$15,283	$12,482

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Much of the value of this collaboration lies in the education of the local community. An educated community is more likely to comply with and support management decisions such as seasonal area or trail closures for wildlife. Friends of Pathways will engage students in this project through their Youth Crew, who will help install and rotate trail counters and wildlife cameras, as well as help upload the data into existing databases. This helps students understand data collection standards and the scientific method. Wildflower Watch will engage volunteers through direct monitoring of native and invasive flora and fauna of the Forest, getting volunteers outdoors and participating in rigorous research efforts. Citizen scientists will also be encouraged to participate in data entry, analysis, and interpretation through additional outreach efforts.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 05-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	75
FY20	75

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Bridger-Teton National Forest, Jackson, WY (Region 4)

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: None reported

Results: The increase in statistical data around wildlife location and movement, invasive species location, plant biodiversity within the drainage, and accurate use numbers at each trail head has been extremely useful for outreach to the community and informing management decisions. This project informs recreation managers of existing conditions compared with desired conditions. Trail counters show the types of use, timing, and amount of use, which provides accurate data to assess social changes over time. Wildlife cameras and mapping of wildlife observations show how wildlife populations are using Cache Creek, which, over time, can be used to evaluate how recreation use may be influencing wildlife behavior and inform management actions such as seasonal restrictions. The Wildflower Watch program managed by The Nature Conservancy provides phenological and plant data, which not only helps identify and track the spread of invasive species, but helps managers understand how maturation of key forage species in the tall forb community is being affected by climate change.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Trail count data: https://headwaterseconomics.org/dataviz/jackson-area-trail-use/ ; Phenology data: https://www.usanpn.org/ (quality-assured and open-sourced) ; Wildlife data, Nature Mapping Jackson Hole (NMJH) database: https://naturemapping.jhwildlife.org/ . Data is shared with Wyoming Game & Fish Department & the Bridger-Teton NF.

Product Description: The trail count database currently stores 5 years of trail count data. The USA National Phenology Network (USANPN) data contains both observational data and phenology maps. At Cache Creek, citizen scientists observe phenology for 14 species of flowering plants, native and invasive, totaling 1,500 observations each season. The NMJH database contains over 77,000 wildlife observations entered by volunteers and verified by local biologists.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Jackson Hole Wildlife Foundation	Nonprofit Organization (excluding Academic Institutions)	Personnel; Online support	Jackson Hole Wildlife Foundation has 10 years of experience running its Nature Mapping Jackson Hole (NMJH) citizen science program, which at present includes seven projects and a large, annual event. Several NMJH projects are designed to be long-term systematic monitoring projects.	$1,500	$2,000

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
The Nature Conservancy, Wyoming	Nonprofit Organization (excluding Academic Institutions)	None reported	The Nature Conservancy (TNC): will continue to manage the Wildflower Watch citizen science project monitoring phenology at Cache Creek. The TNC Wyoming science team will also provide guidance on experimental design and data analyses for both the phenology and wildlife monitoring components of the project. TNC has expertise in conducting large-scale experiments on federal lands that result in science-driven management recommendations, including the topics of citizen science, phenology, invasive species, habitat restoration, recreation monitoring and mapping, camera trapping, and wildlife/recreation interactions.	$5,000	$10,000

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Friends of Pathways	Nonprofit Organization (excluding Academic Institutions)	None reported	Friends of Pathways (FOP) has partnered with the Bridger-Teton National Forest (BTNF) for the last 20 years on trail maintenance and outreach. In 2015, FOP was part of a trail study with Headwaters Economics and has continued to purchase more trail counters and collect data over the last 5 years to help land managers make informed decisions about the lands they oversee. We now have three permanent counters at the three main trail entrances to the Cache Creek drainage and will continue to work with the BTNF, TNC, and JHWF on this project.	$3,500	$2,500

Advancement of Agency Mission: This project adds value to local resource management by providing an accurate, scientific view of the plant and wildlife populations in the area, and the associated recreational use patterns. Understanding how species composition may be altered in response to climate change will also help predict community vulnerability. This could improve the accuracy of risk assessments, leading to better informed decisions, improved project design, and increased efficiency. Aside from informing Forest Service management decisions, much of the value lies in the education of the local community. An educated community is more likely to comply with and support management decisions such as seasonal area or trail closures for wildlife. Additionally, knowledge of recreational patterns directly increases efficiency by informing rangers and trail workers about the areas needing the most attention.

CCS Act Objectives: Collect and analyze data; Interpret the results of data

D.1.7. Volunteer Snow Surveys[224]

Sponsoring Agency and Office: Natural Resources and Conservation Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Completed

FY20: Completed

CCS Activity Summary: USDA's Natural Resources Conservation Service (NRCS) National Water and Climate Center is the technical lead for the Snow Survey and Water Supply Forecasting Program (SSWSF), the NRCS national Soil Climate Analysis Network (SCAN), and a large number of water and climate activities. Activities include providing data for conservation, tools for assessing water supplies and climate, and resources for addressing questions on local and regional conditions, and drought, flooding, fire, and climate trends. Volunteers make up a big part of data gathering at snow courses throughout the western states. Ranging from sites on ranches to ski resorts, citizen science volunteers donate an estimated 660+ hours per year. Snowmelt in the West accounts for approximately 75% of the region's seasonal water supply for agriculture and municipal needs. SSWSF has operated under USDA in twelve western states, including Alaska since 1935, and provides seasonal water supply forecasts essential to the national economy and resource management. Program importance continues to increase as water management in the West adapts to stresses such as population increase, rapid urbanization, flooding, droughts, fires, increased proximity to avalanche, and competing needs over limited resources between water users. Snow measurements, climate data, and water supply forecasts are used by farmers, ranchers, and irrigation districts; municipal and industrial water providers; hydroelectric power utilities; fish and wildlife management; reservoir managers; recreationists; Tribal Nations; Federal, State, and local government agencies, including transportation departments; International treaty signatories; and others.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Transportation of participants; Data entry or/and analysis; Training	Purchase of consumable materials; Transportation of participants; Data entry or/and analysis; Training
FTEs	None reported	None reported
Funding Estimate	$3,500	$3,390

[224] There was no website provided for Volunteer Snow Surveys.

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Other methods are used. Multiple methods are utilized to facilitate goals as best alternatives change over time. Staying flexible optimizes overall efficiency and capacity and provides the ability to adjust and adapt over time. Annual budgets and the nature and number of SSWSF activities at a given time effect what may be a best choice over time.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 01-01-2013 Note: Volunteers have been used for snow survey since 1935.

Anticipated End Date: None reported

Activity End Date: 05-01-2020

Specific Dates for CCS Events: 02-28-2020, 02-29-2020, 03-01-2020, 03-24-2020, 03-29-2020, 03-30-2020, 04-01-2020, 04-02-2020, 04-28-2020, and 05-01-2020

FY	Number of Individuals
FY19	None reported
FY20	7

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	AK, NV, WA, and WY snow courses.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected

Results: Results support agriculture, water management, disaster preparedness, weather and flood forecasting, transportation, commerce, and for those with specific interest in obtaining snowpack, water content, climate/weather data, stream forecast, and soil moisture data. Results contribute to NWS/NOAA's mission for climate prediction; precipitation, temperature, and drought monitoring; and to NOAA's National Snow Observation Database in addition to airborne snow surveys, satellite snow cover mapping, snow modeling and data assimilation, interactive tools, integrated snow datasets for geospatial applications, and applied snow research. Additional users include the USGS which

maintains the National Water Information System and monitors streamflow conditions, NASA for calibration of sensor data for NASA's Airborne Snow Observatory (ASO) missions, the U.S. Forest Service for fire purposes, the U.S. Army Corps of Engineers and Bureau of Reclamation for dam and watershed activities, and the National Park Service for park science and management. Data are also used by public utilities, natural gas, municipal and industrial water supply management, and both State and local agencies. The International Joint Commissions (IJC) stemming from the International Boundary Waters Treaty Act is a cross jurisdictional boundary example.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Use https://www.wcc.nrcs.usda.gov/ to access data through a viewer (interactive map), metrics, or reports.

Product Description: Interactively map snow telemetry (SNOTEL) sites/snow courses, SCAN, Tribal SCAN, Normals, and more. Export basin reports, water supply forecasts, reservoirs conditions, and surface water supply indices. Sensor data is available for snow water equivalent (SWE), snow depth, precipitation, temperature, humidity, and more. Generate reports for snow and precipitation for current, average, and percent-average. Generate basin data reports for snowpack and precipitation. Generate SNOTEL and snow course SWE, snow depth, and snow density maps. Create graphs and reports for SNOTEL water year conditions, SWE, precipitation, basin snowpack summaries, reservoir conditions, and SWE averages.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Provide high quality data and information on snow, water, weather/climate, hydrologic conditions, and seasonal surface water supply forecasts to agricultural producers, water managers, and water users as well as support for NRCS conservation planning tools and other activities. SSWSF provides data quality, data continuity, historical data maintenance, personnel longevity and expertise, plus effective regional and national level analysis. Program efforts, products, and water supply forecasts are invaluable for agency missions like U.S. Army Corps of Engineers' for flood control and water management or NWS/NOAA's for river, flood, and water supply forecasts protecting life and property. Other benefits include efficient use of resources (e.g., electricity, agricultural resources, and water), optimization of food production/national security, contribution to private sector, and public safety (e.g., dam operation, flooding, drought, fire, and avalanche).

CCS Act Objectives: Collect and analyze data

D.1.8. Youth Forest Monitoring Program[225]

Sponsoring Agency and Office: Forest Service

Authority: Crowdsourcing and Citizen Science Act, Other authority (Volunteers in the National Forests Act of 1972, as amended, 16 U.S.C. 558a-558d.)

Status:

[225] The website for Youth Forest Monitoring Program is accessible at https://www.fs.usda.gov/detail/hlcnf/workingtogether/volunteering/?cid=stelprdb5356661.

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Youth Forest Monitoring Program (YFMP) is a 7-week citizen science summer program for high school students. Over the last 20 years, YFMP students have collected key data from permanent monitoring sites in the Helena-Lewis and Clark National Forest. Students are trained by Forest Service scientists and assisted by field instructors. The high schoolers analyze their data and present their findings and information on potential management opportunities at the end of the program to an audience of forest scientists, county commissioners, and the public. YFMP students make a real difference across the Forest and have contributed to known baseline data for the Forest plan revision process. In 2019 and 2020, YFMP revisited study sites within the Stonewall Timber Management Unit, an area impacted by the 2017 Park Fire. Students collected critical information about how fire suppression efforts and long-term wildfires (the Park Fire lasted 7 weeks) impact tree succession and Black-Backed Woodpecker habitat. Students monitored 12 sites—half in the high intensity burn area and half in the lower intensity burn area—to evaluate impacts to tree species, noxious weeds, and wildlife presence.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Federal employee travel; Other (Training development, partner salary)	Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Federal employee travel; Other (Training development, partner salary)
FTEs	None reported	None reported
Funding Estimate	$8,638	$8,638

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: YFMP has been an early implementer of the Rapid Forest Assessment (RFA) protocol. RFA is a citizen science approach to landscape forest monitoring that can quickly capture characteristics of a stand (usually under an hour) and determine if further monitoring is needed. Participants learn about forest ecology, explore their local National Forest System and other nearby lands, engage in forest health monitoring, and network with natural resource professionals. In the Stonewall Project Area, citizen science is the preferred method, since students collected RFA data in the area over the five years leading up to the 2017 Park Fire. With the Forest's limited budgetary and workforce capacity, YFMP greatly augments the Forest's ability to monitor forest health.

Participants:

Intended Participants: 9th-12th grade students

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 05-2009

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	11
FY20	7

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Helena-Lewis and Clark National Forest. Helena, Montana.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates; Other (Students complete the program by presenting their data and conclusions to parents, the public, and Forest Service personnel in a report presentation.)

Results: YFMP aims to provide data on the success of fire suppression treatments on vegetation recovery, the extent of invasive weed spread, and how quickly and how sustained Black-Backed Woodpeckers pioneer into habitat influenced by wildfire. Students complete the program by presenting their data and conclusions to parents, the public, and Forest Service personnel in a report presentation. Student data is then integrated with other monitoring data and used to evaluate the Forest Plan.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The RFA data is shared with the collaborative resource managers. The Forest shares annual program summaries with internal and external audiences, including Regional Office staff, county commissions, youth-focused non-profit groups, media outlets, conservation groups, and high schools.

Product Description: Throughout the year, the Forest shares annual program summaries with internal and external audiences, including the Regional Office (RO; Regional Foresters Team and select RO Directors), several county commissions, youth-focused community and non-profit groups, local and regional media outlets, numerous interested community and conservation groups, local high schools, and the general public.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Montana Discovery Foundation	Nonprofit Organization (excluding Academic Institutions)	None reported	Montana Discovery Foundation provides program administration, hires field instructors, and applies for outside grants to sustain the program.	$9,000	$9,000
Helena College	Academic Institution	Personnel; Space	Helena College provides computer lab space and IT support.	$2,500	$2,500
Lewis and Clark County	State or Local Government	Funding	None reported	$11,000	$7,000

Advancement of Agency Mission: Since 2013, YFMP has collected tree status and survey data at the Stonewall Proposed Timber Management Unit. Data were collected at both a treatment and control site using the Rapid Forest Assessment (RFA) protocol. YFMP monitoring will provide long-term analysis of forest health both before and after wildfire. Through collected data and photo verification, citizen scientists observe recovery in different fire management regimes and provide information to the Forest Service that helps inform fire management practices. The 2017 Park Fire provides the opportunity to evaluate vegetation recovery after a wildfire, in an area that was previously inventoried. YFMP aims to provide data on the success of fire suppression treatments on vegetation recovery, the extent of invasive weed spread, and how quickly and how sustained Black-Backed Woodpeckers pioneer into habitat influenced by wildfire.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Interpret the results of data; Make discoveries

D.2. Department of Commerce (USDOC)

D.2.1. NOAA OceanEYEs[226]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration (NOAA)

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: As part of its efforts to monitor Bottomfish species in Hawaii, the National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center (PIFSC) launched the OceanEYEs Citizen Science project on September 15, 2020. Since launch, over 7,000 volunteer citizen scientists have made over 1 million classifications across 100,000 underwater images during the 2019 Bottomfish Fishery-Independent Survey in Hawaii (BFISH). After logging into the OceanEYEs website, volunteers are guided through a short tutorial where they learn about the Bottomfish stock, stock assessment science, as well as the fish species being surveyed. They are taught how to recognize each of the key species and are then presented with underwater images from the survey. They are first asked if they see any fish in the image and, if so, are asked to mark the location of the fish and identify the species by name. Initial results suggest that the information provided by multiple citizen scientists can, when combined, rival that provided by professional annotators. The work being done by OceanEYEs volunteers can allow NOAA scientists to look at new ways of counting fish and is being used to develop artificial intelligence solutions, training computers to identify fish and allowing NOAA scientists to deploy human expertise more efficiently. To date, the work done by OceanEYEs citizen scientists is equivalent to over 300 full-time equivalent (FTE) hours.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Approximate Funding	$25,000	$10,000
Approximate FTEs	1	2
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Other (The OceanEYEs web portal was developed through the Pacific Young Scientist student internship program)	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Other (The OceanEYEs web portal was developed through the Pacific Young Scientist student internship program)

[226] The website for NOAA OceanEYEs is accessible at https://www.zooniverse.org/projects/benjamin-dot-richards/oceaneyes.

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Crowdsourcing and Citizen Science was chosen to foster community engagement while simultaneously providing a fiscally efficient means for generating additional data on Hawaii Bottomfish stocks. The NOAA Pacific Islands Fisheries Science Center additionally employs scientists through cooperative agreements as well as FTEs and sponsors student interns to work on Bottomfish research. Challenge and prize competitions to develop machine learning algorithms have also been hosted in conjunction with the International Conference on Computer Vision and the Winter Conference on Applications of Computer Vision.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: No specific intended group

Participation:

Activity Open Date: 09-15-2020

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	1957
FY20	5100

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	OceanEYEs is focused on Hawaii, specifically the main eight Hawaiian islands including Niihau, Kauai, Oahu, Molokai, Maui, Lanai, and Hawaii Island.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency

Results: Abundance estimates generated through OceanEYEs can be used to augment existing data streams used in the Stock Assessment for the Main Hawaiian Islands Deep 7 Bottomfish Complex. The data provided by OceanEYEs citizen scientists can also allow NOAA researchers to look and new ways

of counting fish using underwater video. Images in which fish have been located and classified to species can also be used to train advanced machine learning algorithms.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.fisheries.noaa.gov/inport/item/53762.

Product Description: The data from OceanEYEs can be provided in tabular or graphic form. Content includes counts by species by year as well as location information.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: OceanEYEs has advanced the Agency's mission to improve stock assessment by providing additional methods to estimate Bottomfish population abundance using underwater images collected during the annual Bottomfish survey. OceanEYEs is also advancing the Agency's mission to Maintain American Leadership in Artificial Intelligence by providing additional data to train machine learning algorithms for fish detection. Finally, OceanEYEs is advancing the Agency's Education and Outreach mission by engaging citizen scientists to learn about stock assessment, Hawaii Bottomfish species, and engaging the community to learn about and participate in the Agency's scientific surveys.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data; Make discoveries

D.2.2. Urban Heat Island Mapping Campaign[227]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Completed

FY20: Completed

CCS Activity Summary: In each of the last four summers (2017-2020), NOAA's Climate Program Office, Office of Education, and National Integrated Heat Health Information System (NIHHIS) have partnered with CAPA Heat Watch (Llc), Portland State University, and leaders in municipal government as well as academic and NGO entities in 24 different U.S. cities to lead urban heat island mapping campaigns that were conducted by using local volunteer citizen scientists to collect air temperature data all across the cities. CAPA Heat Watch used these data, together with high-resolution land cover classification data collected by a satellite sensor, as inputs into a machine-learning algorithm (developed by Portland State U.) to produce models and high-resolution temperature maps of each city on one of the hottest days of summer. The resulting data and maps were shared freely with the local government leaders and the public to help them pinpoint their cities' hottest places, to show how high temperatures can get in those places, and to identify and protect residents who are most vulnerable to the adverse effects of extreme heat. The ultimate goal is to assist city leaders and

[227] The website for Urban Heat Island Mapping Campaign is accessible at https://nihhis.cpo.noaa.gov/Urban-Heat-Island-Mapping; https://www.climate.gov/news-features/features/detailed-maps-urban-heat-island-effects-washington-dc-and-baltimore.

managers, emergency responders, and health care providers in their long-term plans to keep people safe and mitigate the risks associated with dangerously hot temperatures.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Data entry or/and analysis; Contracted services; Training	Purchase or rental of equipment; Data entry or/and analysis; Contracted services; Training
FTEs	None reported	None reported
Funding Estimate	$58,000	$115,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Support local long-term planning to mitigate the adverse health effects of extreme heat.)

Justification for Using CCS: These urban heat island mapping campaigns use both CCS and contracts (it's not either / or) to meet campaign requirements.

Participants:

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Adults not affiliated with higher education; Retirees; Other (Interested residents)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations

Emphasized Populations: Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: Started in FY17 and continued in each summer through FY20.

Anticipated End Date: None reported

Activity End Date: 09-30-2020 (This activity has been extended for 2021 and a new set of cities is currently being onboarded.

https://nihhis.cpo.noaa.gov/News-Events/ArtMID/7905/ArticleID/2134/Rolling-Announcement-NIHHIS-CAPA-UHI-Mapping-Cities-for-2021)

Specific Dates for CCS Events: 08-28-2018, 08-29-2018, 07-29-2019, 08-04-2019, 08-19-2019, 08-20-2019, 08-31-2019, 09-18-2019, 06-27-2020, 07-10-2020, 07-10-2020, 07-27-2020, 08-07-2020, 08-07-2020, 08-08-2020, 08-08-2020, 08-10-2020, 08-10-2020, 08-10-2020, 08-23-2020, 08-26-2020.

FY	Number of Individuals
FY19	Not reported
FY20	375

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	2017 - Richmond, VA 2018 - Baltimore, MD, and Washington, DC 2019 - Boston, Brookline, Cambridge, and Worcester, MA; Yonkers, NY; Ft. Lauderdale and West Palm Beach, FL; and Honolulu, HI 2020 - San Jose and Santa Clara, CA; Burlington, VT; Cincinnati, OH; Detroit, MI; Austin, El Paso, and Houston, TX; Jackson, MS; Las Cruces, NM; Miami, FL; New Orleans, LA; Roanoke, VA; and Seattle, WA.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates; Other (Some participants took and provided photographs of themselves and noteworthy events and landmarks during the campaign.)

Results: The results of the urban heat island mapping campaigns are used by NOAA and NIHHIS in two key ways: 1) to help fulfill our mission of providing science-based information to promote public science literacy and to inform planning and decision-making; and 2) to help us advance the science of observing, researching, understanding, modeling, and predicting weather and climate and how it may impact humans, built environments, and natural systems. Specifically, we hope these campaigns will help us improve our ability to model and predict precisely where it will get dangerously hot, and how hot it may get, in U.S. cities all across the nation.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access:

- 2017-2018
    - https://osf.io/eb4tw/
- 2019
    - https://osf.io/tdsy7/

- 2020
  - https://osf.io/9neka/

Product Description: Available for download on the Open Science Framework (OSF) website are the outputs of the 2019 CAPA/NOAA/NIHHIS Heat Watch Campaigns. The other years' outputs will also be made available on that site soon as well. Outputs include summary reports, traverse point vector shape files and predictive surface model raster tiffs for three traverse periods from each of the six campaign cities. Learn more at www.capastrategies.com and https://nihhis.cpo.noaa.gov/Urban-Heat-Island-Mapping

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists a representative set of these partners and their contributions.

Partner Name	**Partner Type**	**Contribution Type(s)**	**Personnel Contributions**	**FY19 Contribution**	**FY20 Contribution**
CAPA Heat Watch	Private Industry	None reported	None reported	$0	$0
Local city government officials	State or Local Government	None reported	None reported	$5,000	$5,000
Local NGOs	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported	$0	$0
Academic institutions	Academic Institution	None reported	None reported	$0	$0
Local government and NGO entities in all 25 cities (too many to list here)	None reported	None reported	None reported	None reported	None reported
Santa Clara University	Academic Institution	None Reported	None Reported	None Reported	None Reported
City of San Jose	State or Local Government	None Reported	None Reported	None Reported	None Reported
City of Santa Clara	State or Local Government	None Reported	None Reported	None Reported	None Reported
Vermont Department of Health	State or Local Government	None Reported	None Reported	None Reported	None Reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
National Weather Service (Burlington Office)	Federal Government	None Reported	None Reported	None Reported	None Reported
University of Vermont	Academic Institution	None Reported	None Reported	None Reported	None Reported
City of Burlington	State or Local Government	None Reported	None Reported	None Reported	None Reported
City of South Burlington	State or Local Government	None Reported	None Reported	None Reported	None Reported
City of Winooski	State or Local Government	None Reported	None Reported	None Reported	None Reported
Chittenden County Regional Planning Council	State or Local Government	None Reported	None Reported	None Reported	None Reported
Vermont Climate & Health Alliance	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Burlington Local Health Office	State or Local Government	None Reported	None Reported	None Reported	None Reported
Vermont Urban & Community Forestry Program	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
ECHO, Leahy Center for Lake Champlain	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
University of Vermont Medical Center	Private Industry	None Reported	None Reported	None Reported	None Reported
EcoWorks Detroit	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Detroit's city Office of Sustainability	State or Local Government	None Reported	None Reported	None Reported	None Reported
University of Michigan's Urban Energy Justice Lab	Academic Institution	None Reported	None Reported	None Reported	None Reported
City of El Paso, TX	State or Local Government	None Reported	None Reported	None Reported	None Reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
University of Texas El Paso (UTEP)	Academic Institution	None Reported	None Reported	None Reported	None Reported
Extreme Weather Task Force.	Private Industry	None Reported	None Reported	None Reported	None Reported
ECO El Paso.	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
The Promotora Network (Community Health Workers).	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Medical Center of the Americas	Private Industry	None Reported	None Reported	None Reported	None Reported
City of Seattle Office of Sustainability and the Environment	State or Local Government	None Reported	None Reported	None Reported	None Reported
Seattle Public Utilities	State or Local Government	None Reported	None Reported	None Reported	None Reported
Public Health – Seattle & King County	State or Local Government	None Reported	None Reported	None Reported	None Reported
King County Agriculture, Forestry, and Incentives Program	State or Local Government	None Reported	None Reported	None Reported	None Reported
ISeeChange	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
New Orleans Department of Health	State or Local Government	None Reported	None Reported	None Reported	None Reported
Gulf Restoration Network	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
City of Houston	State or Local Government	None Reported	None Reported	None Reported	None Reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Harris County Public Health (HCPH)	State or Local Government	None Reported	None Reported	None Reported	None Reported
The Nature Conservancy of Texas	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Houston Advanced Research Center (HARC)	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Lowe's Home Improvement	Private Industry	None Reported	None Reported	None Reported	None Reported
Shell	Private Industry	None Reported	None Reported	None Reported	None Reported
City of Austin Office of Sustainability	State or Local Government	None Reported	None Reported	None Reported	None Reported
EcoRise (Schools)	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Go Austin/Vamos Austin (GAVA)	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
Michael & Susan Dell Center for Healthy Living at UTHealth School of Public Health in Austin	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported
University of Texas at Austin	Academic Institution	None Reported	None Reported	None Reported	None Reported
City of Austin Departments	State or Local Government	None Reported	None Reported	None Reported	None Reported
City of Cincinnati Office of Environment and Sustainability	State or Local Government	None Reported	None Reported	None Reported	None Reported
Museum of Science, Boston	Nonprofit Organization	None Reported	None Reported	None Reported	None Reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Santa Clara University	Academic Institution	None Reported	None Reported	None Reported	None Reported
City of San Jose	State or Local Government	None Reported	None Reported	None Reported	None Reported

Advancement of Agency Mission: NOAA's mission is to "understand and predict changes in climate, weather, oceans, and coasts, to share that knowledge and information with others." The urban heat island mapping campaigns help local residents, city government officials, and community and business leaders understand where their cities' hottest places are located, how hot it can get in those places, and what are their options for mitigating the human health risks of extreme heat. Scientists project these risks are likely to increase this century as the number of very hot days increases ten- or twenty-fold (depending upon the location) due to global warming.

CCS Act Objectives: Collect and analyze data; Interpret the results of data

D.3. Department of Energy

D.3.1. Orphan Well Location Survey[228]

Sponsoring Agency and Office: Under Secretary for Science

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Orphan Wells Locations Survey (OWLS) was created to locate and log coordinates of abandoned oil and gas wells, which will be further studied in methane emissions research projects; maps of data collected from the survey will be periodically published to the community.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	None reported
FTEs	0	0
Funding Estimate	$0	$0

[228] The website for Orphan Well Location Survey is accessible at https://www.netl.doe.gov/onsite-research/geological/OWL.

Goal Types: Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: CCS was chosen to achieve the goals through data contribution, because it takes a lot of footwork to find abandoned wells. Often, databases are incorrect or incomplete in their records, but regular citizens are aware of the wells in their favorite hiking or hunting spots or even on their own property. We used CCS in order to improve databases of orphan wells.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Indigenous populations

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 06-01-2019

Anticipated End Date: 12-31-2022

Activity End Date: Ongoing

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	0
FY20	0

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Participants log on from their location

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images

Results: The results will be used by the National Energy Technology Laboratory (NETL) to compare actual well locations with database locations. This will be used as evidence for needed Light Detection and Ranging (LiDAR) or magnetic survey campaigns to identify abandoned wells in areas where database records are incorrect. The results will also be used to aid in methane emissions research, which will be sent to the Environmental Protection Agency (EPA) as a part of the Greenhouse Gas Emissions Inventory.

Data Availability: N/A: no data or results were collected as part of this project.

Data Access: NA

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The OWLS advances the agency's mission by providing new orphan well locations. There are perhaps hundreds of thousands of abandoned oil and gas wells across the country, but due to lax regulations in the past, many locations are unknown. We hoped that hikers and rural dwellers, including indigenous communities, would provide well locations so we could correct state and national databases, and eventually visit the sites (with permission) to determine if environmental remediation was necessary; all of this fits within the mission to quantify methane emissions from the natural gas sector of the economy.

CCS Act Objectives: Collect and analyze data; Make discoveries

D.4. Department of the Interior (DOI)

D.4.1. Project eTrout[229]

Sponsoring Agency and Office: U.S. Geological Survey

Authority: Crowdsourcing and Citizen Science Act, Other authority (Organic Act of 1879)

Status:

FY19: Completed

FY20: No activity occurred during FY20

CCS Activity Summary: Virtual reality (VR) platforms provide powerful new opportunities for environmental research and education in fish ecology and climate change research. The goal of Project eTrout is to engage students in fish biology research using VR and crowdsourcing platforms to generate data for ecological analysis by the U.S. Geological Survey (USGS) while achieving educational objectives for participants. The pilot project (FY18-FY20) involved three steps: (1) USGS researchers collected underwater 360-degree videos from targeted stream sites in Shenandoah National Park, Virginia and provided video samples to participating schools; (2) participants watched video samples and collected data on trout abundance, behavior, and habitat use; then (3) USGS summarized the crowdsourced data and reported results back to participants. This project provided a powerful new link between ecological research and education by enabling fish biology research across large regions while providing students and citizen scientists a new way to experience stream ecosystems. This effort could be expanded to include video collections taken by visitors at National Forests and National Parks as well as non-governmental organization (NGO) partners at the national and international levels.

[229] The website for Project eTrout is accessible at https://www.usgs.gov/centers/eesc/science/project-etrout and at https://virginiatech.qualtrics.com/jfe/form/SV_3KmmcAZmpC2Yw29 with additional information available at https://www.usgs.gov/centers/eesc/science/enabling-ai-citizen-science-fish-biology and at https://www.usgs.gov/centers/chesapeake-bay-activities/science/project-etrout-linking-research-and-education-virtual and https://vimeo.com/322476364.

Budget and Resources: The following table indicates the budget and resources used to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	Not applicable
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Data entry or/and analysis; Training	Not applicable
FTEs	0.5	Not applicable
Funding Estimate	$10,300	Not applicable

Goal Types: Education; Digitization of agency-owned materials; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community; Other (Inform the restoration and conservation of brook trout and their habitat)

Justification for Using CCS: Stream ecosystems are spatially complex and therefore an understanding of stream fishes requires data from many locations. Collection and analysis of such spatially-distributed data is not feasible by any single agency or university alone. Instead, stream ecosystems require a collaborative effort across many institutions for analysis at the landscape scale. Moreover, prior efforts in this regard have been criticized for a lack of independently verifiable results. Project eTrout overcomes both of these limitations by using 360-degree video data collected at a low cost from many locations with empirically verifiable archived records, and then rapidly analyzing the video data by a distributed team of online students and volunteers at an unprecedented rate compared to traditional analysis conducted in-house.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Other (Teachers, Parents, Students, Anglers, Youth, Citizen Scientists of all ages)

Underrepresented Groups: Black/African-American populations; Women and girls

Emphasized Populations: Urban populations

Participation:

Activity Open Date: 09-2018

Anticipated End Date: Not applicable

Activity End Date: 10-01-2019

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	500
FY20	Not applicable

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	360-degree videos were collected in Shenandoah National Park, Virginia. Project eTrout was promoted to schools and teachers where participation in the analysis component often occurred in classrooms around the country in 34 states (see https://www.usgs.gov/media/images/etrout-map).
Virtual Activity	The primary activity of analyzing the 360-degree video data is solely conducted online through a website accessible to anyone with an Internet connection.

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions or materials included images; Other (Watched 360-degree videos, identified fish species, and counted the number of trout)

Results: Results from Project eTrout supported USGS research on brook trout ecology in Shenandoah National Park, Virginia. The underwater video methods developed from Project eTrout yielded conference presentations and a peer-reviewed publication, as well as new research with other Federal agencies within the Department of Interior at the National Park Service and the Department of Agriculture at the U.S. Forest Service). This project also addressed educational objectives from NGO partners (namely Trout Unlimited) and schools (namely Virginia Tech) though student participation.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://doi.org/10.5066/P9M8U8MN
https://doi.org/10.1002/tafs.10245

Product Description: Virginia Polytechnic Institute and State University (Virginia Tech) provided the online platform for data collection in this project (i.e., crowdsourced counts of fish abundance from video analysis). The video samples are archived in ScienceBase (https://www.sciencebase.gov). A journal article published in April 2020 provides more details on how video techniques can provide a robust alternative or supplement to traditional methods for estimating fish abundance in streams (Hitt et al. 2020, *Transactions of the American Fisheries Society*).

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Virginia Tech	Academic Institution	Online support	None reported	$10,000	None reported
Trout Unlimited	Nonprofit Organization (excluding Academic Institutions)	Personnel	Coordination of project participants via "Trout In the Classroom" environmental education program	$10,000	None reported
National Park Service	Federal Agency or Office	Funding; Personnel	Research collaboration, partial funding, study site access	$20,000	None reported

Advancement of Agency Mission: A core mission of the USGS is to help America achieve sustainable management and conservation of its biological resources. Specifically, a goal of the USGS Ecosystems Mission Area is to conduct cutting-edge research that leads to the protection and restoration of our Nation's fisheries and aquatic resources. Project eTrout advances this mission by applying new camera technology in stream ecosystems and then crowdsourcing the analysis of large datasets from students, educators, anglers, and citizen scientists. This project empowers youth to be a part of a large research team, and enables new spatial analysis of fish abundance, behavior, and habitat use by USGS researchers.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Develop technologies and applications; Make discoveries

D.5. Environmental Protection Agency (EPA)

D.5.1. Air Sensor Toolbox[230]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Air Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Air pollution sensors are a class of technology that are lower in cost, more portable, and generally easier to operate than regulatory-grade air quality monitors. These commercially available air sensors are widely used in the United States to understand air quality conditions. EPA's Air Sensor Toolbox, a website launched 10 years ago, provides the latest science on the performance, operation, and use of air sensors for technology developers, air quality managers,

[230] The website for Air Sensor Toolbox is accessible at https://www.epa.gov/air-sensor-toolbox.

citizen scientists, and the public. The online toolbox is part of a larger EPA research and development program to advance air sensor technology, which includes performance evaluations of sensor devices and identification of best practices for effective use of sensors. The information helps the public learn more about air quality in their communities and how to use air sensors appropriately for a desired application.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Contracted services	Web portal or application development and support; Contracted services
FTEs	0.1	0.1
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Public involvement in measuring air pollution helps communities understand and solve air pollution problems. Low-cost air sensors continue to grow because the lower price point makes sensors more affordable for individuals and community groups. With growing use comes a need to support the user community with information on technical aspects of monitoring. EPA's Air Sensor Toolbox website provides information for citizen scientists who want to use air sensors to learn about air quality in their communities. The website provides a wide range of information including data on expected sensor performance so that users can make informed purchasing decisions; best practice for use; tools and information on how to interpret air sensor data; findings from EPA's research program on air sensor technologies; and access to other technical resources.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: None reported

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	80-100 interactions per day
FY20	80-100 interactions per day

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	EPA research facilities in Research Triangle Park, NC

Consent: Participation was voluntary; consent was implicit

Submission Types: Other (EPAs air sensor toolbox provides resources and information that helps the public use low cost air pollution sensors to monitoring air quality. EPA does not collect the data. Rather the data are used by the public for their own purposes.)

Results: EPA's Air Sensor Toolbox website is an online portal designed to help citizen scientists and others access vital technical information, tools, and resources on effective use of air sensor technologies. The content provides users with critical information needed to make informed decisions about how to choose equipment, design projects, and effectively evaluate, interpret, and communicate the data collected using air sensors. The Air Sensor Toolbox helps users gain a greater understanding of air quality in areas where more traditional air monitoring is not available. The site can be used by communities that want to engage individuals and community groups in air quality monitoring. The website provides assistance and guidance to a large number of users. Additionally, hundreds of hours of technical support are given to stakeholders who contact EPA scientists through this website.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.epa.gov/air-sensor-toolbox.

Product Description: This website provides the latest science on the performance, operation and use of air sensor monitoring systems.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Air Sensor Toolbox supports the EPA's mission to protect human health and the environment by providing accurate information about the use of air sensor technology. The web-based toolbox communicates EPA research findings; provides up-to-date information on how to measure air pollution and its sources; and advances knowledge on newer, more cost-effective air quality measurement devices. The Air Sensor Toolbox provides support to citizen scientists who want to measure air pollution, and provide data that can be used in environmental protection decisions.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Solve problems

D.5.2. Best Practices Guide for Library Air Sensor Loan Programs[231]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Air Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: There is currently limited material available to the public on how to use lower cost air sensors in community settings. This project, still in the design phase, will create curricula and training materials that can be used by non-technical staff in a school, library or other community settings to explain how the public can use sensors to collect data about air pollution in their neighborhood. EPA will compile a Best Practices guide that draws on lessons learned from several EPA-sponsored air sensor loan programs across the U.S. that pilot and evaluate air sensor training curricula. The guide will include sensor curriculum for youth and adults and other transferable materials like startup guides, as well as a grab-and-go option for organizations starting their own air sensor loan program. A science fair event is planned that will bring together the community participants from different library loan programs to share lessons learned and user experiences.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Contracted services; Training	Publicity, advertising, outreach, or/and communications; Contracted services; Training
FTEs	None reported	None reported
Funding Estimate	$15,000	$30,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (To build scientific and environmental literacy)

Justification for Using CCS: This project is a community-centered approach inspired by a collaborative EPA project with the Los Angeles Public Library to demonstrate and evaluate a community-based air sensor loan program. Involving the public in the measuring of air pollution is a cost-effective way to increase public understanding and to collect more data that can be used in decision making. This project will consolidate lessons learned from multiple air sensor loan projects in disparate

[231] The website for Best Practices Guide for Library Air Sensor Loan Programs is accessible at https://www.epa.gov/innovation/los-angeles-public-library-air-sensor-loan-program https://www.epa.gov/air-sensor-toolbox/air-sensor-loan-programs.

communities across the country. Communities can learn how to operate air quality instruments (specifically low-cost air sensors) and learn to interpret and understand the air quality measurements in their communities.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: The activity was intended to launch in 2020 but was postponed due to COVID-19

Anticipated End Date: 05-30-2022

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	The best practices guide will draw on experiences from sensor loan programs in multiple locations including Los Angeles.
Virtual Activity	The Best Practices Guide will be useful for virtually any geographic area, and draws on experiences from multiple locations including a large urban region (Los Angeles, CA), rural areas in the Midwest (IL and IN) and tribal communities in the Pacific Northwest.

Consent: Participation was voluntary; consent was implicit

Submission Types: Other (Participants will collect data or observations for their own use, this data can include images and information on location or geospatial coordinates.)

Results: The Best Practices Guide is a collaborative effort between EPA's Region 5 (Chicago), Region 9 (San Francisco), Region 10 (Seattle), tribal communities in R10, and the Office of Research and Development. The intention of the Best Practices Guide is to assist communities in implementing air sensor loan programs more easily and efficiently and to help overcome potential barriers so that

these types of programs are more common. This guidance has the potential to be useful for local, state, Federal, and/or tribal programs.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The guide, when completed, will be posted on EPA's citizen science website, and will be part of the online EPA air sensors toolbox. Decisions about data accessibility will be made by each participating community. EPA will not compile data collected by the various air sensor loan programs.

Product Description: The Best Practices Guide will consolidate feedback we receive from the various loan programs across different types of communities (urban, rural, tribal, traditional library loan structure, other types of loan structures) plus air sensor resources that are both identified and developed from this program, all of which will be consolidated into one resource. The purpose of the Best Practices Guide is to help any organization learn how to create a loan program and to anticipate and avoid problems that other pilot loan programs experienced.

Partnerships: The crowdsourcing or citizen science activity involved five partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Los Angeles Public Library	State or Local Government	Personnel	Time	None reported	None reported
Nez Perce Tribe	Other (Tribal Government)	Personnel	Time	None reported	None reported
Heritage University	Academic Institution	Personnel	Time	None reported	None reported
Evansville IN Public Library	State or Local Government	Personnel	Time	None reported	None reported
Morten Arboretum	Nonprofit Organization (excluding Academic Institutions)	Personnel	Time	None reported	None reported

Advancement of Agency Mission: Air sensors are an important environmental tool for the public, since many air hazards are not detectable without monitoring. The goal of this project is to expand public opportunities to contribute to EPA's mission to protect human health and the environment. An increase in equipment loan programs will increase the number of air sensors available to communities, particularly in areas that might not otherwise have access to these tools. Air sensor programs provide communities with information about the air quality in their neighborhoods, homes, places of worship, and schools. This builds awareness about air pollution and helps people learn how to manage individual exposure that can impact health and wellbeing. Expanding access to low-cost air sensors can help individuals and communities take steps to protect their health and environment.

CCS Act Objectives: Enable the formulation of research questions; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

D.5.3. Cyanoscope: EPA Collaborative Partnership on Monitoring Harmful Algal Blooms[232]

Sponsoring Agency and Office: Region 1 - Boston

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Water Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Cyanobacteria Monitoring Collaborative was formed in 2013 at the request of the New England State environmental agencies to support their monitoring and management of harmful algal and cyanobacteria blooms. The initial project evolved into a three-tiered program to educate people on the problem, increase surveillance to better understand the dynamics of harmful algal blooms (HABs), and collect data that can be used to determine trends and hotspots. The cyanoScope project, the middle component of the three-tiered program, engages volunteers to identify the types and potential toxicity of cyanobacteria genera. After standardized training on methods and protocols, citizen scientists collect water samples from waterbodies of interest and submit microscope photos of the cyanobacteria present in the samples. These photos are shared on the cyanoScope project of iNaturalist (www.inaturalist.org/projects/cyanoscope), which allows participants to interact with the cyanoScope community and also to have experts assist with species identification. The project goal is to develop a national library of identified cyanobacteria photographs that can be used for spatial distribution and occurrence modeling, while simultaneously educating stakeholders on types of cyanobacteria, their potential toxicity and risk, and their distribution. The combined data of the whole program, of which cyanoScope is key, will provide insights to spatial and temporal distributions, frequency and longevity of occurrence, and the prominent drivers of harmful cyanobacteria blooms.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	Personnel, lab & field supplies	Personnel, Lab & field supplies
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Database development; Data entry or/and analysis; Contracted services; Federal employee travel	Purchase of consumable materials; Purchase or rental of equipment; Database development; Data entry or/and analysis; Contracted services; Federal employee travel

[232] The website for Cyanoscope: EPA collaborative partnership on monitoring harmful algal blooms is accessible at Cyanos.org https://www.inaturalist.org/projects/cyanoscope.

Funding	FY19	FY20
FTEs	0.75 FTE	0.75 FTE
Funding Estimate	$50,000	$50,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Sharing of data, protocols & methods, and general information among local, State, and Federal agencies)

Justification for Using CCS: Scientists suspect that cyanobacteria blooms are substantially under reported and, given the state of current technology and monitoring programs, crowdsourcing the collection of data through citizen scientist volunteers is the only realistic mechanism to conduct large spatial surveillance and monitoring of blooms. Government resources are not extensive enough (nor is it logistically feasible) to carry out the work of the cyanoScope program because individuals need to be on-site when a bloom occurs.

Participants:

Intended Participants: Pre-k through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees; Other (any stakeholder or person with interest)

Underrepresented Groups: Indigenous populations; Women and girls

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: originally started in 03-2013

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	over 1,000
FY20	over 1,000

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	The main location for managing this collaborative partnership is the USEPA regional laboratory in Chelmsford, Massachusetts. The program engages the public primarily in New England states but can accept contributions from anywhere.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: Data collected in the cyanoScope project has multiple uses, including providing information to stakeholders about potential risks of cyanobacteria blooms; contributing to strategies and management actions to mitigate toxic blooms; identifying vulnerable waterbodies and populations (human and wildlife); and discovering how to improve community communication strategies about risks from harmful algal blooms (HABs).

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data will be made available via web links (i.e. cyanos.org) along with data visualization tools useful to all parties. This work is currently in development.

Product Description: The website will provide information on how to get involved in monitoring cyanobacteria via the three tiers of the program. The website will contain key information, including video training clips on sampling methods and microscope use; quality assurance plans; success stories and information via blog posts; data visualization tools that can summarize data for different audiences; identification guides for cyanoScope images; and management strategies that can be used to mitigate harmful cyanobacteria blooms.

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists five major partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Maine Dept. Env. protection	State or Local Government	Monitoring efforts, FTE, Data Sharing expertise, technology	sampling/monitoring engagement, program development/ brainstorming	None reported	None reported
NH Dept. Env. Services	State or Local Government	Expertise, data sharing, monitoring efforts, FTE, technology	sampling/monitoring engagement, program support	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
University of Rhode Island	Academic Institution	Expertise, technology	sampling/monitoring engagement, program development, community engagement	None reported	None reported
CT Dept. Energy Env. protection	State or Local Government	FTE, monitoring, technology, Data sharing	program support, community engagement, monitoring and sampling	None reported	None reported
University of New Hampshire	Academic Institution	Monitoring, FTE, data sharing, technology and expertise	research opportunities, training, community engagement	None reported	None reported

Advancement of Agency Mission: The cyanoScope project provides valuable information on the occurrence, distribution, and types of blooms found around the country. This information cannot be obtained by EPA staff working on cyanobacteria issues due to staffing levels, logistics, travel times, etc.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

D.5.4. Demonstration of Air Sensor Loan Programs for Rural Communities and Living/Nature Museums[233]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act; Other authority (Clean Air Act)

Status:

FY19: No activity occurred during FY19

FY20: Launched

CCS Activity Summary: This innovative project in the Midwest will help the public measure and better understand the impacts of air pollution in smaller communities and will provide information on how people can reduce their exposures to certain types of air pollution, such as particulate matter. This Air

[233] There was no website provided for Demonstration of Air Sensor Loan Programs for Rural Communities and Living/Nature Museums.

Sensor Loan Project, still in the planning stages, will demonstrate educational and equipment loan programs in a small number of remote Midwestern libraries and educational/library programs found at living museums/nature centers. The project has four components, including 1) virtual training for library and educational program staff on basic information about air pollution, health impacts, low-cost air monitoring sensors; 2) Information on how data from low-cost sensors compares with the data from more expensive air monitoring equipment; 3) Resource materials about air pollution and measurement with low-cost sensors specifically designed for community members who use these smaller libraries and living museums; and 4) Low-cost monitoring equipment that can be used in an air sensor loan program and in educational programs.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	Not applicable	0
Agency Fund Use	Not applicable	Not applicable
FTEs	Not applicable	Not applicable
Funding Estimate	Not applicable	$50,000

Goal Types: Education; Public outreach or engagement

Justification for Using CCS: This demonstration project will create some rural air sensor loan programs that allow remote communities access to these newer technologies and will increase awareness of air pollution and its sources. The project also provides an opportunity to work with various types of partners to develop educational and training materials tailored to teaching non-experts how to use air pollution sensors. Air sensors allows invisible elements of air pollution to become visible for those borrowing the equipment. The training resources for the loan program staff and relevant educational/enrichment materials will enhance the public's understanding of air quality data.

Participants:

Intended Participants: Pre-k through 8th grade students; 9th-12th grade students; Adults not affiliated with higher education

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 10-2020

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Physical location(s); Virtual activity

Location Type	Description
Physical Location	This project is still in the planning stage, and the specific locations have not yet been selected
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit

Submission Types: Not applicable

Results: The anticipated results from this project, which is still in the developmental stage, include: 1) air sensor loan programs for smaller, remote communities and living museums; 2) training material for library staff; 3) educational materials about air pollution for the public, designed specifically of the users of the air sensors; and 4) lessons learned about how to establish air sensor loan programs with various types of lending or non-traditional educational programs. The training and enrichment materials will be available to all interested partners through EPA's Air Sensors Toolbox webpage. The material will also be shared with partner organizations so they can post it on their websites. The lessons learned from this project will be shared with other EPA Regional Air Sensor Loan programs and included in a future EPA document on Best Practices for Establishing an Air Sensors Loan Program.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: None reported

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Evansville, IN Public Library	State or Local Government	Personnel	Collaboration and Advisory	Not applicable	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Morton Arboretum	Nonprofit Organization (excluding Academic Institutions)	Personnel	Collaboration and Advisory	Not applicable	None reported

Advancement of Agency Mission: This rural air sensor loan project, still in the planning stage, advances EPA's mission to protect human health and the environment by educating the public about air pollution and helping EPA learn about the field performance of lower-cost air sensor measurement devices. The project provides smaller, rural community libraries and similar organizations (i.e., living museums) an innovative, hands-on way to educate community members about air pollution. With the support of trained library and resource staff, the public can use these monitoring technologies to learn about local air quality.

CCS Act Objectives: Collect and analyze data; Interpret the results of data; Make discovers; Solve problems

D.5.5. Demonstration of a Tribal Air Sensor Loan Program[234]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act; Other authority (Clean Air Act)

Status:

FY19: No activity occurred during FY19

FY20: Launched

CCS Activity Summary: Exposure to smoke from wildfires and wood burning, which may result in adverse health impacts, can be mitigated through increased public awareness and understanding of air quality. This project will create a tribal air sensor loan program that will include access to particulate matter air sensors and an air quality curriculum. This air sensor loan project expands ongoing EPA efforts to support community monitoring of air pollution. It adds unique demographic partners, a different type of air sensor, and a different loan program structure. The target audience is tribal and surrounding communities that experience poor air quality caused by wildfires, outdoor burning, and residential wood heaters. The project resources will engage and empower the public to develop knowledge in air quality science, gain an understanding of particulate matter pollution and associated health risks, and learn about data interpretation. While these sensors are not suitable for regulatory decision making, these sensors allow citizen scientists to contribute to localized, community-based air quality assessments. This project, still in the planning stage, will increase community capacity and expertise in use of air quality sensors through a partnership between EPA Region 10, tribal partners, and the local communities.

[234] There was no website provided for EPA Demonstration of a Tribal Air Sensor Loan Program.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Additional Agency Resources	Not applicable	None reported
Agency Fund Use	Not applicable	Not applicable
FTEs	Not applicable	None reported
Funding Estimate	Not applicable	$50,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The focus of this citizen science project is education and knowledge transfer -- with direct public participation being the best teacher. Air quality professionals typically possess skills and training to use air quality monitoring equipment (such as low-cost sensors), manage the data, and interpret the monitoring results. However, this type of technology and information is not readily available to, nor understood by, the public. The low cost of some sensor systems and relative ease of operation makes it possible for non-experts to acquire and use these technologies, collect air quality information and apply the results to daily life. By partnering with tribal governments, EPA can help make low-cost sensors available to tribal members and provide training on the use of air pollution sensors.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Hispanic or Latino populations; Indigenous populations

Emphasized Populations: Rural populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: We anticipate the public will begin to participate in the tribal sensor loan project in 2021

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	The activity has not taken place yet
Virtual Activity	The activity has not taken place yet

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency

Results: This project is in the planning stage. The data and results from the project will be used by the tribal partners. Additionally, in consultation with participating tribes, the Information and lessons learned from this project will be shared with EPA's Office of Research and Development and staff in other EPA regional offices. The lessons learned will aid in the preparation of an EPA Best Practices Guide for future loan programs. Experiences from different types of loan programs will help create a more robust and complete set of best practices for a variety of loan systems and communities throughout the country. Specifically, this project will build capacity for sensor loan programs with tribal partners. It will increase access to air sensors and empower communities to learn more about the air quality and actions they can take to protect their health and the environment.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: None applicable

Product Description: This project will provide an expanded air quality sensor curriculum to increase community understanding of air quality associated with smoke impacts. Lesson plans will be expanded to utilize stationary particulate matter sensors and expand examination of common local sources of PM2.5 pollution including wildfire smoke and outdoor or residential wood heating, and instruction on how to understand, use and interpret air quality data. In addition, a quick start PurpleAir sensor guide will be developed.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Nez Perce Tribe	Other (Tribal Government)	Personnel	Time	Not applicable	None reported
Heritage University	Academic Institution	Personnel	Time	Not applicable	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Environmental Education and Outreach Program (EEOP) at Northern Arizona University	Academic Institution	Personnel	Time	Not applicable	None reported

Advancement of Agency Mission: The project supports EPA's mission to protect human health and the environment by investigating air pollution, educating the public, advancing knowledge of newer and more cost-effective measurement devices, and incorporating citizen science into tribal communities. Many communities - in particular low-income communities and communities of color - are impacted by poor air quality. Lower-cost air sensors provide increased public access to and understanding of air quality information. Providing these resources increases expertise in air quality science and improves understanding of air pollution and associated risk. This project expands tribal capacity for environmental protection by increasing access to air sensors and empowering communities to learn more about air quality and the actions they can take to protect their health and the environment.

CCS Act Objectives: Interpret the results of air quality sensor data; Develop technologies and applications; Make discoveries

D.5.6. Evaluating Air Pollution Sensors for Hot Spot Monitoring by Citizen Scientists[235]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Air Act)

Status:

FY19: No activity occurred during FY19

FY20: Launched

CCS Activity Summary: Compact, mixed-use development patterns with commercial, residential, and civic buildings are common throughout New Jersey. These types of neighborhoods may pose localized air quality risks for pedestrians from automobile pollution, yet little research has explored the impacts of automobile traffic on air quality for pedestrians. This goal of this project is to conduct a scientifically sound and meaningful evaluation of a low-cost air sensor network for citizen science screening and monitoring at a neighborhood scale. Pollutants to be monitored include nitrogen dioxide, ozone, and particulate matter. The project will provide a real-world test of the Citizen Science Quality Assurance Project Plan (QAPP) Template for Hot Spot Identification, developed by the New Jersey Department of Environmental Protection. Lessons learned about low-cost sensor networks will be used in the Region 2 Citizen Science Equipment Loan Program. Project results will be shared with

[235] The website for EPA Evaluating Air Pollution Sensors for Hot Spot Monitoring by Citizen Scientists is accessible at https://www.epa.gov/innovation/region-2-evaluating-air-pollution-sensors-hot-spotmonitoring-citizen-scientists.

state, local, and community organizations interested in the design and conduct of community monitoring projects.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	Purchase or rental of equipment; Contracted services
FTEs	None reported	0.1
Funding Estimate	None reported	$50,000

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: A crowdsourcing and citizen science approach was chosen because it allows the community and local partner organizations to help define project goals, objectives and participate in the project. This demonstration of community monitoring of air pollution will help government agencies understand the performance of lower cost monitoring technology, and how to work and communicate with communities on air quality concerns.

Participants:

Intended Participants: Undergraduate College/University/Technical students

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 09-2020

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	The location of this citizen science project, which has not yet started, will be Rider University, Lawrenceville, NJ.

Consent: Participation was voluntary; consent was implicit

Submission Types: Not applicable

Results: Lessons learned about low-cost sensor networks will be used in the EPA Region 2 Citizen Science Equipment Loan Program to inform decisions regarding the addition of air monitoring equipment. The EPA Office of Research and Development will use the lessons learned to inform future equipment loan programs and improve understanding of how lower cost sensors perform in the field. Using the NJ QAPP Template for Hot Spot Monitoring in this work will inform how the state environmental agency works with groups and communities interested in air quality monitoring. The QAPP's performance will also help them design (and conduct training/outreach on) three other planned QAPP templates for citizen use. Project results will be shared with state, local, and community organizations interested in the design and conduct of community monitoring projects. The data and analysis from this demonstration and evaluation project will be used by Rider University to educate students on the equipment and analyses.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: The project is in the design phase and no data has not been collected yet. Data ownership and availability will be determined with partner organizations before the project is formally launched.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
New Jersey Department of Environmental Protection	State or Local Government	Personnel	Personnel time; Equipment loan; QA resources; Access to the site that houses the Federal reference monitoring equipment	None reported	None reported
Rider University	Academic Institution	Personnel; Space	Personnel and student time; Site access	None reported	None reported

Advancement of Agency Mission: This project advances EPA's mission of protecting human health and the environment by evaluating emerging air pollution measurement technologies that can be used in

community-level data collection. Participation in air monitoring empowers communities to advocate for their local air quality needs. The air sensors (which will be operated by undergraduates on campus) also helps educate the next generation of scientists as they enter the workforce. The analyses from this project will also allow the EPA Regional Office and NJ Department of Environmental Protection to refine their goals of better air quality tools and resources for citizen scientists.

CCS Act Objectives: Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

D.5.7. Equipment Loan Program for Water Quality Monitoring[236]

Sponsoring Agency and Office: Region 2 - New York

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Water Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Since 2015, the EPA Region 2 Citizen Science Water Monitoring Equipment Loan Program has provided access to field and laboratory equipment to volunteer monitoring organizations, citizen science groups, nongovernment organizations, academic institutions, local governments, Tribal Nations, and other organizations. The available equipment includes instruments for measuring water quality parameters, pathogen monitoring, and macroinvertebrate collection. Organizations that participate receive hands-on training from EPA regional staff. All recipients must submit a Quality Assurance Project Plan (QAPP) before receiving their equipment, provide monthly updates, and submit a final report that summarizes the work and outcomes of the data collection. This program is open to citizen scientist organizations in New York, New Jersey, Puerto Rico, U.S. Virgin Islands, and nine Tribal Nations. Priority is given to sites within communities with environmental justice issues and Tribal Nations. The program runs annually in New York and New Jersey to reflect the general sampling season (May-November). Beginning in 2018, to accommodate more communities, the program began working with the Caribbean Science Consortium to set up a formal system of Equipment Loan Centers with university partners throughout Puerto Rico and the U.S. Virgin Islands. There are currently five centers in Puerto Rico and two in the U.S. Virgin Islands, each with their own full set of equipment maintained by university staff.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Program operations	Program operations
FTEs	0.5	0.25

[236] There was no website provided for Equipment loan program for water quality monitoring.

Funding	FY19	FY20
Funding Estimate	$7,000	$0

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Empower communities to collect data for own uses)

Justification for Using CCS: After becoming involved with citizen science in 2012, the EPA Region 2 office recognized the need for technical support, training, and equipment loans to support local citizen science organizations. EPA provided an initial grant that included purchase of equipment and other supplies. Today the program allows different groups to use the equipment for their own scientific needs, which contribute to environmental protection actions and decisions.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls

Emphasized Populations: Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 04-2015

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	60
FY20	30

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	New York, New Jersey, Puerto Rico, U.S. Virgin Islands, Seneca Nation, Shinnecock Indian Nation

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: The data gathered from this equipment loan program is used by local communities (e.g., to help identify pollution issues that are addressed by the municipality). Some data are also entered into searchable databases and used by states as secondary data for reporting to EPA. EPA Region 2 tracks community engagement, samples collected and analyzed, and provides summary reports and data.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: The data are owned and managed by each non-governmental organization that participates in the equipment loan program. Decisions about how and when to share the data are made by these organizations.

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists five major partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Shinnecock Nation Environmental Dept.	Other	Personnel; Space; Consumable resources	Personnel time, Lab space, consumable purchase	None reported	None reported
Clean Ocean Action	Nonprofit Organization (excluding Academic Institutions)	Personnel; Space; Consumable resources	Personnel time, Lab space, consumable purchase	None reported	None reported
NY/NJ Baykeeper	Nonprofit Organization (excluding Academic Institutions)	Personnel; Space; Consumable resources	Personnel time, Lab space, consumable purchase	None reported	None reported
University at Buffalo	Academic Institution	Personnel; Space; Consumable resources	Personnel time, Lab space, consumable purchase	None reported	None reported
The Watershed Institute	Nonprofit Organization (excluding Academic Institutions)	Personnel; Space; Consumable resources	Personnel time, Lab space, consumable purchase	None reported	None reported

Advancement of Agency Mission: Improving the nation's water quality is one of EPA's highest priorities. The Agency recognizes the value of additional monitoring data to guide programs designed to improve the health of the streams, lakes, estuaries, and other water bodies. Due to budget constraints, it is not possible to collect water quality data for many water ecosystems. For over 25 years, volunteer water monitoring groups have played a valuable role in supplementing monitoring data collected by state regulatory agencies. This project supports the EPA mission of protecting

human health and the environment by providing tools and training to citizen science groups. This program allows collection of data by local citizen science organizations, which can be used locally to better understand water pollution and protect water quality in local communities.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Collect and analyze data; Interpret the results of data; Solve problems

D.5.8. Escaped Trash Assessment Protocol ETAP- (OW Trash Free Waters Program)[237]

Sponsoring Agency and Office: Office of Water

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Water Act)

Status:

FY19: Launched

FY20: Ongoing

CCS Activity Summary: The goal of this project is to collect better data on the volumes, impacts, and sources of trash in water using EPA's Escaped Trash Assessment Protocol (ETAP). Beginning In 2017, the EPA Trash Free Waters Program began development of this macro-trash assessment tool, spurred by external stakeholder interest. The need from users was twofold: standardized methodologies for sampling and analysis of trash pollution larger than microplastics and a more effective protocol to guide source reduction decisions. The ETAP tool is designed to support data gathering on site characteristics and trash type and item counts and volumes in the environment. ETAP provides valuable information about the context of trash in the environment, and therefore can be used in various water quality protection programs operated by EPA, states, and tribal governments. *Budget and Resources:* The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Contracted services	Contracted services
FTEs	0.5	0.4
Funding Estimate	$50,000	$0

Goal Types: Education; Other (To support stakeholder needs for informed decisions about trash pollution.)

Justification for Using CCS: Involving volunteers and citizen science organizations in monitoring trash in water bodies is a cost-effective way to collect data and educate the public about water pollution.

Participants:

Intended Participants: No specific intended group

[237] There was no website provided for Escaped Trash Assessment Protocol ETAP- (OW Trash Free Water Program).

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: The ETAP tool is not currently available to the public, but is anticipated to be released in the Spring of 2021. Project development began in 07-2017 and beta testing started with a small group of stakeholders in 03-2018.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	20
FY20	10

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Seattle, WA; Mobile Bay, LA; Atlanta, GA; Kansas City; MO; Mystic River, MA; Multiple locations outside of SF, CA and multiple locations outside of LA, CA; Multiple locations along the Gulf Coast.
Virtual Activity	The Trash Free Waters team has participated in multiple methods development workshops related to this topic to understand stakeholder interests. Most workshops were virtual and were hosted by partners in California or on the west coast.

Consent: Participation was voluntary; consent was implicit

Submission Types: Not applicable

Results: This new ETAP tool, which builds on previous protocols, will be used by organizations to assess local trash pollution in water bodies and define opportunities for prevention and source reduction (i.e., through sustainable materials management, social messaging, and stormwater management). Stakeholder groups will be able to confidently assess and monitor their waterways for trash pollution.

Data Availability: N/A: no data or results were collected as part of this project.

Data Access: N/A

Partnerships: The crowdsourcing or citizen science activity involved twelve partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
San Francisco Estuary Institute	Nonprofit Organization (excluding Academic Institutions)	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Zero Waste Washington	Nonprofit Organization (excluding Academic Institutions)	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Mystic River Watershed Association	Nonprofit Organization (excluding Academic Institutions)	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Mobile Bay National Estuary Program	Nonprofit Organization (excluding Academic Institutions)	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Osprey Initiative Inc.	Private Industry	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Southern California Coastal Water Research Project	Nonprofit Organization	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Bridging the Gap, Kansas City	Nonprofit Organization	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Maryland Department of Environment	State or Local Government	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
DC Department of Energy and Environment	State or Local Government	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Gulf of Mexico Program	Federal Agency or Office	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
NOAA	Federal Agency or Office	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported
Mobile Baykeeper	Nonprofit Organization	Other (beta testing feedback and provided goals for data collection)	None reported	None reported	None reported

Advancement of Agency Mission: This effort supports EPA's mission to protect human health and the environment, and specifically addresses the priority goals to provide clean and safe water and to increase transparency and public participation. The ETAP tool supports community monitoring efforts for participation in state and tribal water quality regulatory programs required by the Clean Water Act. By working with stakeholders to develop a trash pollution data collection protocol, EPA is supporting volunteer efforts to assess and monitor water quality; and in locations where states consider trash pollution data in their 303(d) listings or MS4 permits, this protocol supports community monitoring efforts for participation in those water quality regulatory programs.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data

D.5.9. Improving Tribal Science and Citizen Science with Collocated Low-Cost Air Sensor Shelters[238]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Air Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Accurate air quality measurements are the foundation of regulatory programs that reduce air pollution. Recent improvements in sensor technology allow volunteer citizens scientists to measure air pollution in their communities. However, one challenge is that the quality of data obtained from low-cost air sensors often is not equal to more expensive monitors used by government agencies. A cost-effective way to assess the performance of low-cost air sensors (and create data correction equations that make sensor data comparable to government monitors) is to test low-cost sensors near the more expensive technology at regulatory monitoring sites. This project sets up small testing enclosures that will be set up at regulatory air monitoring sites. It will fund construction of air sensor shelters to be set up on or near tribal lands that can be used by tribal, state, and local air monitoring agencies. Tribal environmental agencies and citizen science organizations can use these air sensor testing shelters to conduct air sensor projects. Placement of collocated testing shelters at existing regulatory air monitoring sites allows for direct data comparisons between low-cost sensors and more expensive monitoring technology a recommended method in EPA guidance for assessing air sensor measurement accuracy and uncertainty.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	Contracted services
FTEs	0.02	0.2
Funding Estimate	None reported	$20,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Infrastructure to encourage citizen science, engagement, education, and collection of data)

Justification for Using CCS: Using crowdsourcing and citizen science approaches has multiple benefits in monitoring air pollution, including more localized date and improved public understanding of air quality. This project provides a way for citizen science organizations to improve measurements of air pollution in their communities.

[238] There was no website provided for Improving Tribal and Citizen Science with Collocated Low-Cost Air Sensor Shelters.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Indigenous populations

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: The project is still in the planning stage. The anticipated date for public use of the air sensor testing shelters is the summer of 2021.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	This project is still in the planning stage. Expected partners include Catawba Indian Nation Tribal Land, Rock Hill, SC; Broward County, FL; Orlando, FL; Raleigh, NC; Jacksonville, FL; Louisville, KY; Cherokee Nation, OK; and multiple other locations to be determined.

Consent: Participation was voluntary; consent was implicit

Submission Types: Not applicable

Results: The collocated shelters, which are designed to test and calibrate lower-cost air sensors, will be utilized by tribal, state, and local agency partners in their work with local organizations interested in local air pollution. EPA plans to make available the engineering plans for the shelter and best practices document, which will allow for other organizations to benefit from project results.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Decisions about data availability and access will be made collaboratively with the local partners at each location. The engineering drawings and best practices document for the air sensor testing shelters, once developed, will be posted on the EPA website.

Product Description: Ten to twenty collocations shelters will be constructed and located at sites around the country. The engineering drawings/fabrication instructions and best practices for operation will be posted on the EPA's website (Air Sensor Toolbox), which will allow other organizations to use the same approach.

Partnerships: The crowdsourcing or citizen science activity involved ten partners. The following table lists these partners and their contributions.

Partner Name	**Partner Type**	**Contribution Type(s)**	**Personnel Contributions**	**FY19 Contribution**	**FY20 Contribution**
Seminole Tribe of Florida	Other (Tribal Government)	Personnel; Space	Project coordination	None reported	None reported
Catawba Indian Nation	Other (Tribal Government)	Personnel; Space	Project coordination	None reported	None reported
Cherokee Nation of Oklahoma	Other (Tribal Government)	Personnel; Space	Project coordination	None reported	None reported
Mecklenburg County Air Quality	State or Local Government	Personnel	Project coordination and technical guidance	None reported	None reported
North Carolina Department of Environmental Quality	State or Local Government	Personnel; Space	Project coordination	None reported	None reported
Broward County Environmental Protection and Growth Management Department	State or Local Government	Personnel; Space	Project coordination	None reported	None reported
Orange County Environmental Protection Division	State or Local Government	Personnel; Space	Project coordination	None reported	None reported
City of Jacksonville Environmental Quality Division	State or Local Government	Personnel; Space	Project coordination	None reported	None reported
Louisville Metro Air Pollution Control District	State or Local Government	Personnel; Space	Project coordination	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Additional tribal, state, or local agencies to be determined	Tribal, State or Local Government	Personnel; Space	Project coordination	None reported	None reported

Advancement of Agency Mission: This project provides citizen science infrastructure that can be used by local organizations to measure air pollution using lower cost sensors. The project encourages public participation in measuring air quality, which has the added benefit of increasing public understanding of air pollution. Finally, the project strengthens EPA's partnership with tribal, state, and local environmental agencies.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Solve problems

D.5.10. Los Angeles Library Air Sensor Loan Program[239]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act; Other authority (Clean Air Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The purpose of the project is to pilot a citizen science air sensor lending library in one of the country's largest public library systems. This project will make air sensors available to the general public, empowering regular people to become engaged in understanding air quality, science, and the power of data. Library staff have been trained on air quality science, how to use particulate matter air sensors, and how to implement a related environmental education curriculum. The City of Los Angeles library system, which is comprised of 72 branches, 300 librarians, six regional districts, and serves a population of over 4 million residents, will host workshops on citizen science, teach residents how to use the sensors and data, and support the formation of local citizen science clubs.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Contracted services; Training	Purchase or rental of equipment; Contracted services; Training

[239] There was no website provided for LA Library Air Sensor Loan Program.

Funding	FY19	FY20
FTEs	1	1
Funding Estimate	$85,000	$85,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Through working with many communities across Los Angeles, the Los Angeles Library saw a lack of environmental literacy in many of the communities they serve. The library identified CCS as an accessible way to address this issue and engage communities in increasing their environmental literacy. While a lower price point makes sensors more affordable for some individuals and community groups, there are still many people that do not have the resources to purchase their own personal air sensor. The library's loan program increases access to these tools and therefore, builds community knowledge of environmental issues that impact communities throughout Los Angeles.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Urban populations

Participation:

Activity Open Date: The program was planned to begin in spring/summer 2020, but the program has been delayed due to COVID-19

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	0
FY20	16

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Los Angeles, CA

Location Type	Description
Virtual Activity	Los Angeles, CA. There was a virtual training with trainers from Northern California and Research Triangle Park, North Carolina.

Consent: Participation was voluntary; consent was implicit

Submission Types: Not applicable

Results: The data and information from this program will be used to create a best practices guide in a collaborative effort between EPA's Region 5 (Chicago), Region 9 (San Francisco), Region 10 (Seattle), tribal communities in R10, and the Office of Research and Development. The intention of the best practices guide is to assist communities in implementing air sensor loan programs more easily and efficiently and to help overcome potential barriers so that these types of programs are more common. This guidance has the potential to be useful for local, State, Federal, and/or tribal programs.

Data Availability: N/A: no data or results were collected as part of this project.

Data Access: NA

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Los Angeles Public Library	State or Local Government	Personnel	Attended training, will house sensors and loan out sensors, may potentially help with translations	$1,600	$6,000

Advancement of Agency Mission: The Los Angeles Air Sensor Loan Program advances EPA's mission of protecting human health and the environment by putting air sensors into the hands of people and communities that might not otherwise have access to these tools. Air quality in the Los Angeles region has improved notably over the last four decades but the region still has some of the worst air quality in the country. Establishing a loan program in the Los Angeles Public Library will empower residents to measure the air quality in their own neighborhoods and take appropriate actions to protect their health and their environments with support of the LA Library staff.

CCS Act Objectives: Enable the formulation of research questions; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

D.5.11. Local Environmental Observer Network[240]

Sponsoring Agency and Office: Office of Research and Development

[240] The website for Local Environmental Observer Network is accessible at https://www.leonetwork.org.

Authority: Crowdsourcing and Citizen Science Act, Other authority (EPA environmental statutes)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Local Environmental Observer Network (LEO) allows community volunteers to report unique or unusual environmental events, which can be viewed on maps available to the public on the LEO website. The project was started in 2012 in response to rapid environmental change that impacts the ability of rural communities to travel, access clean water, and harvest healthy foods. The LEO Network helps rural communities around the globe document environmental changes in the field using the LEO Reporter App. By documenting the progression of change, traditional and local knowledge holders are able to better understand the environmental change and human health impacts and develop healthy adaptation strategies. Local observations that are contributed by volunteers include a description of the event (e.g., observation on unusual animal sightings, environmental conditions, and weather patterns) with a photo, location, and date. Entries are reviewed by project administrators at the Alaska Native Tribal Health Consortium and matched with topic experts who can share their expertise about the event. An interactive website bridges traditional and western scientific knowledge into a collection of partners and suite of resources, directing information about environmental events to communities around the world.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Software development; Training	Web portal or application development and support; Software development; Training
FTEs	1	1
Funding Estimate	$60,000	$20,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: A crowdsourcing and citizen science approach allows for useful two-way interaction between the public and scientific experts. The LEO network connects community members with technical experts and resources. The project was awarded as a Cooperative Agreement and US EPA had substantial involvement in assisting the grantee in designing an effective platform that responds to the needs of diverse tribal communities.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Indigenous populations

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 2012

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	None reported
Virtual Activity	Activity takes place in over 100 rural communities primarily in Alaska, but also among other Arctic indigenous communities across the Arctic who choose to participate in other rural communities.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: The information will be used by tribal, local, State, Federal, and academic partners to document environmental change, develop effective planning and adaptation strategies, and facilitate communications among partners. The LEO network connects people with others in their community to share observations, raise environmental awareness, and learn about environmental science.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The environmental observations are geo-located on maps with text and images, and are available on the local Environmental Observer network website. https://www.leonetwork.org/en/#lat=55.05982&lng=10.60677&zoom=7.

Product Description: Maps provide great tools for community education and outreach. Scientists look for evidence of observed changes. Traditional and local knowledge holders, whether they be subsistence hunters or environmental managers, have a unique sense of place. They can use the LEO

network to communicate environmental changes to partners with a link to a certain location on the map along with a description of the unusual environmental event. Photos are also used to document events.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The project advances EPA's mission by supporting activities that build tribal capacity to manage environmental programs for a safe and healthy tribal environment.

CCS Act Objectives: Collect and analyze data; Make discoveries; Solve problems

D.5.12. Measuring Coastal Acidification in New England Estuaries[241]

Sponsoring Agency and Office: Region 1 - Boston

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Water Act)

Status:

FY19: Launched

FY20: Ongoing

CCS Activity Summary: Four states in New England have commissions or legislation to increase investment in research, monitoring, and mitigation strategies to address acidification of coastal areas. High resolution measurements of pH and total alkalinity (the ability of seawater to buffer against acidification) help coastal water managers assess the health of local estuaries and better understand the threats to these ecosystems and shellfish species. This project will set up an equipment loan and training program for local volunteer water quality organizations to use new field-portable sensors. The project expands the capacity of EPA's New England Regional Laboratory to measure total alkalinity in seawater samples. Citizen science volunteers will be able to accurately measure pH and send water samples to the EPA regional laboratory for total alkalinity analysis. The data will provide valuable information for coastal management decisions.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Contracted services	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Contracted services
FTEs	0.3	0.4

[241] There was no website provided for Measuring Coastal Acidification in New England Estuaries.

Funding	FY19	FY20
Funding Estimate	$30,000	$40,000

Goal Types: Collection of data or observations; Create or engage a specific community

Justification for Using CCS: Volunteer water quality monitoring is a cost-effective way to collect data. Using crowdsourcing and citizens science provides additional geographic and temporal data, and also engages communities in learning about and protecting the coastal resources.

Participants:

Intended Participants: Other (volunteer monitoring organizations, which included high school students to adults.)

Underrepresented Groups: No specific intended group

Emphasized Populations: Urban populations

Participation:

Activity Open Date: Planned for Spring and Summer 2021, but timeline may be affected by social distancing requirements from COVID-19.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Multiple locations in Coastal Massachusetts.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates; Other (note that the volunteers have not yet collected the data, but that is the plan)

Results: This project is in development and no samples have been collected. Plans are for a pilot program in the Spring and Summer of 2021. Data collected on the variability in calcium carbonate

conditions in coastal estuaries will help coastal water managers assess the health of local estuaries and improve understanding of threats to these ecosystems and shellfish species.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data accessibility to be determined with partner organizations.

Product Description: Although no data have been collected yet, plans are for sharing data in publicly available reports and presentations.

Partnerships: The crowdsourcing or citizen science activity involved five partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Massachusetts Bays Estuary Partnership	State or Local Government	Personnel	partner organization will help train volunteers	None reported	None reported
Gloucester Seaside Sustainability	Nonprofit Organization (excluding Academic Institutions)	Personnel	partner organization will help train volunteers	None reported	None reported
Salem Sound Coastwatch	Nonprofit Organization (excluding Academic Institutions)	Personnel	partner organization will help train volunteers	None reported	None reported
Cohasset Center for Coastal Student Research	Nonprofit Organization (excluding Academic Institutions)	Personnel	partner organization will help train volunteers	None reported	None reported
Parker River Watershed Association	Nonprofit Organization (excluding Academic Institutions)	Personnel	partner organization will help train volunteers	None reported	None reported

Advancement of Agency Mission: One of EPA's primary missions is to protect water quality. The Clean Water Act requires that EPA establish water quality criteria and standards to protect aquatic life and other designated uses. Measurements of coastal acidification will be used to improve understanding of the variability of calcium carbonate concentrations that impact shellfish resources in estuaries.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data

D.5.13. National Groundwater Resource Survey[242]

Sponsoring Agency and Office: Office of Land and Emergency Management

Authority: Crowdsourcing and Citizen Science Act, Other authority (Solid Waste Disposal Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: This project, currently in the planning phase, will crowdsource collections of hydrogeologic data (e.g., depth to groundwater and hydraulic conductivity) from across the United States and its territories. The aim is to improve characterization of the surficial groundwater resources that are at greatest potential risk from waste disposal on the ground surface. Data collection will involve both the collection of new field measurements and the identification and aggregation of existing data from a range of potential sources. EPA will provide a short and simple electronic survey form that allows volunteers to contribute data. EPA scientists will provide descriptions of the types of relevant data, how these data can be collected in the field (based on availability of equipment), quality assurance procedures that should be followed, instructions for reporting data, and details about how contributed data will (and will not) be used by the Agency.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Database development; Data entry or/and analysis; Contracted services; Other (Review of existing data sources to determine whether the necessary information is already available. Development of citizen science survey.)	Database development; Data entry or/and analysis; Contracted services; Other (Review of existing data sources to determine whether the necessary information is already available. Development of citizen science survey.)
FTEs	Less than 0.1	Less than 0.1
Funding Estimate	Less than $10,000 (estimated)	Less than $10,000 (estimated)

Goal Types: Education; Collection of data or observations

Justification for Using CCS: A crowdsourcing approach was selected for this project, based on prior EPA assessments of alternative ways to compile relevant data. EPA conducted an extensive review of existing hydrologic data from academic institutions, non-governmental organizations, and State and Federal agencies. Although some relevant data can be accessed in disparate databases and reports,

[242] There was no website provided for National Groundwater Resource Survey.

there are significant gaps in the types and coverage of these data. It would be extremely difficult and costly for EPA to aggregate these data.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: This project has not yet been opened for public participation. Activity in FY20 included development of the survey and associated documentation. Submittal of the Information Collection Request to OMB for review and approval will be submitted through EPA's Generic Clearance for Citizen Science and Crowdsourcing Projects.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: Following appropriate validation and peer review, the hydrogeologic data obtained through this effort will be used to update groundwater modeling.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data collection has not yet started for this project. All the compiled data will be made available through the EPA's webpage.

Product Description: The format of the survey is an Excel spreadsheet. The data that are aggregated from these surveys will be included, along with any data quality flags applied during Agency validation of the data, in a searchable database.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Following appropriate validation and peer review, the hydrogeologic data obtained through this effort will be used to update groundwater modeling. The primary goal of the project is to improve the spatial resolution of available hydrogeologic data, which will improve the precision of EPA groundwater pollution models where the collection of site-specific data is not feasible. However, both the models and the underlying data may have additional uses both within and outside of the Agency.

CCS Act Objectives: Collect and analyze data; Interpret the results of data

D.5.14. New England Stormwater Toolbox Equipment Loan Program[243]

Sponsoring Agency and Office: Region 1 - Boston

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Water Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: This equipment loan program, started about 10 years ago, provides tools that enable citizen scientist volunteers to conduct watershed monitoring. Polluted stormwater runoff in urbanized areas adversely impacts the Nation's waters, and poses a significant threat to public health. Common pollutants include pesticides, fertilizers, oils, road salt, litter, sediment, and bacteria. A major source of bacterial contamination comes from aging, leaking water infrastructure or illegal connections of human sanitary sewers to municipal separate storm sewer systems. The stormwater toolbox equipment loan program supports volunteer water quality monitoring groups. Data on stormwater collected by these organizations complements data from EPA's monitoring programs. The framework behind it, the EPA New England Bacterial Source Tracking Protocol, is a method used to investigate human sources of bacterial contamination in stormwater systems and receiving waters. In addition to water quality monitoring equipment, the loan program provides a consistent and quality-assured protocol for collection of high quality data. The data gathered by these citizen science groups is used to help EPA eliminate sanitary sewage from the stormwater system and upgrade stormwater infrastructure, thereby improving water quality in New England.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported

[243] There was no website provided for New England Stormwater Toolbox Equipment Loan Program.

Funding	FY19	FY20
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment	Purchase of consumable materials; Purchase or rental of equipment
FTEs	0.1	0.1
Funding Estimate	$1,500	$3,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: The New England Stormwater Toolbox Equipment Loan Program supports water quality monitoring by citizen science organizations and encourages community participation in activities that promote environmental awareness. Sampling surface waters for water quality analysis is expensive for State and local governments. Monitoring by citizen scientist volunteers presents a cost-effective alternative. The key is to ensure that the data abide by quality assurance and quality control levels acceptable under regulatory criteria. Using crowdsourcing and citizen science allows for testing of the quality and usability of the data, sampling efficiency, and sampling coverage.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Urban populations

Participation:

Activity Open Date: 04-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Salem, MA; Newport, RI; Groton, MA; Windam County, VT; Hampshire County, MA; Danbury, CT; Lawrence, MA; Waterford, CT

Location Type	Description
Virtual Activity	A virtual training on the use of the toolbox was provided to the participants, in lieu of in-person, hands-on training, to adhere to health and safety protocols.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: The data collected can be used in monitoring and enforcement programs that are required by Federal stormwater regulations. Data from this program also increase environmental awareness of participants on the impact of human contaminants in urban waters.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data availability will differ between each monitoring group's protocols/preferences. Many monitoring groups include a summary of data collected in an annual report and make the data available online. Data used by EPA for enforcement purposes may be confidential and therefore not publicly available.

Product Description: Data in an annual report may consist of maps displaying sample locations, photographs, descriptions of observations made in the field, and the results of any analytical or field tests performed, displayed in tabular form or other.

Partnerships: No partners were indicated.

Advancement of Agency Mission: One component of EPA's mission is to protect water quality. The Clean Water Act requires criteria and standards to be met to protect aquatic life and other water uses, such as swimming and fishing. Data about stormwater discharges, collected by volunteers in this project, will assist EPA in its efforts to eliminate contaminated sanitary sewage and upgrade stormwater infrastructure in communities across New England.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Interpret the results of data

D.5.15. New Test Method for Community Mapping of Radon in Puerto Rico[244]

Sponsoring Agency and Office: Region 2 - New York

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Air Act)

Status:

FY19: Launched

FY20: Ongoing

[244] There was no website provided for New Test Method for Community Mapping of Radon in Puerto Rico.

CCS Activity Summary: Data from the U.S. Geological Survey (USGS) suggest that some areas in Puerto Rico have the potential for high radon levels, which may pose health concerns. However, radon levels in Puerto Rico are not well characterized, which limits effective policies and programs to reduce risks. Additionally, typical radon testing technology (charcoal canisters or electric-powered devices) are impractical because of high humidity and electrical power uncertainties in Puerto Rico. The 2017 hurricanes (Irma and Maria) that devastated the island present an opportunity to improve radon mitigation strategies during renovation and rebuilding. This project will deploy new radon measurement devices that rapidly show results via integrated electronic readings. The project will engage communities and neighborhoods in radon surveys. Radon measurements will be carried out by community members who will receive citizen-level training. The project will increase radon monitoring capacity at the local level and inform planning decisions, including incorporation of radon-reducing features in building practices as part of the disaster recovery and rebuild effort. Monitoring radon in neighborhoods will provide actionable information to citizens and inform local and regional policy. The project is aligned with The Healthy Buildings Long-Term Recovery Initiative, which has developed strategic partnerships with universities, community organizations, PR Mayors Association, and the territorial agencies.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Contracted services; Federal employee travel; Training	Purchase or rental of equipment; Contracted services; Federal employee travel; Training
FTEs	0.1	0.1
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: This project combines citizen science, crowdsourcing, and advanced field monitoring technologies to better characterize radon risks in Puerto Rico. This approach combines data collection, public education, and engagement of experts and Puerto Rican institutions to better understand the extent of radon problems on the island. The neighborhood-oriented sampling strategy will engage local residents to test for radon in their homes. This project will demonstrate lower-cost monitoring equipment suitable for remote communities.

Participants:

Intended Participants: Undergraduate College/University/Technical students; Adults not affiliated with higher education

Underrepresented Groups: Hispanic or Latino populations

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 02-2020 - Student Team Lead Training on Radon measurement and Community Engagement

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	Not applicable

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Project is still in the planning phase, but possible multiple Puerto Rico municipalities locations: Arecibo, Camuy, Ciales, Hatillo, Lares, Morovis, San Sebastian

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: There are multiple uses of project data, including by communities in local decision making, and by universities and territorial agencies to identify geographic areas of concern. The partner organizations (University of Puerto Rico and Department of Health) may find unique ways to utilize the data to define hot spots in different communities, municipalities, or geographical areas. Community members who participate will learn about radon levels in their own homes and neighborhoods, which will allow them to understand risk and consider ways to lower their exposure to radon.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The data and learning will be available in multiple forms including summary reports, personal communications with communities and web links. The project dataset will also be available in ArcGIS and will be used to create a geospatial map of radon levels for the various communities being tested.

Product Description: Project is still ongoing and available product is not yet been created.

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists five major partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Puerto Rico Department of Health	State or Local Government	Personnel	train and empower community leaders	None reported	None reported
Puerto Rico Chamber of Commerce	Private Industry	Personnel	train and empower community leaders	None reported	None reported
Puerto Rico Planning Board	State or Local Government	Personnel	train and empower community leaders	None reported	None reported
University of Puerto Rico - Mayaguez	Academic Institution	Personnel; Space	train and empower community leaders	None reported	None reported
U.S. Green Building Council	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported	None reported	None reported

Advancement of Agency Mission: Radon is the number one cause of lung cancer among non-smokers, according to EPA estimates. Overall, radon is the second leading cause of lung cancer. Radon is responsible for about 21,000 lung cancer deaths every year. Despite the wealth of information available on radon, there is still little knowledge of its extent in Puerto Rico. This lack of information creates a barrier to successfully reducing the risk of radon exposure in the region. This citizen science and crowdsourcing project will focus on the seven municipalities with the highest geologic potential for radon.

CCS Act Objectives: Collect and analyze data; Interpret the results of data; Make discoveries

D.5.16. Smoke Sense[245]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Air Act)

[245] The website for Smoke Sense is accessible at https://www.epa.gov/air-research/smoke-sense-study-citizen-science-project-using-mobile-app.

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Smoke Sense is a U.S. EPA citizen science initiative that supports broad efforts to reduce the public health burden of wildfire smoke. Central to the project is the Smoke Sense mobile app, which is free and available on both Android and iOS devices. Since August 2017, when the project launched, over 40,000 individuals have downloaded the app and participated anonymously in the Smoke Sense project. The public can engage with the app through different modules. The app also provides an opportunity to collect information from participants about their experiences and perspectives on wildfire smoke. Through the Smoke Sense app, participants learn about and view maps of current and forecast air quality and smoke conditions, share their experiences with smoke and concurrent health symptoms, provide responses to interactive quizzes, and review guidance on reducing exposure to smoke. Participants also have access to weekly summary responses to experiences and health symptoms reported by all participants. In addition to summary responses available within the app, summary data is published on the public Smoke Sense Data Visualization Tool webpage. Through this online data visualization dashboard, a selection of Smoke Sense data is available for viewing and download in near real-time.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training
FTEs	2	2
Funding Estimate	$100,000	$100,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Citizen science and participatory research is the best way to reach individuals when and where hazardous conditions are likely to present, as well as when and where individuals need the health risk information the most. A citizen science approach also facilitates democratization of knowledge and engagement in ways that other research approaches cannot. The cost of a similar scientific study conducted using traditional methods would possibly be multiple millions of dollars.

Participants:

Intended Participants: Other (participation in Smoke Sense is open to anyone over the age of 18 in the United States.)

Underrepresented Groups: Other (Individuals affected by wildfire smoke and seeking information on what health protective actions they can take)

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: The project opened to the public for participation in 08-2017

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	20,000
FY20	20,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Smoke Sense does not focus on a particular location or region. Participation in Smoke Sense is open to anyone over the age of 18 in the United States.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: Smoke Sense data strengthen the two-way interaction and communication established with program partner organizations. Smoke Sense data and results will bring about public health improvements through actions by supporting partner agencies (e.g., State and local agencies) that are more closely connected with local communities. The program findings provide insights on the experiences and challenges of partner organizations and how we can better support them. From a scientific perspective, the interaction and communication structure developed within the Smoke Sense program improves how EPA productively helps the public respond to the complexities of wildfire smoke problems using feedback loops with partner agencies and community stakeholders.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The data are accessible through the Smoke Sense Data Visualization Tool online dashboard available at https://www.epa.gov/air-research/smoke-sense-data-visualizationtool. Data associated with peer-reviewed manuscripts are also available through Data.gov, a publicly available data repository.

Product Description: From the Data Visualization Tool webpage, data can be exported into MS Excel as nearly real-time data along with interpretations of summary data from the pilot season. Data used in peer-reviewed manuscripts are available through Data.gov, a publicly available data repository.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
NOAA	Federal Agency or Office	None reported	None reported	None reported	None reported
USFS	Federal Agency or Office	None reported	None reported	None reported	None reported

Advancement of Agency Mission: Improving communication about health risks associated with wildfire smoke supports EPA's mission and goals to protect public health. Wildfire smoke is a significant source of air pollution in the U.S. Among the pollutants found in smoke, fine particulate matter, and ozone are strongly linked to cardiovascular and respiratory health effects. According to the 2011 National Emissions Inventory, 40% of fine particulate matter and 31% of volatile organic compounds (which serve as precursors to ozone formation) result from fires. Current wildfire trends are expected to continue, including increased frequency and severity. Increase in large fire frequency means more smoke, and growing public concern regarding impacts on human health. As air pollution from anthropogenic sources continues to decline, the relative contribution of smoke is expected to increase.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

D.5.17. Streamflow Monitoring Using Computer Vision Machine Learning [246]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Clean Water Act)

Status:

FY19: Ongoing

[246] The website for Streamflow Monitoring Using Computer Vision Machine Learning (ORD w R5 and other regions, states and tribes) is accessible at http://fpe.ecosheds.org/.

FY20: Ongoing

CCS Activity Summary: This project will develop a lower-cost method to quantify stream flow that can be used by states, tribes, and other organizations. This approach can supplement the current approach to deployment of hydrological measurement equipment (stream gauges) that is costly and requires specialized expertise. This user-friendly alternative will use continuous photo imagery and machine learning to estimate flow monitoring. Water volume is a critical variable in maintaining both the health of aquatic and riparian biological communities and for human uses of water. However, in many parts of the country, flow regimes are changing due to anthropogenic changes and natural impacts. Therefore, many states, tribes, and other groups want to collect more hydrologic data, especially in small- to mid-size streams. In this proof-of-concept project, the website Flow Pictures Explorer is being expanded as a publicly available repository for photos and hydrographs. State and tribal partners are supplying thousands of continuous photos from game cameras together with hydrological data for multiple stream sites. The goal is to determine whether these images and graphs can be used together to understand how much the stream, including flow regime, changes over time. In the subsequent phase, computer vision machine learning will be tested as an approach to estimate flow from images, using the large number of images generated from partner organizations. By using continuous imagery of streams with novel machine learning, states, tribes, nonprofits/watershed associations, and other groups will gain a better understanding of altered hydrology. The resulting tools may also be used to develop an effort to protect aquatic life from the impacts of hydrological alterations.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services	Purchase or rental of equipment; Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services
FTEs	0.15	0.10
Funding Estimate	$19,000	$156,000

Goal Types: Collection of data or observations; Analyzing existing agency data; Create or engage a specific community; Other (Develop a low-cost and more user-friendly alternative to traditional methods of flow recording)

Justification for Using CCS: Crowdsourcing and citizen science is a cost effective way to gather the thousands of stream flow photos from game cameras around the United States. The USGS recently tested the capability of deep learning to identify flow from stream images and found the approach promising, but this initial effort was limited by the small number of available images. Thousands of photos are needed. Partner organizations and volunteers will deploy game cameras to take time-

lapse photos. Game cameras are inexpensive ($40-$200), easy to set up and deploy, and can be set up to take pictures on a fixed schedule (e.g., hourly).

Participants:

Intended Participants: Master/PhD students; Other (State and tribal agencies, nonprofits/watershed associations)

Underrepresented Groups: Indigenous populations

Emphasized Populations: Rural populations

Participation:

Activity Open Date: First round of data submission took place between 12-2019 and 07-2020; second round will occur when the online database is complete.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	15
FY20	17

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Round 1 data submitted from the following locations: Browns Brook, Raymond, NH Parkers Brook, Oakham, MA Peavine Creek, Pokagon Township, MI Additional locations to be added from EPA Regions 1, 2, 3, and 5 before completion of project.
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions or materials included images; Submissions included information on location or geospatial coordinates; Other (Participants submitted best practices to assist in project development)

Results: The results of this project will assist in the development and assessment of flow water quality criteria. The data can be used to identify sites that will need more continuous water monitoring, and

will increase water quality modeling capabilities. An added benefit will be enhanced communication on stream impacts to stakeholders. Hydrographs combined with time-lapse photos form a compelling story that will resonate with the public, connect them to streamflow restoration projects, and further their understanding of hydrology.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: When the project is completed, the database with hydrological data and images will be available to the public via an online website.

Product Description: Users can use the online database to select a site for viewing from a map or list. When a site is selected, users will see a time-sorted grid of the available pictures and a slide show of the images associated with the hydrograph.

Partnerships: The crowdsourcing or citizen science activity involved five partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Fond du Lac Band of Lake Superior Chippewa	Other (Tribal Government)	None reported	personnel for field work, data collection, and data quality assurance; input and examples of processes; equipment to collect data	None reported	None reported
Pokagon Band of Potawatomi	Other (Tribal Government)	None reported	personnel for field work, data collection, and data quality assurance; input and examples of processes; equipment to collect data	None reported	None reported
Massachusetts Department of Fish and Game	State or Local Government	None reported	personnel for field work, data collection, and data quality assurance; input and examples of processes; equipment to collect data	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Connecticut Department of Energy and Environmental Protection	State or Local Government	None reported	personnel for field work, data collection, and data quality assurance; input and examples of processes; equipment to collect data	None reported	None reported
Susquehanna River Basin Commission	State or Local Government	None reported	None reported	None reported	None reported

Advancement of Agency Mission: A primary EPA responsibility is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, the goal of the Federal Clean Water Act. The goal of this project is to develop a low-cost and more user-friendly alternative to traditional methods of recording stream flow. This will advance the development and assessment of flow water quality criteria that can be used to protect aquatic life from impacts of hydrological alterations.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries

D.5.18. Using Citizen Science to Improve Drinking Water Epidemiology Studies in Puerto Rico[247]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act, Other authority (Safe Drinking Water Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The goal of this project is to showcase an innovative, simple saliva test for gastrointestinal illness, which can improve the way epidemiology can incorporate citizen science. In this project, families with children can report incidences of gastrointestinal disease. These reports will facilitate follow-up stool and saliva tests in impacted school districts. The tests use salivary antibodies as a non-invasive indicator of waterborne infections. The project provides instructions on how to report incidences of gastrointestinal illness that are sent to homes with students. The incidence of reported illness can be linked to specific community water systems by using the sample results and information on noncompliance violations obtained from Puerto Rican environmental programs that

[247] There was no website provided for Using Citizen Science to Improve Drinking Water Epidemiology Studies in Puerto Rico.

administer the Federal Safe Drinking Water Act (SDWA). This project is designed to motivate members of the community (non-experts) to actively participate in targeted health studies with the goal of improving their health and increasing their understanding of water treatment.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Contracted services; Training	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Contracted services; Training
FTEs	Less than 1 FTE	Less than 1 FTE
Funding Estimate	$30,000	$16,000

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Citizens in Puerto Rico have a great interest in and can be positive contributors to environmental protection and improved health of their communities. This citizen science project builds on a long history of working with citizens, community groups, students, and volunteers in rural communities in Puerto Rico. The project allows community citizen scientists to be part of the scientific process that links their illnesses to pathogens in their drinking water systems. The public communication materials prepared in the project will help participants understand the reason for the study, the trigger points/timing for collection of stool and saliva samples, and the results of the tests. The project provides guidelines on quality assurance and quality control for dissemination to participants in the study.

Participants:

Intended Participants: Other (3rd to 5th grade students)

Underrepresented Groups: Hispanic or Latino populations

Emphasized Populations: Rural populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 08-2017

Anticipated End Date: 09-30-2021

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	200
FY20	200

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Patillas, Adjuntas San German and Yabucoa, Puerto Rico
Virtual Activity	Patillas, Adjuntas San German and Yabucoa, Puerto Rico

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates

Results: This citizen science project investigates the incidence and type of gastrointestinal illness using fecal and saliva tests in Puerto Rican communities that lack municipal drinking water treatment facilities. EPA research scientists will use saliva tests to assess the incidence of several bacterial and viral pathogens. Additionally, DNA extracted from stool samples will be used to determine the abundance of different bacterial groups, including fecal indicator bacteria, fecal source indicators, bacterial pathogens, and virulence factors. The information from this project will be used to identify the specific microorganisms that cause gastrointestinal illness, and also help evaluate the effectiveness of drinking water treatment systems.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: The data obtained during the study will be publicly available upon publication of a peer-reviewed journal article without personally identifiable information (PII) or sensitive personal information (SPI). Data will also be available in EPA Science Hub publication datasets.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Pegasus Technical Services, LLC	Private Industry	Personnel	Project Oversight	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
InterAmerican University	Academic Institution	Funding; Personnel; Space; Consumable resources	Project Implementation	None reported	None reported

Advancement of Agency Mission: A majority of Safe Drinking Water Act (SDWA) violations in Puerto Rico occur in small rural communities that are economically challenged. These communities cannot afford to provide basic filtration and disinfection treatment processes or pay operators to maintain community water systems. As a result, residents are vulnerable to acute illnesses caused by microbial and chemical contaminants. Often, episodes of diarrhea in isolated rural communities follow recurring patterns that become a way of life. One way to identify risk factors for disease is to conduct epidemiology studies that document illness rates, and at the same time, involve and educate members of the community in the process.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

D.5.19. Volunteer Monitoring Support for Macroinvertebrate Sampling to Fill Chesapeake Bay Program Data Gaps[248]

Sponsoring Agency and Office: Office of Research and Development

Authority: Crowdsourcing and Citizen Science Act; Other authority (Clean Water Act)

Status:

FY19: Launched

FY20: Ongoing

CCS Activity Summary: The Chesapeake Bay Program partnership has developed a Strategic Science and Research Framework to identify science needs of the partnership, help focus existing science resources, and leverage science and research providers to more effectively advance the partnership's goals. The Strategic Science and Research Framework identified benthic macroinvertebrate sampling in streams as an existing data gap for tracking progress towards toward stream health goals through the Stream Health Indicator. This project will leverage citizen science monitoring to fill benthic macroinvertebrate data gaps in the Chesapeake Bay watershed, which will improve the resolution and density of samples contributing to the Stream Health Indicator and will provide data to improve models that are currently used to fill data gaps. This project is a collaboration between EPA's Chesapeake Bay Program Office and Region 3 Field Services Branch, the Chesapeake Bay Program partnership, and the Chesapeake Monitoring Cooperative, which is a partnership of citizen science monitoring groups across the Chesapeake Bay region. EPA's Chesapeake Bay Program Office provides funding for general administration of the Chesapeake Monitoring Cooperative. The project partners

[248] There was no website provided for Volunteer Monitoring Support for Macroinvertebrate Sampling to Fill Chesapeake Bay Program Data Gaps.

are working together to develop standardized sampling protocols, map priority sampling areas, and identify interested volunteer citizen science groups. The Chesapeake Monitoring Cooperative will be providing protocols and trainings to citizen science groups to conduct monitoring, EPA Region 3's Field Services Branch will conduct taxonomic processing of the collected samples, and resulting data will be made publicly available through the Chesapeake Monitoring Cooperative's online Data Explorer, EPA's Water Quality Portal and the Chesapeake Bay Program's Water Quality Database, and will be used by the Chesapeake Bay Program in its Stream Health Indicator assessments.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Data entry or/and analysis; Training; Other (Coordination, methods development)	Purchase or rental of equipment; Contracted services; Training
FTEs	0.1	0.1
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: CCS provides a cost-effective way to expand monitoring efforts spatially and temporally, while producing data of known quality. By leveraging multiple citizen science groups through the Chesapeake Monitoring Cooperative, this project will result in more monitoring points than would be possible using other mechanisms. The project simultaneously increases engagement of citizens throughout the watershed, which is an additional goal of the Chesapeake Bay Program.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: No specific intended group

Participation:

Activity Open Date: Not yet open to the public

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	15
FY20	15

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Chesapeake Bay Watershed

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected

Results: This project will result in additional monitoring data points for benthic macroinvertebrates in freshwater streams throughout the Chesapeake Bay watershed. These data points will be utilized in calculating and assessing the Chesapeake Bay Program's Stream Health Indicator, which is a metric used by the partnership to track progress toward stream health goals. The data will also be used to calibrate and validate stream health models that are currently used to fill data gaps in between sampling locations. The additional data will improve the accuracy of the Stream Health Indicator assessment and the model. The data will also be made available and accessible online, and can be used by partners for generating watershed report cards or other outreach materials, or by Federal or State agencies in water quality assessments.

Data Availability: Yes, data and/or results have been or will be made publicly accessible

Data Access: Data will uploaded to publicly available online databases including:

Chesapeake Bay Program Water Quality Database:
https://www.chesapeakebay.net/what/downloads/cbp_water_quality_database_1984_present

EPA/USGS Water Quality Portal: https://www.waterqualitydata.us/

Chesapeake Monitoring Cooperative Data Explorer:
https://www.chesapeakemonitoringcoop.org/services/chesapeake-data-explorer/

Product Description: The data will be made available through online databases and will be downloadable in typical formats such as tabular or comma separated.

Partnerships: The crowdsourcing or citizen science activity involved four partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Alliance for the Chesapeake Bay	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Space; Online support	Coordination, methods development, training, outreach, data collection	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Izaak Walton League	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Space; Online support	Coordination, methods development, training, outreach, data collection	None reported	None reported
University of Maryland Center for Environmental Sciences	Academic Institution	Funding; Personnel; Space; Online support	Coordination, methods development, training, outreach, data collection	None reported	None reported
Alliance for Aquatic Resources Monitoring	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Space; Online support	Coordination, methods development, training, outreach, data collection	None reported	None reported

Advancement of Agency Mission: The Volunteer Monitoring Support for Macroinvertebrate Sampling to Fill Chesapeake Bay Program Data Gaps project will result in additional data points that can be used to assess stream health in the Chesapeake Bay watershed by EPA and its partners in the Chesapeake Bay Program. The ability to track and assess watershed and ecosystem health is essential to protecting and restoring the environment and its resources.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design

D.6. Department of Health and Human Services (HHS)

D.6.1. Epidemic Prediction Initiative[249]

Sponsoring Agency and Office: Centers for Disease Control and Prevention (CDC), National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) and the National Center for Immunization and Respiratory Diseases (NCIRD)

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Ongoing

[249] The website for Epidemic Prediction Initiative is accessible at https://predict.cdc.gov.

FY20: Ongoing

CCS Activity Summary: Timely interventions like vaccinations can prevent or control the adverse impacts of epidemics on human health. However, prediction of epidemics is extremely challenging. For example, the incidence of dengue, a vector-borne disease affecting approximately 100 million people per year, can increase three- to five-fold during an epidemic, yet no clear indicator of the intensity or timing of an epidemic exists until it is already underway. Influenza and other globally important diseases present similar challenges. Advances in forecasting for these diseases and others are continually occurring, yet research gaps limit forecasting model development, evaluation of forecasts, and adoption by decision makers. The Epidemic Prediction Initiative (EPI) aims to improve the science and usability of forecasts by addressing these challenges. Since January 2016, EPI has published influenza forecasts from participating teams in real-time on the EPI website. This was the first time that infectious disease forecasts from multiple groups were published jointly in real-time, facilitating forecast comparison and evaluation by public health officials. EPI also initiated and maintains an open online repository of code and data related to epidemics. This activity aims to reduce redundancy in data cleaning, standardize data formats, and support forecasting research. Finally, EPI has been engaging in outreach efforts within CDC, among other Federal government agencies, with State and international public health officials, and in the academic community to better understand how to improve forecast accuracy and how forecasts can be used in public health decision-making. The collaborative approach of EPI is the basis for COVID-19 forecasting in the United States, the largest scale real-time epidemic forecasting initiative to date.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services	Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services
Approximate FTEs	2	2
Approximate Funding	$400,000	$400,000

Goal Types: Create or engage a specific community

Justification for Using CCS: By hosting a CCS initiative, CDC was able to receive, combine, and evaluate infectious disease forecasts in real-time from multiple teams based on a variety of data sources and methodologies. These forecasts were submitted by teams that were affiliated with a diverse set of organizations including universities and private industry, and some of the teams had never produced an infectious disease forecast before participation in the CCS. The high number of forecasts received through this approach is in contrast to the number of forecasts that would have been received if a more traditional method of outside engagement available at CDC was utilized (e.g., traditional

contracts or grants). The CCS mechanism allowed CDC to establish the overall goal of accurate forecasts without specifying the forecasting methodologies and allowed CDC to evaluate forecasts for accuracy and quality.

Participants:

Intended Participants: Other (Scientific researchers)

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 09-2018

Anticipated End Date: Flusight projects ended in March 2020. The Aedes and West Nile projects are scheduled to end in December 2020. COVID-19 projects do not have an anticipated end date.

Activity End Date: None reported

Specific Dates for CCS Events: FluSight 2018-2019: September 2018; May 2019. FluSight Hospitalizations: November 2018; May 2019. Aedes 2019: February 2019; December 2019. FluSight 2019-2020: October 2020; March 2020. West Nile Virus 2020: April 2020; December 2020. Aedes 2020: April 2020; December 2020. COVID-19: April 2020; To be determined.

FY	Number of Individuals
FY19	150
FY20	500

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	These sites contain published forecasts for influenza, COVID-19, the presence or absence of Aedes sp., and West Nile Virus from participating teams and aggregated ensembles.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency.

Results: Because of EPI's CCS activity, CDC has received, aggregated, and evaluated forecasts from hundreds of models, providing a unique opportunity to evaluate forecast accuracy across different diseases, years, geographic locations, and methods. Results from these evaluations enable researchers to prioritize future inquiries and help decision makers better understand the strengths

and limitations of current forecasts in real-time. In addition, this activity has allowed CDC to aggregate multiple forecasts into a single ensemble forecast that has probabilistic predictions of key infectious disease metrics in the United States. Finally, this activity has provided experience in communicating and applying forecasts in real-world settings. For example, forecasts are communicated by CDC on a weekly basis for the COVID-19 pandemic (https://www.cdc.gov/coronavirus/2019-ncov/covid-data/mathematical-modeling.html), and this website has had millions of views since it went live. In addition, CDC discusses the forecasts with State and local public health officials and facilitates weekly call with EPI forecasting partners to discuss forecast results, utility, and methods.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://predict.cdc.gov/ https://www.cdc.gov/coronavirus/2019-ncov/covid-data/forecasting-us.html https://covid.cdc.gov/covid-data-tracker/#forecasting_weeklydeaths https://zoltardata.com/ .

Product Description: These sites contain published forecasts for influenza, COVID-19, the presence or absence of *Aedes* sp., and West Nile Virus from participating teams and aggregated ensembles.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists the partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Council of State and Territorial Epidemiologists	State or Local Government	None reported	None reported	$100,000	$100,000

Advancement of Agency Mission: CDC works 24/7 to protect America from health, safety and security threats. EPI's CCS activities have supported this mission by facilitating the development of multiple operational infectious disease forecasting systems for the United States. EPI has demonstrated that multiple infectious diseases can indeed be predicted, and it represents a unique network of researchers and public health officials, who work to provide real-time forecasts whose accuracy has been assessed and that public health officials can use. In addition, EPI has provided a forum to help public health officials across the country access, interpret, and communicate the results and for CDC to communicate the forecasts to the general public. Because of this work, infectious disease forecasts can now be used to more effectively plan for and prevent illnesses, hospitalizations, and deaths experienced during epidemics.

CCS Act Objectives: Solve problems

D.6.2. Lyme Innovation Accelerator (LymeX) [250]

Sponsoring Agency and Office: Department of Health and Human Services, Office of the Chief Technology Officer

Authority: Crowdsourcing and Citizen Science Act

[250] The website for LymeX is accessible at https://lymex.crowdicity.com/

Status:

FY19: No activity occurred during FY19

FY20: Launched

CCS Activity Summary: The U.S. Department of Health and Human Services (HHS) and the Steven & Alexandra Cohen Foundation announced a new $25 million-dollar, public-private partnership[251]— the LymeX Innovation Accelerator (LymeX).[252] This is the largest Lyme disease public-private partnership in history. LymeX will include patients in every step of its innovation process. One of the three main focus areas is stakeholder engagement to facilitate patient-centered innovations, using the Health+ model[253] with HHS. The community crowdsourcing platform, https://lymex.crowdicity.com, is an "open innovation" space for virtually crowdsourcing ideas, engaging with other individuals, and increasing the speed of innovation.

Budget and Resources: The following table indicates the budget and resources used to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	Not applicable
Agency Fund Use	Not applicable	Web portal or application development and support
FTEs	Not applicable	0.01 FTE
Funding Estimate	Not applicable	$173,500

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Our goal is to conduct Stakeholder engagement to facilitate patient-centered innovations, using the Health+ model with HHS. We plan to address Lyme and tick-borne disease through emerging technologies by coupling the power of the crowd and patient insights with data.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: None reported

Emphasized Populations: Rural populations; Urban populations

[251] https://www.hhs.gov/about/news/2020/10/10/hhs-steven-alexandra-cohen-foundation-announce-25-million-lymex-innovation-accelerator.html
[252] https://www.hhs.gov/cto/initiatives/innovation-and-partnerships/lyme-innovation/lymex/index.html
[253] https://www.hhs.gov/cto/initiatives/digital-services/health-plus/index.html

Participation:

Activity Open Date: 09-2020

Anticipated End Date: 09-30-2021

Activity End Date: Not Applicable

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	4

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	United States

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected

Results: The unique lived experiences gathered from the community will be used to create a Human-Centered Design report that includes patient archetypes (describing themes and challenges that intersect with Federal government levers of influence), journey maps (which visually illustrate the complex journeys of people involved at every step), and stakeholder-informed, prioritized opportunity areas.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://lymex.crowdicity.com

Product Description: Participants may engage in challenges on the crowdsourcing platform, such as voting on the core values that resonate most with them and the top ten Lyme disease research priorities.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Setting up the community advanced the mission to enhance the health and well-being of all Americans by listening and learning from their unique experience with Lyme disease as a patient, family member, leader, or caregiver.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Develop technologies and applications; Solve problems

D.6.3. Machine Learning to Code Work-Related Injury Narratives- 2020[254]

Sponsoring Agency and Office: Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH)

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Launched

FY20: Completed

CCS Activity Summary: The National Institute for Occupational Safety and Health (NIOSH) collects free-text injury narratives in a variety of data sources. These narratives, often composed by the injured worker themselves, describe the circumstances leading to a work-place injury. In order to create basic surveillance reports to aid future preventative strategies, these narratives need to be categorized into a standardized coding system that identifies the cause of the injury. Traditionally, this was done manually, however, recent efforts were made to automate this process. About eight years ago, NIOSH developed an auto-coder that read a narrative and assigned it to the appropriate causation category. It was estimated that this auto-coder was approximately 82% accurate. This auto-coder relieved the manual burden of reading thousands of claims and was often more consistent in its designations. The purpose of this project was to host a public competition to improve upon NIOSH's current algorithm. The competition was advertised through TopCoder to recruit participants. Making use of the public National Electronic Injury Surveillance System (NEISS) data source, 250,000 narratives were provided for participants to test various algorithms. Hundreds of competitors from all over the world submitted thousands of scripts, and all scripts were evaluated based upon their accuracy. The top five winning scripts were identified and were awarded prize money by TopCoder. The top five scripts are hosted on GitHub (github.com/NASA-Tournament-Lab/CDC-NLP-Occ-Injury-Coding) for the public to use. The winning script was approximately 90% accurate in identifying the causation category. This was a large improvement over NIOSH's previous solution. This 8% improvement results in thousands of additional narratives correctly categorized. In addition, the winning scripts are flexible and may be evaluated for other projects requiring narratives to be coded to other coding systems.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Contracted services; Federal employee travel	Contracted services; Federal employee travel
Approximate FTEs	0.1 FTE	0.1 FTE
Approximate Funding	$80,000	$10,000

[254] The website for Machine Learning to Code Work-Related Injury Narratives- 2020 is accessible at github.com/NASA-Tournament-Lab/CDC-NLP-Occ-Injury-Coding.

Goal Types: Analyzing existing agency data

Justification for Using CCS: By reaching out to the public, CDC was able to tap into the expertise from a variety of individuals with a variety of different backgrounds and insights. This was an efficient way to obtain and implement state of the art approaches in machine learning that are constantly evolving and being developed.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 10-17-2019

Anticipated End Date: None reported

Activity End Date: 11-24-2019

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	0
FY20	388

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	No region was targeted. The competition was open to the public.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency.

Results: NIOSH currently codes NEISS narratives to publish surveillance reports. The results of this competition will be used to automate this coding process. In addition, the Centers for Workers Compensation Studies (CWCS) collects and promotes the analysis of workers compensation claims that often contain a narrative describing the events leading to an injury. The results of this competition are being shared with owners of workers compensation databases to similarly code the causation of the work-place injuries described by the narratives found on their claims.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The code for the top five algorithms can be found at the following site: github.com/NASA-Tournament-Lab/CDC-NLP-Occ-Injury-Coding.

Product Description: The scripts/algorithms of the top five most accurate submissions are posted at the above site. In addition, a brief report, written by the winning participants, describing the algorithm and how to implement it are also attached.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Centers for Disease Control and Prevention	Federal Agency or Office	Funding; Personnel	Initiated idea. Supplied data, funding and planned competition	$80,000	$10,000
National Aeronautics and Space Administration	Federal Agency or Office	Personnel	Aided in planning.	$0	$0
Bureau of Labor Statistics	Federal Agency or Office	Personnel	technical consultant; aided in design and testing procedures	$0	$0

Advancement of Agency Mission: The results of this competition provided NIOSH a much-needed tool to aid in analyzing injury narratives that can be used to inform preventative strategies to protect and reduce workplace injuries.

CCS Act Objectives: Develop technologies and applications; Solve problems

D.6.4. The Opportunity Project (TOP) Health Tech Sprint - Lyme Disease[255]

Sponsoring Agency and Office: Department of Health and Human Services, Office of the Chief Technology Officer

[255] The website for TOP Health Tech Sprint is accessible at; https://public3.pagefreezer.com/browse/HHS.gov/01-01-2021T09:10/https://www.hhs.gov/cto/blog/2018/09/21/announcing-a-top-tech-sprint-for-health-innovation-join-us.html ; https://public3.pagefreezer.com/browse/HHS.gov/01-01-2021T09:10/https:/www.hhs.gov/cto/blog/2019/1/17/top-health-tech-sprint-unleashes-the-power-of-open-data-and-ai.html ; https://public3.pagefreezer.com/content/HHS.gov/01-01-2021T09:10/https://www.hhs.gov/sites/default/files/ai-and-open-data-innovation-infographic.pdf ;

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Completed

FY20: No activity occurred during FY20

CCS Activity Summary: The Opportunity Project (TOP) Health Tech Sprint took place between October 2018 and January 2019. The TOP Health Tech Sprint gave participants 14 weeks to tackle health-related challenges by applying curated Federal data sets and emerging technologies. This sprint pilot showcased how industry teams and innovators of all ages can create new digital tools and real-world value from Federal open data. TOP Health Challenge #2 asked, "How can we address Lyme and other tick-borne diseases through emerging technologies by coupling the power of the crowd and patient insights with data?" Teams created digital tools and information-sharing supports for data-driven public health decisions and improvements related to tick-borne disease. Lyme disease is a tick-borne bacterial infection that affects more than 300,000 patients annually in the United States - more Americans than HIV/AIDS and breast cancer combined. There is no vaccine and an estimated 10-20% of treated Lyme disease patients fail to recover fully. A comprehensive understanding of the full economic and societal cost remains unknown, yet emerging estimates indicate that Lyme disease costs the United States tens of billions of dollars each year. Domestically, it is the fastest-growing vector-borne disease today. In the last 20 years, the number of U.S. counties with Lyme disease has doubled and those considered "high incidence" for Lyme disease have increased by greater than 300% in the northeastern states and by approximately 250% in the north-central states. This growing problem takes a toll on individuals affected, their families, and Federal government programs.

Budget and Resources: The following table indicates the budget and resources used to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	Not applicable
Agency Fund Use	Publicity, advertising, outreach, or/and communications	Not applicable
FTEs	3	Not applicable
Funding Estimate	$100,000	Not applicable

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Address Lyme and other tick-borne diseases through emerging technologies by coupling the power of the crowd and patient insights with data)

Justification for Using CCS: The Office of the CTO led this 14-week tech sprint as part of its mission to provide leadership and direction for innovation and digital solutions across the Department of Health

https://digital.gov/2019/03/18/deep-dive-on-top-health-data-technology-innovation-for-lyme-disease/ ; https://tophealth.github.io

and Human Services (HHS). HHS CTO used the TOP methodology to connect tech teams with outside-the-box thinking and collaboration across silos for solutions.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retiree

Underrepresented Groups: None reported

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged groups or recognized low-income communities

Participation:

Activity Open Date: 09-2018

Anticipated End Date: Not Applicable

Activity End Date: 01-16-2019

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	11 teams
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	The outcomes from the TOP Health Tech Sprint teams were showcased at events in Washington, D.C.
Virtual Activity	Teams participated around the globe for the TOP Health Tech Sprint. The four teams involved in the Lyme Disease challenge participated remotely from Denver, CO; Columbus, OH; San Francisco Bay Area, CA; and New York, NY.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: Teams created digital tools and information-sharing supports for data-driven public health decisions and improvements related to tick-borne disease. Of the four teams that satisfied TOP Health

criteria and delivered digital tools for Lyme and tick-borne diseases, two teams were led by middle school students in STEM. These young innovators developed:

> **TickTracker App** (developed by the LivLyme Foundation in Denver, CO and Columbus, OH) is a free global app created by a 13-year-old girl who started the Lyme Foundation. This app can be downloaded for free on Android and Apple devices. It is a real-time geo-location based tool that shows the distribution of ticks with heat maps, data visualization, and disease prevention information to keep users safe from tick bites and tick-borne diseases. It also amalgamates data from the CDC, U.S. Department of Agriculture, the Smithsonian Institution, other Federal agencies, and non-government data. Visit: https://ticktracker.com
>
> **TickTickBoom! Game** (developed by the LivLyme Foundation in Denver, CO and Columbus, OH) is the first-ever gamification tool for middle school children to learn how to protect themselves from ticks that may spread diseases like Lyme disease. TickTockBOOM! is a free mobile app created by twin 11 year-olds that is an edutainment-based game targeted towards teaching our nation's youth about tick awareness and ultimately prevention. Visit: https://livlymefoundation.org/education

In addition to these K-12 STEM innovations, two adult-led teams participated in the TOP Health sprint for Lyme disease. The Clyme Health and Lyme Symptom Tracker apps both rest on Blue Button 2.0 standards for data interoperability and portability. These types of tools quantify symptoms and wellness over time, while empowering patients with easy access to their own health data. Patients then choose if and how to share their health data with practitioners, researchers, or third parties. These two teams were:

> **CURA Patient for Lyme Disease** (formerly the Clyme Health App developed by the California Center for Functional Medicine (CCFM) in Kensington, CA) helps doctors and patients identify and track symptoms from Lyme disease using both natural language processing (NLP) and AI-vision technology During the TOP Health sprint, CCFM finished the technical development for Clyme Health and linked it to electronic health records (EHRs) for patient and practitioner use. CURA Patient is being piloted at the U.S. Department of Veterans Affairs. Visit: http://curapatient.com
>
> **Lyme Symptom Tracker App** (developed by Global Lyme Alliance and TrialX in New York, NY) uses patient-centric data to help Lyme disease patients easily track their symptoms and share their data with their healthcare providers. The app (available for Android and Apple devices) also integrates with TrialX's iConnect platform to enable patients to find and connect with a clinical trial investigator near them. Visit: https://rb.gy/uy1yqd

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The results from the TOP Health Sprint for Lyme disease are summarized in the following online posts on:

- https://public3.pagefreezer.com/browse/HHS.gov/01-01-2021T09:10/https:/www.hhs.gov/cto/blog/2019/1/17/top-health-tech-sprint-unleashes-the-power-of-open-data-and-ai.html

- https://public3.pagefreezer.com/content/HHS.gov/01-01-2021T09:10/https://www.hhs.gov/sites/default/files/ai-and-open-data-innovation-infographic.pdf

- https://digital.gov/2019/03/18/deep-dive-on-top-health-data-technology-innovation-for-lyme-disease/

TickTracker App: https://ticktracker.com/#contact; https://www.youtube.com/watch?v=36sdFlR1F-s&t=7411s

TickTickBoom! Game: https://vimeo.com/336477737

CURA Patient for Lyme Disease: http://curapatient.com

Lyme Symptom Tracker App: https://rb.gy/uy1yqd

Product Description:

TickTracker App allows anyone to subscribe and integrate the TickTracker API to other websites or mobile applications that want to leverage the power of the Patent Pending tick severity index by contacting app@ticktracker.com. At the end of the TOP Health sprint, the TickTracker App went live with new data visualizations and heat maps to show the distributions of ticks and presented at the TOP Demo Day available on YouTube.

TickTickBoom! Game will soon be available for free to download on Android and Apple devices. This video promotes the TickTickBoom! game.

CURA Patient for Lyme Disease was inspired by NIH Patient-Reported Outcomes Measurement Information System (PROMIS) data. During the TOP Health sprint, CCFM finished the technical development for Clyme Health and linked it to electronic health records (EHRs) for patient and practitioner use. It leverages symptom tracking, wearable data, and easy access for patients to their own data with Blue Button 2.0 interoperability, and marries this with support and coaching to help patients navigate their chronic illness and path to recovery.

Lyme Symptom Tracker App integrates with TrialX's iConnect platform, which empowers people to find and connect with a clinical trial investigator or clinical trials near them. There is a critical need to take a patient-centric approach to gather population-level data in order to better understand the traits of Lyme disease. Such amassed patient data is important to share in an open environment that will give scientists and physicians a means to accelerate their research efforts and ultimately help patients.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
GSA	Federal Agency or Office	Personnel	Staffing, communications, planning, organization, program	$0	None reported

Advancement of Agency Mission: The challenge connected Federal datasets and data stewards with emerging technologies and ideas and from highly motivated, non-government innovators to solve real-world challenges. Each TOP Health team and its digital tool had to:

#1. Use government data by incorporating or referencing any one (or more) of the 300,000+ datasets and resources on Data.gov and HealthData.gov.

#2. Involve "users" by engaging with patients, practitioners, and/or other stakeholders in the creation of the digital tool (e.g., user-centered methodologies and iterations).

#3. Launch a new tool or add new features/functionality during the approximately 3-month duration of the TOP Health tech sprint.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

D.7. National Aeronautics and Space Administration (NASA)

D.7.1. Backyard Worlds: Planet 9[256]

Sponsoring Agency and Office: Science Mission Directorate

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Is there a large planet at the fringes of our solar system awaiting discovery, a world astronomers call Planet Nine? We're looking for this planet and for new brown dwarfs in the backyard of the solar system, using data from NASA's Wide-field Infrared Survey Explorer (WISE) mission. But we need your help! Finding these dim objects requires combing through the images by eye to distinguish moving celestial bodies from ghosts and other artifacts. There are too many images for us to search through by ourselves. So come join the search, and you might find a rogue world that's nearer to the Sun than Proxima Centauri - or even the elusive Planet Nine.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[256] The website for Backyard Worlds: Planet 9 is accessible at backyardworlds.org.

Funding Type	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Contracted services; Federal employee travel	Web portal or application development and support; Contracted services; Federal employee travel
Approximate FTEs	.2	.2
Approximate Funding	$150,000	$230,000

Goal Types: Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The Wide-field Infrared Survey Explorer (WISE) mission detected over 2 billion sources. The scientific community has been studying these by computer without help from volunteers for more than 10 years, but has missed many important discoveries in this vast data set.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 02-2016

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	60,000
FY20	62,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	The virtual activity is the online participation and classification by citizen scientists. There were no virtual events, just people analyzing data online.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency; Submissions or materials included images

Results: The project has published six refereed papers in scientific journals, and these papers have been cited 45 times. More than 20 citizen scientists are co-authors on these publications. These publications represent an improved understanding of the solar neighborhood, which has already been used to select targets for ongoing missions (Spitzer and Hubble) and which will be used to plan future missions.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.zooniverse.org/projects/marckuchner/backyard-worlds-planet-9/about/results.

Product Description: Scientific publications, press releases, and a blog.

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists five major partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Zooniverse	Nonprofit Organization (excluding Academic Institutions)	Online support	None reported	$80,000	$80,000
American Museum of Natural History	Nonprofit Organization (excluding Academic Institutions)	Personnel	scientific research and training of volunteers	$50,000	$50,000
NOIRLab	Nonprofit Organization (excluding Academic Institutions)	Personnel	scientific research and training of volunteers	$50,000	$50,000

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Arizona State University	Academic Institution	None reported	scientific research and training of volunteers	$50,000	$50,000
U.C. San Diego	Academic Institution	None reported	scientific research and training of volunteers	$50,000	$50,000

Advancement of Agency Mission: The project amplifies the science return from NASA's Wide-field Infrared Survey Explorer (WISE) mission. Furthermore, it supports the Science Mission Directorate's goal of "building a scientifically literate nation" (Science Policy Document SPD-33).

CCS Act Objectives: Enable the formulation of research questions; Interpret the results of data; Make discoveries

D.7.2. Disk Detective[257]

Sponsoring Agency and Office: Science Mission Directorate

Authority: Crowdsourcing and Citizen Science Act, 51 U.S.C. § 20112(a)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: NASA's Wide Field Infrared Explorer Survey (WISE) mission is surveying the whole sky at infrared wavelengths. At Disk Detective, you'll examine data from WISE and other surveys to search for dusty debris disks, similar to our asteroid belt, as well as gas-rich primordial disks, the birthplaces of planets.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Contracted services	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Contracted services

[257] The website for Disk Detective is accessible at diskdetective.org.

Funding Type	FY19	FY20
Approximate FTEs	None reported	None reported
Approximate Funding	$130,000	$140,000

Goal Types: Analyzing existing agency data; Create or engage a specific community

Justification for Using CCS: The project involved researching hundreds of thousands of stars using a variety of methods, from simple visual inspection to assembling information from catalogs to reading the professional literature. This work requires a much larger team than conventional mechanisms, such as research grants, can generally muster.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 01-2014

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	12,000
FY20	12,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	The virtual activity is the online participation of citizen scientists. There were no virtual event, just people analyzing data online.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency; Other (Participants translated the project into multiple languages, researched stars using the professional scientific literature, participated in observing runs, and defined their own research problems)

Results: Disk Detective results are available to the public in the Barbara A. Mikulski Archive for Space Telescopes (https://mast.stsci.edu/) and in the scientific literature. There, they can be harnessed for further scientific investigations by partners and other Federal agencies. For example, the "Peter Pan" disks discovered by Disk Detective became the subject of this theoretical investigation by astrophysicists at Queen Mary University of London: https://academic.oup.com/mnrasl/article/496/1/L111/5854923

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://mast.stsci.edu/.

Product Description: Disk Detective results are available to the public in the Barbara A. Mikulski Archive for Space Telescopes (https://mast.stsci.edu/) and in the scientific literature. Information on the public database can be found at https://blog.diskdetective.org/2019/09/09/the-diskdetective-database/

Partnerships: The crowdsourcing or citizen science activity involved 4 partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
MIT	Academic Institution	Personnel	scientific leadership	$40,000	$45,000
University of Oklahoma	Academic Institution	Personnel	scientific leadership	$5,000	$5,000
Space Telescope Science Institute	Nonprofit Organization (excluding Academic Institutions)	Personnel	scientific leadership and MAST data archive	$5,000	$5,000
Zooniverse	Nonprofit Organization (excluding Academic Institutions)	Online support	None reported	$30,000	$30,000

Advancement of Agency Mission: Disk Detective works to maximize the science output of NASA's WISE mission, and progress toward NASA's goal to "discover and study planets around other stars."

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

D.7.3. Feature Hunter[258]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate

Authority: Crowdsourcing and Citizen Science Act, Other authority (51 U.S.C. 20112a)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Earth Science and Remote Sensing Unit at NASA's Johnson Space Center maintains an enormous collection of over four million astronaut photographs of Earth, spanning manned spaceflight from the Mercury missions to today's ISS missions. These photos can be vital to researchers across many fields, but many are inaccessible because they lack labels for common features like islands, volcanoes, and rivers. Feature Hunter is the first step toward the creation of a machine learning model aimed at labeling previously uncategorized Astronaut Photography with geographic features. Machine learning requires large sets of training data to produce accurate results. Feature Hunter users will help develop this training data by viewing images, determining whether or not a feature or features are present, and identifying features by placing bounding boxes around them. Then, experts in the Earth Science and Remote Sensing Unit will use this data to develop and deploy a machine learning model to add feature-level metadata to the entire astronaut photography database.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis
Approximate FTEs	None reported	None reported
Approximate Funding	$18,000	$4,500

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement

[258] The website for Feature Hunter is accessible at https://eol.jsc.nasa.gov/BeyondThePhotography/FeatureHunter/.

Justification for Using CCS: Labeling is a quick and distributed task that lends itself to multiple virtual volunteers. Additionally, past and ongoing success with CCS projects (Image Detective) and continued public interest in astronaut photography provides evidence that we have an audience that would be interested in labeling these photos. The large potential audience and ease in teaching accurate labeling combine to make CCS the most suitable mechanism for the goal of labeling photos. CCS also has educational and outreach benefits, since users are exposed to astronaut photos and the geographic terms of interest. It gives users an intimate connection with NASA's science and the astronauts that took the photos. This project also introduces key concepts in machine learning, like the training set.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 07-2019

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	41
FY20	232

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Feature Hunter does not target a particular location or region and is open to anyone with internet access.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates

Results: The results from Feature Hunter, which are comprised of bounding box coordinates and associated labels, will be used to add metadata to the Gateway to Astronaut Photography of Earth

database for the images analyzed in the project. Additionally, Feature Hunter results will be used as training data for a machine learning model designed to generalize feature identification to the rest of the database. The results from Feature Hunter will directly influence the accuracy and power of a model that will prescribe features to all of the additional imagery that has not yet been processed by Feature Hunter participants. This metadata, both from Feature Hunter initial results and the machine learning results, will be added to the publicly available Gateway to Astronaut Photography of Earth database, where it can be used for downstream applications in science and education by other database users.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: On a corresponding photo page in the database, hosted at https://eo-web.jsc.nasa.gov/, each photo that was processed in Feature Hunter will have a feature with the label given by the participants. Photos will also be searchable by label.

Product Description: Each astronaut photograph is available to view and download on its own page (https://eol.jsc.nasa.gov/), and each photo is displayed with corresponding image and camera metadata. Feature Hunter outputs provide geographic features as image metadata.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Astronaut photography of Earth has been collected by every crewed mission since the Mercury Program and as such represents the longest continuously collected orbital image record of changes to the Earth's surface. That dataset supports a wide range of geologic, oceanographic, and climate research. As the images are acquired by human beings using visible-wavelength (true-color) cameras rather than robotic sensors, the public has an intuitive connection to the images that strengthens and aids in image interpretation, two factors that make the dataset powerful for educational applications. Feature Hunter furthers the NASA mission by increasing the available metadata and searchability in the Gateway to Astronaut Photography of Earth database. This increased availability will make the database more accessible to researchers, educators, and the general public.

CCS Act Objectives: Collect and analyze data; Interpret the results of data

D.7.4. Image Detective[259]

Sponsoring Agency and Office: Human Exploration and Operations Mission Directorate

Authority: Crowdsourcing and Citizen Science Act, Other authority (51 U.S.C. 20112a)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Image Detective allows citizen scientists to view the world from an astronaut's perspective. Participants are shown astronaut photography of Earth and asked to geolocate the photo

[259] The website for Image Detective is accessible at https://eol.jsc.nasa.gov/BeyondThePhotography/ImageDetective.

and provide additional information about what they can see in it (also known as metadata). This analysis allows users to better familiarize themselves with the physiographic diversity and current geopolitical landscape of the Earth, and gives users a unique perspective from which to analyze the mountains, rivers, and cities commonly found in astronaut photography. The metadata and geolocations from users are input into the NASA-hosted Gateway to Astronaut Photography of Earth database, where they improve searchability for interested scientists, educators, and members of the general public.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Data entry or/and analysis	Web portal or application development and support; Data entry or/and analysis
Approximate FTEs	None reported	None reported
Approximate Funding	$9,000	$9,000

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement

Justification for Using CCS: There are many benefits of astronaut photography of Earth to long-term change studies, but the limitations of the dataset have restricted its application and recognition among the remote sensing community as useful data. Grant funding did not represent a viable approach for development or long-term support of Image Detective, but CCS has provided a way to amend some of the inherent limitations in the dataset, while simultaneously providing a method for a large volume of distributed contributions. Additionally, the public has displayed an interest in interacting with astronaut photos. As many of the components of Image Detective were already in place as part of internal cataloging, database, and website tools, and our team includes software and web design skillsets, it was deemed appropriate to develop a CCS interface as part of our ongoing funded activities to curate the database of astronaut photography.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 02-2013

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	70
FY20	77

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: The primary use of Image Detective results is to reduce the backlog of uncatalogued astronaut photography of Earth. Additional uses for classified images include uses as criteria to add images to specific collections in our database (collections of images all displaying volcanoes/cities/etc.), in allied education and outreach programs, as input data for machine learning models to classify more imagery, and for downstream applications in scientific and educational projects conducted by other database users.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Once an image has been processed, its corresponding page at https://eol.jsc.nasa.gov/ is updated to include the coordinates and metadata gathered from the citizen scientists.

Product Description: Each astronaut photograph is available to view and download on its own page (https://eol.jsc.nasa.gov/), and each photo is displayed with corresponding image and camera metadata. Image Detective outputs provide image metadata including center point, cloud percentage, and features.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Astronaut photography of Earth has been collected by every crewed mission since the Mercury Program and as such represents the longest continuously collected orbital image record of changes to the Earth's surface supporting a wide range of geologic, oceanographic, and climate research. As the images are acquired by human beings using visible-wavelength (true-color) cameras rather than robotic sensors, the public has an intuitive connection to the images that strengthens interest and aids in image interpretation, two factors that make the dataset powerful for educational applications. Image Detective furthers the NASA mission by making more of the astronaut photography dataset accessible and searchable by scientists, educators, and the general public,

improving knowledge of our home planet and forging direct and personal connections with NASA science and spaceflight.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data

D.7.5. Landslide Reporter[260]

Sponsoring Agency and Office: Science Mission Directorate

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Landslide Viewer is a web portal to open global landslide data from NASA, citizen scientists, and other resources.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support	Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support
Approximate FTEs	.01	0
Approximate Funding	$20,000	$0

Goal Types: Collection of data or observations

Justification for Using CCS: Although landslides occur frequently, most go unreported by newspapers or are lumped in with other natural hazards. Data from citizen scientists can fill in gaps in media reporting and disaster databases by amassing information from many different sources: local firsthand accounts, reports in non-English languages, and points from other inventories. Citizen scientists also have a better understanding of their local region, which may improve the accuracy of the landslide report. Citizen science also expands the number of persons who can catalog landslides, leading to a more up-to-date inventory and less reliance on the availability of the landslides team.

[260] The website for Landslide Reporter is accessible at http://landslides.nasa.gov/viewer.

Lastly, a citizen-aided effort creates more awareness and education about landslides as a natural process and natural/man-made hazard.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 03-22-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	17
FY20	11

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Landslide Reporter pertains to all the Earth's land mass, but not the oceans.

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates; Other (Participants submitted information from news media)

Results: None reported

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Information on landslides reported by citizen scientists can be viewed through a GIS portal at http://landslides.nasa.gov/viewer, and the data can accessed via API or downloaded. Other datasets, such as the Global Landslide Catalog, can also be viewed and obtained at this portal.

Product Description: The Cooperative Open Online Landslide Repository (COOLR) contains data from Landslide Reporter, as well as other landslide inventories produced by NASA and other research groups. The locations of landslides are given as either points or polygons, and an estimate of the spatial uncertainty is given for each reported landslide. Dates and times of occurrence are given when

known. Other features of landslides, such as setting and proximate cause, are also provided. The data is provided through an ESRI REST API, as well as in downloadable tables in .csv format, as shapefiles, and as a geodatabase.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Landslide Reporter advances NASA's mission to better understand the Earth by expanding a global open landslide catalog. Landslide Reporter also directly aids NASA's response to the 2017-2027 Decadal Survey for Earth Science and Applications from Space, which prioritizes the forecasting and monitoring of landslides, especially those near population centers. Landslide Reporter fulfills NASA's objective to inspire and engage the public in science by involving the public in NASA's scientific research. In addition to learning about individual landslides, the public learns about landslide hazards and processes. Citizen scientists can use data from Landslide Reporter to conduct investigations. Furthermore, Landslide Reporter supports applications of the Global Precipitation Measurement (GPM) mission, such as NASA's Landslide Hazard Assessment for Situational Awareness model.

CCS Act Objectives: Collect and analyze data

D.7.6. NASA AI4Mars[261]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Crowdsourcing and Citizen Science Act

Status:

FY19: No activity occurred during FY19

FY20: Launched

CCS Activity Summary: You can help NASA explore Mars from home! By participating in the "AI4Mars" challenge you will teach future Mars rovers how to identify terrain types, such as sand, rock, and soil. Through a web-based tool, you will annotate images taken by the Curiosity, Spirit, and Opportunity rovers, which will be used to train a machine learning algorithm to identify and avoid potentially hazardous terrains. The resulting algorithm would be used in the ground operation system of the Mars Science Laboratory and Mars 2020 missions, as well as in future self-driving software on the rover!

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Software development; Data entry or/and analysis; Training

[261] The website for NASA AI4Mars is accessible at https://www.zooniverse.org/projects/hiro-ono/ai4mars.

Funding	FY19	FY20
FTEs	None reported	0.3
Funding Estimate	None reported	$80,000

Goal Types: Analyzing existing agency data; Public outreach or engagement

Justification for Using CCS: Training a deep learning model typically requires a few hundred thousand of labels. Creating such a dataset in-house is laborious and costly. Since deep learning can learn from noisy data, CCS perfectly meets our need.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 06-2020

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	10,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Participants submitted data or observations they collected online and recognition milestones acknowledged on @NASASolve Twitter account.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Other (Machine learning models trained by the data submitted by participants)

Results: As of 09-10-2020, we received 278,000 labels. The accuracy in terrain classification improved from 41% to 91% by using the data from AI4Mars

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.zooniverse.org/projects/hiro-ono/ai4mars/collections.

Product Description: Original images and labels, provided as image files; in addition, the dataset is provided in a format compatible with Keras for easy integration with deep learning

Partnerships: The crowdsourcing or citizen science activity involved no partners. *Advancement of Agency Mission:* The machine learning model trained by the labeled dataset collected through AI4Mars will be used as a terrain classifier for the ground system of Mars Science Laboratory and Mars 2020 Missions to support the ground operation. The algorithm could potentially be deployed on-board for enhancing the safety of rovers in the future.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Develop technologies and applications; Solve problems

D.7.7. NeMO-Net[262]

Sponsoring Agency and Office: Science Mission Directorate

Authority: Crowdsourcing and Citizen Science Act, Other authority (NASA Earth Science Technology Office Advanced Information Systems Program)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: NeMO-Net is a convolutional neural network (CNN) designed for marine ecosystem classification. The CNN takes as input 2D satellite and drone images as well as 3D reconstructions of underwater environments and generates classification maps for those environments as output. These classification maps can be used to better understand and protect coral reefs globally. One component of NeMO-Net is a citizen science game for mobile devices and personal computers. Through playing this game, players help NASA classify coral reefs and other aquatic ecosystems by painting on 2D and 3D images of coral. Players can rate the classifications of other players and level up in the food chain as they explore and classify coral reefs, other shallow marine environments, and creatures from locations all over the world. The application educates

[262] The website for NemoNet is accessible at http://nemonet.info. Information on intended participants was revised for accuracy after the submission deadline for this report; therefore, this information was not included in any related analyses in the report.

players on how to identify the different types of coral and player classifications are used to train the CNN to classify aquatic ecosystems autonomously.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Web portal or application development and support; Database development; Software development; Data entry or/and analysis	Purchase or rental of equipment; Web portal or application development and support; Database development; Software development; Data entry or/and analysis
Approximate FTEs	None reported	None reported
Approximate Funding	$521,493	$61,000

Goal Types: Education; Digitization of agency-owned materials; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Citizen science and crowdsourcing provide a practical and efficient means to help NASA classify coral reefs by painting 3D and 2D images of coral. This project engages participants as a way for them to learn more about coral reefs and other shallow marine environments and creatures from locations all over the world. Data from the NeMO-Net game is then fed to NASA NeMO-Net, the first neural multi-modal observation and training network for global coral reef assessment. NeMO-Net is an open-source deep convolutional neural network (CNN) that leverages NASA's Supercomputer, Pleiades, to use game data to classify and assess the health of coral reefs around the world. NeMO-Net exploits active learning and data fusion of mm-scale, remotely sensed 3D images of coral reefs captured using fluid lensing with the NASA FluidCam instrument, presently the highest-resolution remote sensing benthic imaging technology capable of removing ocean wave distortion. These data are used to train low resolution data from NASA's Earth Observing System, including hyperspectral airborne remote sensing data and satellite data to determine coral reef ecosystem makeup globally at unprecedented spatial and temporal scales.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees; Other (scientists, biologists, citizen scientists)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls; Other (Pacific Islanders)

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 04-22-2020

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	1,000
FY20	70,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Continental United States, Guam, Puerto Rico, Hawaii, world

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants processed data or other materials provided by the agency

Results: Data from the NeMO-Net game is fed to NASA NeMO-Net, the first neural multi-modal observation and training network for global coral reef assessment. NeMO-Net is an open-source deep convolutional neural network (CNN) that leverages NASA's Supercomputer, Pleiades, to use game data to classify and assess the health of coral reefs around the world. NeMO-Net exploits active learning and data fusion of mm-scale, remotely sensed 3D images of coral reefs captured using fluid lensing with the NASA FluidCam instrument, presently the highest resolution remote sensing benthic imaging technology capable of removing ocean wave distortion. These data are used to train low resolution data from NASA's Earth Observing System, including hyperspectral airborne remote sensing data and satellite data to determine coral reef ecosystem makeup globally at unprecedented spatial and temporal scales.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: http://nemonet.info

Product Description: NeMO-Net generates semantic segmentation habitat maps from 3D and 2D remote sensing imagery in 3D and 2D file formats.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Aquatic ecosystems, particularly coral reefs, remain quantitatively misrepresented by low-resolution remote sensing as a result of refractive distortion from ocean waves, optical attenuation, and remoteness. Machine learning classification of coral reefs using NASA FluidCam mm-scale 3D data show that present satellite and airborne remote sensing techniques poorly characterize coral reef percent living cover, morphology type, and species breakdown at the millimeter, centimeter, and meter scales.

CCS Act Objectives: Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

Appendix E.Crowdsourcing and Citizen Science under Other Authorities

This Appendix provides summaries of select crowdsourcing and citizen science activities voluntarily submitted by agencies that were conducted in FY19 and FY20 under authorities other than that provided by the Crowdsourcing and Citizen Science Act. Agency reporting on crowdsourcing and citizen science activities under other authorities was optional, and therefore the activities presented here are representative rather than comprehensive. Please note that funding estimates in funding tables do not include FTEs.

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E.1. Department of Agriculture (USDA)

E.1.1. Biochar Soil Aging[263]

Sponsoring Agency and Office: Research, Education, and Economics

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Ongoing

FY20: Completed

CCS Activity Summary: This global citizen science effort was aimed at having volunteers bury biochar samples in their local soil for a period of 3 to 6 months, and then retrieve these samples and return them to the USDA-ARS for analysis. This project was unique in that it provided the opportunity to age the same biochar in various soils across the globe, which would not have been possible through normal research collaborations or projects.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	None reported
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: This mechanism was the easiest way to achieve the global distribution of the samples into the various soil types.

[263] The website for Biochar Soil Aging is accessible at https://scistarter.org/biochar-soil-aging.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: The project was initiated in March 2018, but difficulty was encountered recruiting volunteers until the project was posted to the SciStarter website that is partially supported through NSF.

Anticipated End Date: None reported

Activity End Date: 04-01-2020

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	12
FY20	2

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	There were participants from Spain, Italy, Germany, Austria, South Korea, Brazil, and the U.S. states of Kansas, Wisconsin, Missouri, Texas, California, Minnesota, Illinois, Idaho, South Carolina, Florida, and Alabama.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants processed data or other materials provided by the agency

Results: We are currently still analyzing these samples and the results will be available for researchers and policy makers for guiding the application of biochar to soils.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: We will be providing a new website within the USDA-ARS St. Paul location site by summer 2021.

Product Description: The data will include chemical alteration of the biochar, changes in agrochemical sorption, and greenhouse gas production potentials.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This project allowed for the collection of a unique experimental data set that involved the aging of the same biochar across various soil types and climates to examine the effect of these environmental variables on the aging processes occurring to biochar in the soil environment.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments

E.1.2. Collaborative Adaptive Rangeland Management (CARM)[264]

Sponsoring Agency and Office: Research, Education, and Economics

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The overarching goal of this study is to examine how science can be conducted in a real-world manner (i.e., at ranch-level scales with manager involvement) to evaluate the effectiveness of adaptive grazing management for both production and conservation goals. In particular, we seek to examine how grazing management can be implemented in a manner that responds to current and changing rangeland conditions, incorporates experiential learning, and makes decisions based on quantitative, repeatable measurements collected at multiple spatial and temporal scales. To this end, ARS scientists and university collaborators have developed an adaptive grazing management experiment being implemented at the Central Plains Experimental Range in northeastern Colorado. A Stakeholder Group of 11 individuals was selected to represent ranchers, public land managers, conservation organizations, and nongovernmental organizations. This Stakeholder Group met in September of 2012 and January and September of 2013 to 1) choose and prioritize outcomes desired from this experiment, 2) determine criteria and/or triggers for movement of livestock among pastures in an adaptive manner, and 3) select appropriate monitoring data requirements needed for feedback to determine if management is achieving desired outcomes. The Collaborative Adaptive Rangeland Management (CARM) experiment was implemented in 2014 and continues to run as part of the ARS Long-term agroecosystem research network.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported

[264] The website for Collaborative Adaptive Rangeland Management (CARM) is accessible at https://www.ars.usda.gov/plains-area/fort-collins-co/center-for-agricultural-resources-research/rangeland-resources-systems-research/docs/range/adaptive-grazing-management/research/.

Funding	FY19	FY20
Agency Fund Use	None reported: no agency funds or other non-employee resources were used	None reported: no agency funds or other non-employee resources were used
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The intent of this project was to be participatory and co-produce knowledge and information that could achieve the desired goals.

Participants:

Intended Participants: Other (ranchers, non-government conservation organizations, state and Federal land managers)

Underrepresented Groups: Women and girls

Emphasized Populations: Rural populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 01-2012

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	11
FY20	11

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	USDA-ARS Central Plains Experimental Range, Nunn, Colorado, USA
Virtual Activity	USDA-ARS Central Plains Experimental Range, Nunn, Colorado, USA

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency

Results: The names of the individuals involved in the project have been included on scientific papers, scientific and extension presentations, videos, and other outreach materials associated with this project.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data are discoverable to research communities and the public through the Ag Data Commons, a digital repository hosted by National Agricultural Library.

Product Description: Data on livestock weight gains, vegetation production/height/structure, and data on grassland birds

Partnerships: The crowdsourcing or citizen science activity involved eleven partners, listed in the following table.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
State Land Board - Colorado	State or Local Government	Personnel	Tour to a State Lands location, input on management practices employed	None reported	None reported
Crow Valley Livestock Cooperatives, Inc.	Private Industry	Personnel	Cattle to conduct research, tours of local ranches, input on management practices employed	None reported	None reported
USDA Forest Service	Federal Agency or Office	Personnel	Input on management practices employed, information on primary questions to be addressed, monitoring methodology	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Environmental Defense Fund	Nonprofit Organization (excluding Academic Institutions)	Personnel	Expertise in human dimensions, information on conservation program implementation and practices employed	None reported	None reported
The Nature Conservancy	Nonprofit Organization (excluding Academic Institutions)	Personnel	Monitoring methodology, tour to owned and managed properties	None reported	None reported
USDA Natural Resources Conservation Service (NRCS)	Federal Agency or Office	Personnel	Stakeholder representative	$20,000	$20,000
Rocky Mountain Bird Observatory	Nonprofit Organization (excluding Academic Institutions)	Personnel	Stakeholder representative	$15,000	$15,000
Colorado State University	Academic Institution	Personnel	Stakeholder representative	$10,000	$10,000
Colorado State Lands	State or Local Government	Personnel	Stakeholder representative	$10,000	$10,000
University of Wyoming	Academic Institution	Personnel	Scientific collaborator	$20,000	$20,000
USDA Northern Plains Climate Hub	Federal Agency or Office	Personnel	Scientific partner; outreach	$10,000	$10,000

Advancement of Agency Mission: This project advances the ARS mission of conducting research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to enhance the natural resource base and the environment. This project addresses the confluence of production and conservation issues in native grasslands that are providing a suite of ecosystem goods and services to the public, as well as enhancing rural sustainability of small communities in highly rural areas.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.1.3. Farmlab[265]

Sponsoring Agency and Office: Research, Education, and Economics

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: FarmLab is a farm-scale research platform for exploring systems-level questions about agricultural sustainability. The mission of FarmLab is to develop an integrated, whole-farm management and research program that facilitates long-term, quantitative exploration of the agricultural production and other ecosystem services trade-offs associated with land cover and land management practices.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported: no agency funds or other non-employee resources were used	None reported: no agency funds or other non-employee resources were used
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: FarmLab is intended to be a working farm laboratory, and as such, we feel it is important that farmers are directly engaged in the development and refinement of research questions. FarmLab is informed by the communities of practice concept that groups of people who share a concern for what they do will learn how to do it better as they interact regularly. We want to be sure that FarmLab is responsive to the lived experience of farmers, and particularly dairy producers, as they work to achieve economic and environmental sustainability.

[265] There was no website provided for Farmlab.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: The initial meetings to establish the FarmLab mission and vision, which included members of the public with agricultural and conservation expertise, were organized in FY2017.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	30
FY20	None reported (FY20 interruped by COVID-19)

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	FarmLab activities take place at the Prairie du Sac Agricultural Research Station in Prairie du Sac, WI (Sauk County). Some planning meetings take place at our main administrative offices on the west side of the University of Wisconsin-Madison campus in Madison, WI.

Consent: Participation was voluntary; consent was implicit

Submission Types: Not applicable

Results: FarmLab research will be used to inform our understanding of the leverage points that exist within integrated dairy crop systems (and other agricultural systems) for improving both environmental and economic performance. This science can inform potential market and policy opportunities that will improve the resilience of farming systems.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data collection as a part of the citizen science component have not yet been collected. We are still determining a format for accessibility.

Product Description: Still in development.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
University of Wisconsin - Madison	Academic Institution	Personnel	Research/technical support	None reported	None reported
The Savanna Institute	Nonprofit Organization (excluding Academic Institutions)	Personnel	Communications and grant-writing support; field	None reported	None reported
Sauk Soil and Water Improvement Group (partnership in development)	Other	None reported	None reported	None reported	None reported

Advancement of Agency Mission: FarmLab has and will advance the agency's mission by informing our understanding of potential or realized ecosystem services (including crop production) that can be achieved in farming systems through strategic investigation of the impacts of land cover decisions and farm management practices. FarmLab research is designed to inform models that are relevant beyond the regional context of the Prairie du Sac agricultural research station.

CCS Act Objectives: Enable the formulation of research questions; Solve problems

E.1.4. Invasive Mosquito Project[266]

Sponsoring Agency and Office: Research, Education, and Economics

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Invasive Mosquito Project is aimed at monitoring invasive container-inhabiting mosquito species across the United States. By doing this monitoring, we can determine where invasive mosquito species, as well as native species, are distributed across the U.S. and define at-risk human and animal populations based on this distribution. This citizen science project provides students, teachers, and anyone interested the opportunity to collect real data and contribute to a

[266] There was no website provided for Invasive Mosquito Project.

national mosquito species distribution study. This project not only gives individuals an opportunity to explore and collect around their house, but also raises their awareness of diseases that can be transmitted by mosquitoes, and how they can make an effort to protect themselves, their communities, and their pets from illness.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	None reported
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Education; Public outreach or engagement

Justification for Using CCS: Crowdsourcing and citizen science were the only methods for conducting continent-wide collections of mosquito species in a single summer.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Retirees

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 05-2016

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	30
FY20	25

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Specimens may have been shipped to Manhattan, Kansas, but participants were from all over the United States. Participants did the project in their schools or homes, which means some engagement may have been virtual.
Virtual Activity	Specimens may have been shipped to Manhattan, Kansas, but participants were from all over the United States. Participants did the project in their schools or homes, which means some engagement may have been virtual.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected

Results: The USDA has a better understanding of the distribution of mosquito vector species, which helps with making disease transmission risk maps.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: We will not make the data publicly available. Data will be used for education purposes only.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Invasive Mosquito Project advanced the USDA mission by educating the public about the dangers of mosquito-borne pathogens and by getting mosquito samples from across the United States for population genetics studies.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

E.1.5. Land-Potential Knowledge System (LandPKS)[267]

Sponsoring Agency and Office: Research, Education, and Economics

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Land-Potential Knowledge System (LandPKS) provides a free mobile app for users to discover the potential of their land and monitor change over time. The app provides access to a wide variety of knowledge and information based on location alone, including information on soils in the area, using data from the USDA's Natural Resources Conservation Service (NRCS). It allows

[267] There was no website provided for Land-Potential Knowledge System (LandPKS).

users to employ their mobile device for soil identification, land cover and soil health monitoring, land management and farm record keeping, and more. A Land Management module allows them to easily keep records of their plantings, fertilizer applications, rainfall, yields, and more. A Soil Health module provides very simple indicators from NRCS for monitoring soil health, while a Land Cover module allows citizens to monitor the condition of their pasture and rangeland using the same indicators as NRCS uses on non-Federal lands and the Bureau of Land Management uses on public rangelands but requiring only a yard or meter stick to complete the measurements. Soil property data (field observations) entered into the app may be used by NRCS to improve soil maps, and a future version of the app will allow users to indicate whether or not the soil identified by LandPKS using USDA Soil Survey data is, in fact, their soil.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	None reported	None reported
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Education; Digitization of agency-owned materials; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Citizen science is the only way to engage citizens directly in the scientific process in a way that helps them both learn more about their land, and innovate. Data (such as soil data for improving USDA soil maps) is simply a co-benefit. That co-benefit could be realized in other ways.

Participants:

Intended Participants: Pre-K through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: Hispanic or Latino populations; Indigenous populations

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 2015

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	1,000
FY20	2,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Global, including all 50 states.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: Soil property data (field observations) entered into the app may be used by NRCS to improve soil maps. A future version of the app will allow users to indicate whether or not the soil identified by LandPKS using USDA Soil Survey data is, in fact, their soil. This information can also be used to improve Soil Survey.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://landpotential.org/.

Product Description: Data portal with data that be downloaded. Only data that is not marked private on the portal can be downloaded.

Partnerships: The crowdsourcing or citizen science activity involved six partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Bureau of Land Management	Federal Agency or Office	Funding	None reported	None reported	None reported
Natural Resources Conservation Service	Federal Agency or Office	Funding; Personnel	Outreach and coordination with NRCS	None reported	None reported
University of Colorado, Boulder	Academic Institution	Personnel; Space	Software development and outreach	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
New Mexico State University	Academic Institution	Personnel; Space	Software development and testing	None reported	None reported
The Nature Conservancy	Nonprofit Organization (excluding Academic Institutions)	Personnel	App module design and outreach	None reported	None reported
USAID	Federal Agency or Office	Funding; Personnel	Facilitate engagement with global partners	$100,000	$100,000

Advancement of Agency Mission: LandPKS promotes sustainable agricultural production by increasing access to the USDA Soil Survey, allowing stakeholders to more effectively optimize management systems for different types of soil. User input helps refine soil identification, while providing USDA with valuable data to improve soil maps. Other inputs allow users to keep a record of management, track changes in their soil health and, on pastures and rangelands, vegetation cover structure. This supports innovation by allowing users to better understand outcomes of new management systems. Together, these functions promote agriculture production that better nourishes Americans while also helping feed others throughout the world and preserve our Nation's natural resources through conservation, restored forests, improved watersheds, and healthy private working lands.

CCS Act Objectives: Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Solve problems

E.1.6. National Wildlife Research Center Hawaii Field Station - Ring Nose Parakeets[268]

Sponsoring Agency and Office: Marketing and Regulatory Programs

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

CCS Activity Summary: Rose-ringed Parakeets (RRPA) were introduced to Kauai in the 1960s; it is believed a single pair was released in Lawai. As the population of this species has grown, so too has its distribution across Kauai. Introduced RRPA in England had a range expansion of only 0.4 km/year, despite a population growth of approximately 30% annually (Butler 2005), demonstrating that this

[268] There was no website provided for National Wildlife Research Center Hawaii Field Station Ring Nose Parakeets.

species can substantially increase density with limited increase in spatial distribution. Comparing the historic range of RRPA on Kauai with the current distribution can help elucidate what factors are facilitating population expansion, as well as predict future distribution. We consolidated RRPA presence data from eBird, a citizen science reporting tool, and the Global Biodiversity Information Facility (GBIF), a tool which provides species occurrence data reported from literature, museums, and citizen science sources. We mapped these occurrence data over varying time scales. Collectively, eBird and GBIF provided 2,136 presence points with corresponding dates of RRPA on Kauai. After removing duplicate records, this database included 846 records from 1988 to 2020. We will work with partners, including the Kauai Invasive Species Committee and the University of Hawaii Agricultural Extension, to continue gathering occurrence data of RRPA on Kauai. Using the data from eBird, GBIF, and partner organizations, we will develop a species distribution model (as reviewed in Elith and Leathwick 2009) to evaluate environmental factors related to RRPA occurrence on Kauai, including vegetation type, elevation, and other potentially influential variables. Using this model, we will evaluate which areas of Kauai are potentially vulnerable to future RRPA expansion and how this information can be used to develop management strategies (e.g., identify additional roost locations and nesting sites).

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	Not applicable	None reported
Agency Fund Use	Not applicable	Contracted services
FTEs	Not applicable	1.0 FTE
Funding Estimate	Not applicable	None reported

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: No other data were available

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: None reported. Data used has already been collected.

Anticipated End Date: 09-30-2020

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	Not applicable
FY20	None reported

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Island of Kauai, Hawaiian Islands

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected

Results: Using Citizen Science to Estimate the Spread of the Invasive Rose-ringed Parakeet on the island of Kauai was used to understand the rate of spread and ecological associations of an invasive species

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: None reported: Analyses and interpretation are not yet publicly available.

Product Description: None reported: Analyses and interpretation are not yet publicly available

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
USDA APHIS WS National Wildlife Research Center	Federal Agency or Office	Funding	None reported	Not applicable	None reported
Texas A&M University	Academic Institution	Personnel	data analysis	Not applicable	None reported
State of Hawaii Department of Land and Natural Resources	State or Local Government	Funding	None reported	Not applicable	None reported

Advancement of Agency Mission: Using Citizen Science to Estimate the Spread of the Invasive Rose-ringed Parakeet on the island of Kauai was used to understand the rate of spread and ecological associations of an invasive species

CCS Act Objectives: Collect and analyze data

E.1.7. Wildlife Services National Wildlife Research Center Study (QA-3074)[269]

Sponsoring Agency and Office: Marketing and Regulatory Programs

Authority: Other authority (Volunteers for Department of Agriculture Programs, 7 U.S.C. 2272, Volunteer Service, 5 CFR 308)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: National Wildlife Research Center (NWRC) scientists are leading an effort throughout the range of coyotes to collect data on coyote boldness. Participants associated with universities and state and federal agencies are collecting the same data—coyote behavioral response to a novel object or control at a camera trap site—across rural and urban sites in their communities. The data collected will help our understanding of coyote behavior so that we can identify where bold and aggressive behaviors in coyotes are likely to occur and inform management decisions.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	Camera traps - sent to other groups on loan for use	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Data entry or/and analysis; Training	Purchase of consumable materials; Purchase or rental of equipment; Data entry or/and analysis; Training
FTEs	0.3	None reported
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: The study required data from multiple locations, including international locations, to cover the extent of the coyote range. There was interest and enthusiasm by many scientists to participate via CCS in their local communities.

Participants:

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Other (academic, state and federal agency, and nonprofit employees)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations

[269] There was no website provided for Wildlife Services National Wildlife Research Center Study (QA-3074).

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: NWRC scientists met with other scientists at The Wildlife Society's annual conference to discuss ways in which data on coyotes could be collected across coyote range. It was decided in this early meeting to collect data similar to that collected by a previous NWRC study (Breck et al, 2019) but across as many sites in the USA, Canada, and Latin America as possible. Each area's scientist has the option to allow participation in the setting of cameras, control and treatment setups, checking cameras, and/or coding data from camera-trap videos obtained. Many offer opportunities for undergraduate and graduate students but some also utilize community volunteers. Field work, which includes citizen scientists, began as early as spring 2019 and will continue through December 2020.

Anticipated End Date: 12-31-2020

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Atlanta, GA; Gainesville, FL; Salt Lake City, UT; Tucson, AZ; Chicago, IL; Durham, NC; Washington, DC; Portland, OR; Seattle & Tacoma, WA; Los Angeles, CA; Lincoln, NE; Panama; Mexico, and more.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: They will be used in (1) a scientific publication and (2) to inform local management of coyotes.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Once there is a peer-reviewed publication, the data will also be publicly available through a data repository. Publication has been delayed by COVID-19.

Product Description: Peer-reviewed scientific publications.

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists five major partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Dr. Roland Kays, NC Museum of Natural Sciences	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Other (camera traps and related supplies)	set up study site, collected all data from site, submitted data to NWRC	None reported	None reported
Dr. Chris Schell, UW Tacoma & Dr. Laura Pruch, UW Seattle	Academic Institution	Funding; Personnel; Other (camera traps and related supplies)	set up study site, collected all data from site, submitted data to NWRC	None reported	None reported
Dr. Jeff Sikich, NPS & Dr. Seth Riley, NPS	Federal Agency or Office	Funding; Personnel; Other (camera traps and related supplies)	set up study site, collected all data from site, submitted data to NWRC	None reported	None reported
Dr. Stan Gehrt, The Ohio State University	Academic Institution	Funding; Personnel; Other (camera traps and related supplies)	set up study site, collected all data from site, submitted data to NWRC	None reported	None reported
Dr. Jon Benson, University of Nebraska & Dr. Michel Kohl, University of Georgia	Academic Institution	Funding; Personnel; Other (camera traps and related supplies)	set up study site, collected all data from site, submitted data to NWRC	None reported	None reported

Advancement of Agency Mission: Carnivores are often more bold in urban areas, which can result in conflicts with humans. Understanding patterns of bold behavior can help wildlife managers determine what actions are needed.

CCS Act Objectives: Collect and analyze data

E.2. Department of Homeland Security (DHS)

E.2.1. Crowdsourcing for Emergency Management[270]

Sponsoring Agency and Office: Federal Emergency Management Agency (FEMA)

Authority: Other authority (Stafford Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The FEMA Crowdsourcing Unit uses crowdsourcing and citizen science to carry out the agency's mission of helping people before, during, and after disasters by coordinating with online volunteer disaster-response groups. These groups support their communities and response organizations with accurate, timely, and actionable information during disasters. Some are well-established; others self-organize in response to exigent and unprecedented needs that arise. The Crowdsourcing Unit's role is to foster coordination among these groups, and communicate response needs and information gaps. The Unit disseminates volunteer-curated situational awareness products to decision makers in the National Response Coordination Center (NRCC) and emergency managers at the state and local level. The following are examples of products developed by volunteers in support of recent events: (1) Crowdsourced Disaster Photo Map: Volunteers from the Urban and Regional Information Systems Association (URISA) GISCorps and the Crowd Emergency Disaster Response Digital Corps (CEDR) mine social media and news outlets for images citizens post of disasters unfolding around them. Volunteers geolocate photos and upload them to a dynamic, interactive web map within hours of an event. (2) Crowdsourced Shelter Map: CEDR Digital Corps mines official social media accounts to develop interactive maps of evacuation routes and shelter locations for humans, pets, and large animals. Volunteers convert textual shelter location data into consumable, interactive geospatial products. (3) URISA's GISCorps COVID-19 Testing Site Map: As COVID-19 testing sites began to open across all 50 states, there was no national-level database of locally-administered testing sites. The GISCorps activated over 500 volunteers to rapidly identify COVID-19 testing locations and made the data available through a public-facing web application and a Representational State Transfer (REST) service. As the project evolved, multiple organizations contributed data to the map, including CodersAgainstCovid, state public health agencies, and private companies.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Contracted services; Federal employee travel	Web portal or application development and support; Contracted services; Federal employee travel
Approximate FTEs	1.5	3

[270] There was no website provided for Crowdsourcing Playbook for Emergency Management.

Funding Type	FY19	FY20
Approximate Funding	$200,000	$300,000

Goal Types: Collection of data or observations; Create or engage a specific community.

Justification for Using CCS: Many people are compelled to volunteer after a disaster. Some find their way to distribution centers to hand out meals or water, but others choose to volunteer online. Digital volunteers mine social media for disaster photos, provide maps of evacuation routes and shelters, fact check and control rumors on social media, identify and respond to rescue requests when 911 is overwhelmed, and amplify official emergency messaging. Until recently, coordination between official response organizations and online-volunteer contributors was lacking. Although quite a few of these online-volunteer groups engaged in these activities even without coordinating with FEMA, the Crowdsourcing Unit now creates a bridge between the volunteer groups and the emergency management community, providing access to this otherwise unavailable information.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: The NRCC Crowdsourcing Unit was first established in 08-2017. It became a formal program in 2019.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	200
FY20	700

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Washington, DC
Virtual Activity	Various states impacted by natural disasters

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: FEMA's crowdsourcing unit is part of the National Response Coordination Center's (NRCC) Situational Awareness Section. FEMA defines situational awareness as the ability to identify, process, and comprehend the critical information about an incident. Knowing what is going on around you requires continuous monitoring of relevant sources regarding actual incidents and developing hazards. Crowdsourced information helps provide situational awareness. For the three examples mentioned in the activity summary, here is how FEMA used or continues to use crowdsourced information: Crowdsourced Disaster Photo Map: Post-event social media images provide a first look at what is happening on the ground and the nature of damage. Combined with spatial analysis, crowdsourced photos help decision makers understand disaster impacts. Crowdsourced Shelter Map: Shelter maps provide information about how survivors dispersed, and which locations might require wraparound services. COVID-19 Testing Site Map: The COVID-19 testing site map helped decision makers understand which populations lacked testing services and where to stage federal testing sites. Data was also used by state and local emergency managers to populate their own mapping products which helped guide the public to the nearest testing location.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The FEMAs Geospatial Resource Center is available at: https://gis-fema.hub.arcgis.com/. The Crowdsourced Shelter map is available at: https://gis-fema.hub.arcgis.com/items/0b3774831e0a4f38a19645ec46e2f83d. The COVID-19 Testing Sites Map is available at: https://www.giscorps.org/napsg-287/ Photo Map: https://2020-crowdsourced-disaster-photos-napsg.hub.arcgis.com/.

Product Description: The CEDR Shelter Map, the COVID-19 testing locations map, and the Crowdsourced Photo map are all available in a geospatial format and are linked to in the FEMA Geospatial Resource Center. The COVID-19 testing locations map is also available as a REST service so users can add the layer to their own map product. On the Photo Map hub site, users can view imagery in a Lifeline Browser and in a dashboard. A crowdsourced photo uploader lets volunteers contribute disaster images for the GISCorps team to review. Methods used to compile datasets are also documented on these sites.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
GISCorps	Nonprofit Organization (excluding Academic Institutions)	Other (GISCorps manages volunteer projects; builds web applications and architecture; and designs data collection methods. Digital volunteers geolocate photos and information (e.g., testing sites) online.)	None reported	$18,000	$52,000

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
CEDR Digital Corps	Nonprofit Organization (excluding Academic Institutions)	Other (CEDR Digital Corps manages volunteer projects; builds web applications and architecture; and designs data collection methods. Digital volunteers geolocate information (e.g., shelters) online.)	None reported	$2,000	$5,000

Advancement of Agency Mission: FEMA's mission is to help people before, during, and after disasters, which depends, in part, on the ability to quickly understand what is happening on the ground. Crowdsourced information helps fill in gaps in official data, and ultimately better enables the agency to carry out its mission.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Interpret the results of data; Solve problems

E.2.2. FEMA Crowdsourced Building Footprints[271]

Sponsoring Agency and Office: Federal Emergency Management Agency

Authority: Other authority (Stafford Act)

Status:

FY19: No activity occurred during FY19

FY20: Completed

CCS Activity Summary: FEMA Geospatial analysts are exploring ways to use aerial imagery and machine learning to rapidly identify and assess damaged structures after disasters. One algorithm uses building footprint polygons to identify parts of the aerial imagery that may show damage, then uses a classification model to detect and assess structural damage within those building footprints. Over the past 5 years, FEMA and Oak Ridge National Laboratory (ORNL) developed the USA Structures national building outlines dataset, produced through linear segmentation of adjusted DigitalGlobe WorldView Images. However, the USA Structures dataset is not yet complete; many footprints are misaligned or missing and must be manually adjusted prior to use. In response to Hurricane Laura in September 2020, FEMA worked with Federal partners to collect aerial imagery over much of the impacted area, including Lake Charles, Louisiana. FEMA worked with GISCorps to recruit volunteers to adjust, add, or delete building footprint polygons so that they aligned with buildings seen in pre-event aerial imagery. For this project, we used (National Agriculture Imagery Program (NAIP) imagery as a baseline. Volunteers completed this project through an application on FEMA's Geospatial Resource Center. Volunteers logged in, checked out a grid cell, adjusted building outlines within that cell, checked it back in, and moved to the next. FEMA built a leaderboard to track the number of squares and number of building outlines each volunteer completed. In total, 126 volunteer GIS professionals

[271] There was no website provided for FEMA Crowdsourced Building Footprints.

from across the country edited 43,609 building outlines and digitized 27,325 additional buildings over five days. FEMA worked with Federal partners and subcontractors to process aerial imagery and run the damage assessment algorithm. Results are available on FEMA's Geospatial Resource Center and are being used by FEMA staff to conduct recovery activities in the areas impacted by Hurricane Laura.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	Not applicable	1 contractor for 7 days
Agency Fund Use	Not applicable	Contracted services
Approximate FTEs	Not applicable	0.023 FTE
Approximate Funding	Not applicable	None reported

Goal Types: Collection of data or observations

Justification for Using CCS: FEMA used crowdsourcing to complete this task due to the time-sensitive nature of and large amount of manual editing required for this project. Without assistance from volunteer GIS professionals, FEMA could not have outlined approximately 50,000 building footprints in under a week. No existing contract vehicles allowed for this task to be rapidly and elegantly completed. In the future, automated processes may be used to update building footprints.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 09-01-2020

Anticipated End Date: None reported

Activity End Date: 09-09-2020

Specific Dates for CCS Events: 09-01-2020, 09-09-2020

FY	**Number of Individuals**
FY19	Not applicable
FY20	126

Location:

Location Type: Virtual activity

Location Type	**Description**
Virtual Activity	Lake Charles, Louisiana and surrounding area impacted by Hurricane Laura

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates.

Results: FEMA used building outline footprints adjusted by crowdsourcing volunteers as an input for an algorithm that assesses structural damage seen in aerial imagery. This data provides situational awareness and an early indicator of likely damage to support response and recovery efforts. The updated building footprints will also be incorporated into the USA Structures dataset and used to improve the accuracy of the USA Structures dataset going forward.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: This data is publicly available on FEMA's Geospatial Resource Center: https://services.arcgis.com/XG15cJAlne2vxtgt/ArcGIS/rest/services/Laura_ORNLNew/FeatureServer/0. It will also be incorporated into the USA Structures dataset hosted at https://disasters.geoplatform.gov/publicdata/Partners/ORNL/USA.

Product Description: The product is a GIS polygonal feature layer hosted on FEMA's ArcGIS Online (fema.maps.arcgis.com). The layer contains 82,219 objects representing the structure footprints over a subset of the area impacted by Hurricane Laura.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists this partner and its contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
GISCorps	Nonprofit Organization (excluding Academic Institutions)	Other (Project planning; volunteer recruitment; and participation)	None reported	None reported	$20,000

Advancement of Agency Mission: FEMA's mission is to help people before, during, and after disasters, which depends, in part, on the ability to quickly assess damage after an event. Aerial imagery and virtual damage assessments can speed up the damage assessment process, and ultimately, the distribution of relief to impacted citizens. Completing the task virtually alleviates the need for dangerous in-person assessments, particularly during the time of a pandemic. This crowdsourcing activity advanced the agency's mission by enabling the use of automated damage assessment algorithms in the aftermath of Hurricane Laura. The results of this project will also inform how the agency uses automated imagery analysis in future disasters.

CCS Act Objectives: Create and refine project design; Collect and analyze data

E.3. Department of Commerce (USDOC)

E.3.1. Alaska Groundfish Tag Recovery[272]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Magnuson Act: 16 U.S.C Sect. 304 (e))

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The National Marine Fisheries Service (NMFS) Groundfish Tag Program of the Alaska Fisheries Science Center (AFSC) has released over 430,000 tagged groundfish in Alaska and West Coast waters since 1972. Tag reporting by industry is the primary means of data recovery and to date, nearly 40,000 tags have been returned by the fishing industry. It is one of the longest ongoing tagging programs in the Nation and is an example of successful cooperative research between researchers and industry, and citizen science to recover this valuable data. These tagging data are incredibly valuable and have been used to examine movement patterns, evaluate areal apportionment strategies of annual catch quota, validate ageing methods, examine growth, and have resulted in numerous scientific and management publications. The success of the tagging program is dependent on cooperation with the fishing industry. While prepaid business reply envelopes are provided to processors and fishers to ease the burden and cost of returning and reporting recovered tags, there is still an amount of effort that is incurred. We are improving and streamlining the process for industry to report data by developing a tag recovery reporting application (app) for mobile devices. A mobile app would simplify the process for fishers when returning recovered tags and presumably could improve reporting rates and provide more tag data. In addition, fishers would immediately receive release information associated with the recovered tag, which would encourage participation and industry engagement. Furthermore, physically returned tags require a considerable amount of labor to process, digitize, and enter tag recovery data into the groundfish tag database. Tag recovery data received via mobile app could be entered directly into the tag database (along with the digitization of the physical tag), therefore providing the government a significant savings in staff time, materials, and shipping costs.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported

[272] The website for Alaska Groundfish Tag Recovery is accessible at https://www.fisheries.noaa.gov/resource/map/alaska-groundfish-tagging-map .

Funding	FY19	FY20
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Training	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Training
FTEs	1	1
Funding Estimate	$60,000	$60,000

Goal Types: Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: CCS was chosen to assist with data collection/data contribution. Tagged fish recovery data could not be obtained without the contributions of fishers and processors.

Participants:

Intended Participants: Other (members of the fishing industry - fishers, processors, Federal observers)

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: Tag recovery/reporting by fishers began in 01-1972.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	~600 persons
FY20	~600 persons

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Tag recoveries by fishers occur and are reported from all Federal fishery locations in Alaska, as well as internationally (Japan, Russia, Canada, and Mexico).
Virtual Activity	Tag recoveries by fishers are reported from all Federal fishery locations in Alaska, as well as internationally (Japan, Russia, Canada and Mexico).

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: Data collected by the AFSC Groundfish Tag Program is utilized by National Oceanic and Atmospheric Administration (NOAA) employees, the Alaska Department of Fish and Game, and international partners (Department of Fisheries and Oceans, British Columbia). The data collected by industry is valuable for defining movement for apportionment, Essential Fish Habitat, as well as providing information on coastal community engagement. This data is now being utilized for an international coastwide (West Coast North America) management study as well. Further, the in-production mobile device application will not only be a valuable data collection tool for fishers (the general public), it can also be used by the Federal observer program. Fishery observers are mandated to be aboard vessels to gather critical catch and biological sample data. Fishery observers often collect tagged fish recoveries as well, which involves filling out a form and physically delivering the form and tag at the conclusion of their contracted trip. These are then received by NOAA at the end of each quarter of the year, so data received is quite delayed. With the mobile app, observers will be able to collect and submit the data in a timely fashion with minimal effort.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The Alaska Fisheries Science Center tagging data can be accessed at this location: https://www.fisheries.noaa.gov/resource/map/alaska-groundfish-tagging-map.

Product Description: The groundfish tag website is a public site sharing the AFSC groundfish tag release and recovery data. This site includes an interactive map displaying tagged fish movement, information on growth, time at liberty, sex, and distance traveled. In addition, there are a number of tables and figures summarizing tag data targeted more for the scientific community. All data provided on the website has been adjusted to meet confidentiality requirements.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Alaska Department of Fish and Game	State or Local Government	Other (help facilitate tag recoveries; outreach)	None reported	$0	$0

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Department of Fisheries and Oceans, British Columbia	Other	Other (help facilitate tag recoveries; outreach)	None reported	$0	$0

Advancement of Agency Mission: Tag recovery data collected by industry members are included in population dynamics models used to set annual allowable catches in the sablefish stock assessment. Tag data provides information on the rate of sablefish migration between the West Coast, British Columbia, and Alaska and among Alaska management areas. This work directly relates to the Magnuson-Stevens Fishery Conservation and Management Act (MSRA) priority of collecting data to improve, supplement, or enhance stock assessments (Section 318(c)(i)). Because the success of this program relies heavily on the involvement of industry by turning in recovered fish tags and associated recovery data, this project involves collaboration and cooperative research between scientists and members of the industry. This work directly relates to the MSRA Section 408 (a)(4) which requires the agency to conduct research, including cooperative research with fishing industry participants.

CCS Act Objectives: Collect and analyze data

E.3.2. California Collaborative Fisheries Research Program[273]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Magnuson-Stevens Fishery Conservation and Management Act (MSA) (State authority: California Marine Life Protection Act))

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The California Cooperative Research Program (CCFRP) blends citizen science and cooperative research to monitor fish populations inside the state's network of marine protected areas and at nearby reference sites that are still open to recreational fishing. Faculty from California Polytechnic State University (Cal Poly) and Moss Landing Marine Labs developed a scientifically rigorous hook-and-line survey in partnership with the NOAA Fisheries Southwest Fisheries Science Center and the recreational fishing industry (the Commercial Passenger Fishing Vessel, or CPFV, fishing fleet), where vessels (including vessel captain and crew) are chartered to conduct the survey, and volunteers conduct all of the sampling. During a sampling event, volunteer anglers are assigned a station aboard the fishing vessel to fish, while scientific staff collect information on the environmental conditions, the catch by species, size of each fish, and tag a subset of fish. The vast majority of fish caught (with some exceptions for age data collections or other special studies) are released with descending devices to increase post-capture survivorship. In 2016, CCFRP was expanded statewide to

[273] The website for California Collaborative Fisheries Research Program is accessible at https://www.mlml.calstate.edu/ccfrp/.

include six partner academic institutions, monitoring 14 protected areas and 14 adjacent reference sites spanning the entire coast of California. Over 1,650 volunteer anglers have caught more than 150,000 fish since 2007. The volunteers include all experience levels of anglers and ages from high school students to retirees. As one of the few citizen science programs contributing data to stock assessments and protected area management, the program inherently supports the sustainable management of domestic fisheries, and provides high-quality data to address a range of other management questions. In addition, the collaborative nature of the methodology allows the fishing community to work directly with scientists, increasing trust and confidence in the resulting data from both groups.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Other (Cooperative Research funds provided to California Polytechnic State University, San Luis Obispo (Cal Poly) for program support through the Cooperative Ecosystem Studies Units (CESU) Network)	Other (Cooperative Research funds provided to California Polytechnic State University, San Luis Obispo (Cal Poly) for program support through the Cooperative Ecosystem Studies Units (CESU) Network)
FTEs	0	0
Funding Estimate	$35,000	$40,000

Goal Types: Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The CCFRP is a long-term survey of fish populations and the marine protected area network developed with a number of goals including engagement of the fishing community, providing data to sustainable fisheries management and marine spatial planning. The Principal Investigators sought out stakeholder engagement from the very first planning stages of the program. The goal was to develop a scientifically rigorous sampling program that involved the fishing fleet, local fishing communities and Agency scientists. The process by which scientific surveys are conducted and then feed into fisheries management is not always transparent. By involving the local fishing communities (local recreational fishing vessels and volunteer anglers) those individuals are invested in the program. Mason et al. (2020) found CCFRP volunteers had more positive opinions of marine protected areas after volunteering.

Participants:

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: Other (Cal Poly has worked for several years with an AP Environmental Science class from Clovis West High School)

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: Volunteer angler recruitment began in 03- 2006 in central California (from Point Buchon to Ao Nuevo, California). Angler recruitment for the expanded program in 2016 in southern California (south of Pt. Conception) and northern California (north of San Francisco Bay) began in 2016.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	405
FY20	168 (lower due to social distancing practices and reduced boat capacity due to COVID-19)

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	The six partner academic institutions conducting sampling utilize a number of fishing ports within California and near their respective locations (from north to south: Humboldt State University, University of California Davis Bodega Marine Laboratory, San Jose State University Moss Landing Marine Laboratory, California Polytechnic State University, University of California Santa Barbara, University of California San Diego Scripps Institution of Oceanography). Sampling takes place in California state waters, within 15 designated marine protected areas, and in 16 reference sites adjacent to those protected areas. The sites are sampled annually aboard chartered vessels. All of the sampling occurs in less than 150 feet of water to increase the survivorship of groundfish species that suffer from barotrauma.

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Other (Participants collect all of the data (catch all the fish) during a sampling day.)

Results: The 2019 gopher/black-and-yellow rockfish complex stock assessment was the first Federal stock assessment to use both a time series for an index of abundance as well as biological data (age and length) collected from CCFRP. Stock assessments depend on data throughout the range of a stock to ensure that stock-wide abundance trends and demographic data are available to inform management decisions. The gopher/black-and-yellow rockfish stock assessment was approved for management and CCFRP data will contribute to a number of 2021 stock assessments. For many of these, this survey may represent the only fisheries-independent data source. The biological age and

length data will provide estimates of growth for a number of species with changing ocean conditions. The ongoing genetic analyses and tagging data will also help inform movement and dispersal patterns, essential to understanding whether and how marine protected areas contribute to the resilience and productivity to commercially and recreationally important resources. The California Department of Fish and Wildlife is also utilizing data produced from CCFRP to inform the marine spatial planning of the protected area network.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data is available at the Moss Landing Marine Labs Digital Commons: http://digital.mlml.calstate.edu/islandora/object/islandora%3A10865. DataOne citation: Richard Starr, Dean Wendt, Tim Mulligan, Joe Tyburczy, Steven Morgan, et al. 2020. Nearshore Fishes Abundance and Distribution Data, California Collaborative.

Product Description: Digital commons contains the following: database created in Microsoft Office Access 2010, metadata documentation, and seven Excel files to be used if MS Access is not available: trip information (.cvs), angler information (.csv), drift information (.csv), caught fishes (.csv), fish species (.csv), grid cell locations (.csv) and monitoring areas (.csv).

Partnerships: The crowdsourcing or citizen science activity involved many partners. The following table lists major partners and their contributions.

Partner Name	**Partner Type**	**Contribution Type(s)**	**Personnel Contributions**	**FY19 Contribution**	**FY20 Contribution**
San Jose State University, Moss Landing Marine Laboratories	Academic Institution	Funding; Personnel; Space; Consumable resources	Project leads for the central coast CCFRP region	None reported	None reported
California Polytechnic State University, San Luis Obispo	Academic Institution	Funding; Personnel; Space; Consumable resources	Project leads for the central coast CCFRP region	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Three University of California Campuses (UC Davis Bodega Marine Laboratory, UC Santa Barbara, UC San Diego Scripps Institute of Oceanography in collaboration with The Nature Conservancy) and Humboldt State University (in collaboration with CA Sea Grant at HSU)	Academic Institution	Funding; Personnel; Space; Consumable resources	Project leads for the expanded northern and southern CCFRP region	None reported	None reported
California Department of Fish and Wildlife	State or Local Government	Funding	None reported	$700,000	$350,000
California Ocean Protection Council	State or Local Government	Funding	None reported	None reported	$300,000

Advancement of Agency Mission: NMFS works with the Regional Fisheries Councils to assess fisheries stock status to inform fisheries management. There are a number of groundfish species for which we lack basic biological information and are undergoing stock assessments for the first time. The CCFRP provides the only long-term time-series of nearshore groundfish along the West Coast, and is also the only long-term study sampling the groundfish populations within marine protected areas. The CCFRP has also begun collecting fish ear bones (otoliths) that are used to age fish and fin clips for genetic studies. To date, CCFRP has encountered 171,086 fish (92 unique species) during 626 sampling trips. Additionally, current NMFS scientific surveys do not sample in waters shallow enough to accurately represent a number of managed groundfish species and many species live in rocky habitat and are difficult to sample.

CCS Act Objectives: Collect and analyze data

E.3.3. Community Collaborative Rain, Hail and Snow (CoCoRaHS) network[274]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Weather Service Organic Act, 15 U.S.C. 313)

[274] The website for Community Collaborative Rain, Hail and Snow (CoCoRaHS) network is accessible at https://www.cocorahs.org/.

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: With various levels and types of sponsorship by the National Oceanic and Atmospheric Administration (NOAA) and the National Science Foundation (NSF) since the late 1990s, this project is for citizen scientists of all ages and from all walks of life who can spend a few minutes per day collecting information on precipitation in their area. Volunteers register their location on the project website and can train themselves online or in-person with a local coordinator. By following a set of simple procedures and using a standardized rain gauge, volunteers measure and report their daily amount of rain (or melted snow) onto the project website, making it readily available in a centralized database. Options to report hail and/or other significant weather are also available, as well as advanced options such as evapotranspiration, drought impact reports and more. The major goals are providing high quality precipitation data with at least one gauge every square mile in urban areas and one every 36 square miles in rural areas and providing educational opportunities with a focus on climate literacy to project volunteers and the general public.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	in-kind staff time and amplification of calls for volunteers to support the network	in-kind staff time and amplification of calls for volunteers to support the network
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Other (There is currently no direct federal support for the CoCoRaHS program. Our funding sources include the PRISM group at Oregon State University; the National Mesonet Program; Fundraising from volunteers; and fees paid by data users such as water conservation districts and utilities, etc. In the past there has been some grant support from NOAA for CoCoRaHS, but no support for regular operations of the network.)	Publicity, advertising, outreach, or/and communications; Other (There is currently no direct federal support for the CoCoRaHS program. Our funding sources include the PRISM group at Oregon State University; the National Mesonet Program; Fundraising from volunteers; and fees paid by data users such as water conservation districts and utilities, etc. In the past there has been some grant support from NOAA for CoCoRaHS, but no support for regular operations of the network.)
FTEs	0	0
Funding Estimate	$0	$0

Goal Types: Education; Collection of data or observations

Justification for Using CCS: Climate monitoring is an absolutely essential element of climate services. It is imperative to know what the background climate conditions are and how they vary from place to place and over time. The traditional spacing of weather stations in the U.S. has been roughly one

every 1000 to 1500 square kilometers. With CoCoRaHS striving and sometimes succeeding in reaching one per 1.6 km2 in populated areas and one per 58 km2 in rural areas, the true nature of local variability in precipitation can be shown. The atmospheric science community values the CoCoRaHS high-density data while the science education community is setting goals for climate literacy. The popularity of rooftop weather stations may give the illusion that a high density of precipitation observations are easily available for use, but automated weather stations have been found to be less accurate than the 4-inch manual gauge that is required by CoCoRaHS and approved by NOAA.

Participants:

Intended Participants: Other (Any member of the public with the desire and ability to set up a manual rain gauge and report data by web, smartphone, telephone or e-mail.)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls; rural populations

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 06-17-1998

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	21,141
FY20	22,144

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	United States (All 50 states, D.C., Puerto Rico, U.S. Virgin Islands, and Bahamas) and Canada (all provinces).

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates.

Results: CoCoRaHS precipitation data is used widely by the National Weather Service and other NOAA entities, for real-time precipitation monitoring and for use in flood warning and prediction, for improvement of operational and experimental quantitative precipitation estimation systems (such as the Multi-Radar Multi-Sensor, MRMS). The data are also used in national drought monitoring efforts

through Federal and State agencies. CoCoRaHS data are freely available and widely used by researchers and practitioners in a variety of fields. Some example publications are listed below:
Appels, Willemijn M., Bradford, Lori, Chun, Kwok P., Coles, Anna E., and Graham Strickert, 2017: DIY Meteorology - Use of Citizen Science to Monitor Snow Dynamics in a Data-Sparce City. Facets, published online 26 Sept, 2017.
Mattingly, K.S., Lynne Seymour and Paul W. Miller, 2017. Estimates of Extreme Precipitation Frequency Derived from Spatially Dense Rain Gauge Observations: A Case Study of Two Urban Areas in the Colorado Front Range Region. Annals of the American Association of Geographers, Vol. 107, Iss. 6, 2017.
Suriano Z.J., Leathers D.J., 2017. Synoptically classified lake-effect snowfall trends to the lakes Erie and Ontario. Clim Res 74:1-13. https://doi.org/10.3354/cr01480.
Cocks, S.B., J. Zhang, S.M. Martinaitis, Y. Qi, B. Kaney, and K. Howard, 2017: MRMS QPE Performance East of the Rockies during the 2014 Warm Season. J. Hydrometeor., 18, 761–775, https://doi.org/10.1175/JHM-D-16-0179.1
Curtis, M. B., 2017: A synoptic and mesoscale analysis of heavy rainfall at Portland, ME 13-14 August 2014. J. Operational Meteor., 5 (7), 78-86, doi: https://doi.org/10.15191/nwajom.2017.0507.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: CoCoRaHS data are made available to the public via the web site (www.cocorahs.org).

Product Description: The data gathered by volunteer observers through the CoCoRaHS network is freely available to governments, academic institutions and the private sector as well as participants and the general public for the purposes of promoting learning, enhancing scientific knowledge and protecting life and property. Unless otherwise noted, all CoCoRaHS content and data are released under a Creative Commons Attribution 3.0 License. The data are provided "as is", and in no event shall the providers be liable for any damage or loss due to missing data or misinterpretation of its content.

Partnerships: The crowdsourcing or citizen science activity involved >10 partners (if selected, we will reach out to you for information on additional partners). The following table lists these partners and their contributions. There were no partners indicated.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Colorado State University	Academic Institution	Funding, Personnel, Space, Consumable Resources, Other	Colorado Climate Center staff serve as CoCoRaHS HQ	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
NOAA	Federal Agency or Office	Personnel, Online support, Other	NWS staff serve as Regional and State Coordinators for CoCoRaHS	None reported	None reported
Various Land Grant Universities, and Master Gardener/Extension Programs as well as some non-Land Grant Universities where State Climatologists exist	Academic Institution	Personnel, Consumable resources, Other	Various State Climate Offices serve as Regional and State Coordinators for CoCoRaHS	None reported	None reported
Various city and county water utilities, State Dept. of Natural Resources, Water Agencies	State or Local Government	Personnel, Consumable resources, Other	Some water utilities personnel serve as local county coordinators for CoCoRaHS in various states	None reported	None reported
Various Resource Protection and education groups (watershed, wildlife, Master Naturalists, open space)	Nonprofit Organizations	Space, Consumable resources, Other	Many nonprofit organizations provide space for training, and rain gauges for volunteers – various states	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Various libraries, zoos, and museums	Nonprofit Organizations	Space, Consumable resources, Other	Many libraries, zoos, and museums provide space for training and with their own outside funds have provided rain gauges for volunteers – various states	None reported	None reported
K-12 schools	Academic Institutions	Consumable Resources, Other	K-12 schools participate throughout all 50 states and provide rain gauges when available and assist with education and recruitment	None reported	None reported
Various private companies	Private Industry	Funding, Other	Many firms that use and appreciate the data contribute financially during fundraising campaigns	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Various private individuals	Other	Funding, Other	Volunteers participating in the network contribute financially during fundraising campaigns, and of course, they are also providing the precipitation data at the heart of CoCoRaHS	None reported	None reported
USDA, including Forest Service and Climate Hubs	Federal Agency	Personnel, Consumable Resources, Other	Some employees serve as coordinators and promoters of CoCoRaHS and some have provided rain gauges for volunteers	None reported	None reported

Advancement of Agency Mission: CoCoRaHS data is widely used by NOAA entities for a variety of purposes, including rainfall estimation, flood forecasting and warning, research, and so on. The regular, high-resolution collection of precipitation data, and the sharing of that data, advances NOAA's missions to understand and predict changes in climate, weather, oceans, and coasts, and to share that knowledge and information with others.

CCS Act Objectives: Collect and analyze data

E.3.4. CrowdMag[275]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Coast and Geodetic Survey Act, 33 U.S.C. 883a et seq.)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: In partnership with the Cooperative Institute for Research in Environmental Sciences (CIRES), National Centers for Environmental Information (NCEI) started a crowdsourcing project (CrowdMag) to collect vector magnetic data from digital magnetometers in smartphones. The aim is to test whether we can obtain meaningful magnetic data from a large number of noisier measurements, thereby filling some of the gaps in the global magnetic data coverage. A phone's magnetometer measures three components of the local magnetic field with a typical sensitivity of about 150 to 600 nanotesla (nT). By combining data from vector magnetometers and accelerometers, the phone's orientation is determined. Using the phone's internet connection, magnetic data and location are sent to NCEI. We check the quality of the magnetic data from all users and make the data available to the public as aggregate maps. Currently, the CrowdMag project has about 65,000 enthusiastic users who have contributed more than 50 million magnetic data points from around the world. A global magnetic model, solely based on CrowdMag data, has been developed and is generally consistent with the large-scale component of models such as the World Magnetic Model (WMM). A unique contribution of the CrowdMag project is the collection of ground-level magnetic data in densely populated regions. By binning the data in closely spaced grids, it is possible to create magnetic anomaly maps of urban regions. The CrowdMag Day campaigns at the University of Colorado offer an opportunity for several student interns to become scientists for a day. For CrowdMag Day, teams of interns use the CrowdMag app to measure the Earth's magnetic field on and around the university campus. Analysis of magnetic data from multiple cell phones provided insights into the data stability of different types of phones. The CrowdMag team is currently developing a flight-mode version of the app for passengers to collect magnetic data while flying on commercial airlines.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Database development; Software development; Contracted services	Purchase of consumable materials; Database development; Software development; Contracted services
FTEs	0.3	0.3

[275] The website for CrowdMag is accessible at https://www.ngdc.noaa.gov/geomag/crowdmag.shtml.

Funding	FY19	FY20
Funding Estimate	$140,000	$0

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Professional magnetic mapping, especially of short-wavelength (<20 km) anomalies associated with man-made infrastructure (urban noise) and of magnetic minerals in rocks (crustal magnetic anomalies), is prohibitively expensive. The CrowdMag citizen scientists help fill the gaps by mapping the magnetic anomalies using their phone's magnetometers.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 01-2015

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	60,000
FY20	65,000

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	The citizen scientists collect magnetic data using the CrowdMag app from around the world. Currently there are approximately 65,000 contributors to the program. The majority of data contributed to the CrowdMag program comes from North America.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates.

Results: NOAA's NCEI develops magnetic reference field models to aid navigation and scientific research. The US Department of Defense, Federal Aviation Administration, NOAA's Coast and Geodetic Survey, U.S. Geological Survey and the US Forest Service use NCEI's World Magnetic Model (WMM) for navigation and charting. NCEI works with technology companies such as Google and Apple to incorporate the magnetic reference models into consumer devices with miniaturized magnetic sensors. Currently, every iOS or Android device comes pre-installed with WMM, bringing WMM to more than 1 billion devices around the world. The magnetic data collected by the CrowdMag program will be used to improve the geomagnetic models developed by NOAA's NCEI thereby helping public and private innovation.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.ngdc.noaa.gov/geomag/crowdmag.shtml#data. The CrowdMag data collected by the citizen-scientists are quality controlled during the ingest process. On the CrowdMag website, the users can query the quality-controlled data for any date (2014-present) and for any locations. Currently the data are only displayed as aggregate maps.

Product Description: Currently the CrowdMag data are only available as maps. We have plans to develop a public repository to make the curated version of CrowdMag data available to the public.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists the partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Cooperative Institute for Research in Environmental Sciences	Academic Institution	Personnel	1) The CrowdMag program is made possible by the CIRES scientists and software engineers working at NCEI. 2) The CrowdMag Day campaign at the University of Colorado every summer harnesses the power of several student interns participating in CIRES's Research Experience for Community College Students (RECCS) program.	$10,000	$10,000

Advancement of Agency Mission: NOAA's National Centers for Environmental Information (NCEI) develops magnetic reference field models to aid navigation and scientific research. The NCEI uses magnetic data collected by observatories, satellites and ship/airborne surveys to develop magnetic models. However, the available measurements leave gaps in coverage, particularly for short-wavelength (<20 km) anomalies associated with man-made infrastructure (urban noise) and the magnetic minerals in rocks (crustal magnetic anomalies). The data collected by the CrowdMag users

were used to develop a low-resolution model of the Earth's magnetic field. By binning the data in closely spaced grids, we created magnetic anomaly maps of urban regions. The long term goal of the project is to use the magnetic data collected by the citizen scientists to improve NCEI's geomagnetic models and maps.

CCS Act Objectives: Conduct scientific experiments; Collect and analyze data

E.3.5. Crowdsourced Bathymetry[276]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Coast and Geodetic Survey Act of 1947)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Crowdsourced bathymetry (CSB) is the collection of depth measurements from vessels, using standard navigation instruments, while engaged in routine maritime operations. While CSB data may not meet accuracy requirements for charting, the International Hydrographic Organization (IHO) recognizes its limitless potential for other uses. Data can be used to identify uncharted features, assist in verifying charted information, and help fill gaps where bathymetric data are scarce, such as unexplored areas of polar regions, around developing maritime nations, and the open ocean. The key to successful CSB efforts are volunteer observers who operate vessels-of-opportunity in places where nautical charts are poor or where the seafloor is changeable and hydrographic assets are not easily available. Most ships and boats are already equipped to measure and digitally record depth in coastal waters, and the measurement capabilities of vessels have been increasing. NOAA's National Centers for Environmental Information (NCEI) provides archiving, discovery, and retrieval of global CSB and is now working to create a scalable point data store in a cloud environment to accommodate the ever-growing data volumes. The vision is to tap into the enthusiasm for mapping the ocean floor by enabling trusted mariners to easily contribute data to fill the gaps in our current bathymetric coverage.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	Hosting of the CSB end-to-end infrastructure	Hosting of the CSB end-to-end infrastructure
Agency Fund Use	Web portal or application development and support; Database development; Software development; Federal employee travel; Other (cooperative institute services)	Web portal or application development and support; Database development; Software development; Federal employee travel; Other (cooperative institute services)

[276] The website for Crowdsourced Bathymetry is accessible at ngdc.noaa.gov/iho/ maps.ngdc.noaa.gov/viewers/iho_dcdb/.

Funding	FY19	FY20
FTEs	1.2	1.2
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations

Justification for Using CCS: N/A

Participants:

Intended Participants: Other (Mariners and vessel operators)

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 2016

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	100
FY20	200

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Global

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates.

Results: Crowdsourced bathymetry can be used to supplement the more rigorous and scientific bathymetric coverage done by hydrographic offices, industry, and researchers around the world. While CSB data may not meet accuracy requirements for charting areas of critical under-keel clearance, it does hold limitless potential for myriad other uses. If vessels collect and donate depth information while on passage, the data can be used to identify uncharted features, assist in verifying

charted information, and help confirm that existing charts are appropriate for the latest traffic patterns. This is especially relevant considering that many soundings on charting products are pre-1950. In some cases, CSB data can fill gaps where bathymetric data are scarce, such as unexplored areas of polar regions, around developing maritime nations, and the open ocean. CSB also has potential uses along shallow, complex coastlines that are difficult for traditional survey vessels to access.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: maps.ngdc.noaa.gov/viewers/iho_dcdb/.

Product Description: The public can now access the bathymetric observations and measurements from citizen science volunteers and crowdsourcing programs through the International Hydrographic Organization (IHO) Data Center for Digital Bathymetry (DCDB) Data Viewer hosted and maintained by NOAA's National Centers for Environmental Information. This operationalized database allows free access to millions of ocean depth data points and serves as a powerful source of information to improve navigation products and the general knowledge about the seafloor.

Partnerships: The crowdsourcing or citizen science activity involved four partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
National Geospatial-Intelligence Agency	Federal Agency or Office	Funding	None reported	None reported	$200,000
University of Colorado's Cooperative Institute in Environmental Science	Academic Institution	Personnel	Staff, funded by NCEI, NGA, NOS and Federal dollars, are responsible for the management of CSB data and for the maintenance and enhancement of the infrastructure and interface of the CSB data repository.	None reported	None reported
International Hydrographic Organization	Other	Other (International project and working group support)	None reported	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
NOAA's National Ocean Service	Federal Agency or Office	Funding; Personnel	Funding to NCEI to cover cooperative institute salary support	$100,000	None reported

Advancement of Agency Mission: This project aligns with Goal II of NOAA's Office of Coast Survey Ocean Mapping Plan: Map the Full Extent of U.S. Waters to Modern Standards. As the data holdings become more significant, Coast Survey expects to use crowdsourced bathymetry data to identify chart discrepancies, update charts, inform product development, and revise hydrographic survey priorities. Enhancing NCEI's database to accommodate the stewardship of crowdsourced bathymetry data will make it much easier for NOAA to attain this goal. This project also aligns with NOAA/Department of Commerce (DOC) priorities and corporate interests to advance data integration and services and improve decisions by transforming data capabilities to support resilient coastal communities and economies for a data-enabled economy.

CCS Act Objectives: Collect and analyze data; Develop technologies and applications; Make discoveries; Solve problems

E.3.6. eMOLT[277]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Integrated Coastal and Ocean Observation System Act of 2009 (ICOOS Act), Magnuson-Stevens Fishery Conservation and Management Act (MSA)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Beginning in 2001, more than one hundred commercial fishing vessel captains have helped deploy oceanographic sensors on the Northeast Continental Shelf as part of the Environmental Monitors on Lobster Traps and Large Trawlers (eMOLT) program. While there have been a variety of instruments deployed, bottom temperature sensors and satellite-tracked drifters have provided the most data and continue to be deployed today. As of this writing, over 50 commercial vessels have collectively transmitted over 12,000 haul-averaged bottom temperatures in real time which are now being fed to ocean forecast models. For our fisheries to be sustained in a rapidly changing environment, it is important that the stakeholders be involved and partner with government-funded science to monitor our shelf water variability on multiple time and space scales.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[277] The website for eMOLT is accessible at emolt.org apps-nefsc.fisheries.noaa.gov/nefsc/emolt.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training	Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training
FTEs	one FTE	one FTE
Funding Estimate	$150,000	$150,000

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The fishers involved in the eMOLT program participate because they are interested in the science and want to help improve our understanding of how the ocean works. For generations, they have wondered about the conditions at the ocean bottom. These fishers have a vested interest in having real-time data displayed in their wheelhouse and seeing how it compares to both climatology and local ocean model estimates. The eMOLT system provides participants with information to fish smarter and they are happy to volunteer.

Participants:

Intended Participants: Adults not affiliated with higher education

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 04-2001

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	90
FY20	100

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Data collected from thousands of locations on the Northeast Continental Shelf by commercial fishing vessels emanating from dozens of ports ranging from New Jersey to Nova Scotia

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: The eMOLT bottom temperature data is now being used to not only improve numerical ocean models but it is also used in stock assessment models to predict the variability of marine animals. Fisheries biologists input the data into their simulations on stock abundance and see how it affects the inter-annual changes in population and distribution. In both these cases, the data can be used in hindcast, nowcast, and forecast simulations.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://comet.nefsc.noaa.gov/erddap/tabledap is an Environmental Research Division Data Access Protocol (ERDDAP) server which is now a standard for the oceanographic observation community. Users can plot and query for certain subsets of the data and request output in a variety of formats.

Product Description: The raw data is relatively simple. In the case of bottom temperatures, it is just a time series of position, depth, and temperature. In the case of the fisher-deployed drifters, it is simply a time series of position.

Partnerships: The crowdsourcing or citizen science activity involved 6partners (if selected, we will reach out to you for information on additional partners). The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Gulf of Maine Lobster Foundation	Nonprofit Organization (excluding Academic Institutions)	Personnel; Space; Online support	lead administrator	liaison with industry; finances; paid interns	liaison with industry; finances; paid interns

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Berring Data Collective	Nonprofit Organization (excluding Academic Institutions)	Personnel; Online support	online data archive/display	connection to similar organizations around the globe; helped serve data on European portals like eMODNET	connection to similar organizations around the globe; helped serve data on European portals like eMODNET
Center for Coastal Studies	Nonprofit Organization (excluding Academic Institutions)	Personnel	dockside technician	Helped connect and troubleshoot vessels near their local harbors	Helped connect and troubleshoot vessels near their local harbors
Commercial Fisheries Research Foundation	Nonprofit Organization (excluding Academic Institutions)	Personnel	dockside technician	Helped connect and troubleshoot vessels near their local harbors	Helped connect and troubleshoot vessels near their local harbors
Cape Cod Commercial Fishermen's Alliance	Nonprofit Organization (excluding Academic Institutions)	Personnel	dockside technician	Helped connect and troubleshoot vessels near their local harbors	Helped connect and troubleshoot vessels near their local harbors
Gulf of Maine Research Institute	Nonprofit Organization (excluding Academic Institutions)	Personnel	webmasters	exposed data through local ocean observing system portals	exposed data through local ocean observing system portals

Advancement of Agency Mission: Given the loss of research vessel time in recent years, the eMOLT data collected by commercial fishers is able fill data gaps. The hourly samples collected on fixed gear, in particular, provide time series of ocean conditions that are needed to understand multiple time scales of variability. The real-time data telemetered to shore as soon as the fixed and mobile gear lands on deck is automatically fed to ocean models. This system improves ocean forecast similar to the NWS operation to improve weather forecasting. Given several million lobster traps on the bottom and hundreds of fishing trawlers dragging through a variety of depths, there is potential to collect much more data in the future.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.3.7. FISHstory (South Atlantic Fishery Management Council)[278]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Magnuson-Stevens Fishery Conservation and Management Act)

Status:

FY19: No activity occurred during FY19

FY20: Ongoing

CCS Activity Summary: The FISHstory project uses historic fishing photos to document species and length composition data in the charter and headboat fisheries prior to when dedicated catch monitoring began in the 1970s. Knowing the species, number, and size of fish caught over time is critical in understanding the health of a fish population. These photos, an untapped source of this important biological data, will help fill this data gap identified in the for-hire South Atlantic fisheries. The FISHstory project is collaborating with Rusty Hudson, a retired fisherman, who has provided over 1,300 historic dock photos from his family's for-hire fleet in Daytona Beach, FL from the 1940s-1970s. Due to the large number of photos, the Council is turning to citizen scientists to help with photo analysis. Using Zooniverse, an online crowdsourcing platform, volunteers are trained to identify and count fish and people in the photos. A Validation Team, comprised of fishers and scientists, will be used to verify species identifications and counts when there is disagreement among volunteers. Additionally, the FISHstory team will also develop a method to estimate fish lengths from the historic photos and pilot test it on one species, King Mackerel. Data gathered from this project exploring fisheries of the past could help us better understand the health of fish stocks today and into the future. If the FISHstory pilot project is successful, the team hopes to expand it to collect photos from other fishers and stakeholders across the South Atlantic.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Additional Agency Resources	Not applicable	None reported
Agency Fund Use	Not applicable	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services; Training

[278] The website for FISHstory (South Atlantic Fishery Management Council) is accessible at South Atlantic Fishery Management Council (SAFMC) FISHstory webpage: https://safmc.net/safmc-fishstory/SAFMC Citizen Science Program webpage: https://safmc.net/citizen-science-program/ FISHstory Project in Zooniverse: https://www.zooniverse.org/projects/safmcadmin/fishstory.

Funding	FY19	FY20
FTEs	Not applicable	Approximately one FTE was used to support the FISHstory project in addition to the contractors funded through the Fisheries Information Systems award, which represent approximately one FTE position.
Funding Estimate	Not applicable	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Analyzing photos can be labor intensive and time consuming. The FISHstory pilot project has archived over 1,300 historic fishing photos. Past efforts to fund analysis of these historic photos have not been successful in part due to the resource-intensive nature of photo analysis. Due to the large number of photos, the FISHstory team turned to CCS and built an online crowdsourcing project in the Zooniverse platform where volunteers help classify photos. The crowdsourcing approach is being used to make the photo analysis more efficient and cost-effective. If successful, the protocols and techniques developed through this pilot project could be expanded to include photos from other locations throughout the region. Building the project in an online crowdsourcing platform and using CSS for analysis will make this future expansion more cost-effective.

Participants:

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees; Other (Fishers and other South Atlantic Fishery Management Council stakeholders)

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 05-26-2020

Anticipated End Date: 07-01-2021

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported

FY	Number of Individuals
FY20	As of November 18, 2020, over 1,590 volunteers have participated in the FISHstory project. Additionally, 28 volunteers serve as members of the Validation Team, a group of fish ID experts, which helps verify species identifications and counts when there is volunteer disagreement. As of March 10, 2021 over 1,930 volunteers have participated in FISHstory.

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	The historic photos for the FISHstory project are from the Daytona Beach, FL area. Project promotion was focused on the states within the South Atlantic Fishery Management Council (SAFMC) jurisdiction (e.g. North Carolina, South Carolina, Georgia, and the east coast of Florida). However, the project is completely online, so volunteers could participate virtually from across the globe.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants processed data or other materials provided by the agency; Other (A small group of scientists and fishers in the South Atlantic region volunteer as members of the FISHstory Design Team who provide guidance on project design and development.)

Results: Species composition and length data are critical to accurately estimating stock productivity. The FISHstory project extends, back in time, the time series of catch information available through current surveys and reporting. The information in the photos covers the beginning of the recreational for-hire fishery in the South Atlantic, which is widely regarded as a data-poor period for all finfish stock assessments in the South Atlantic. The species composition data can be used to explore seasonal and temporal changes in catch both within this historic period and compared to more modern data. FISHstory is also developing a method to collect fish lengths from historic photos and produce species-specific length compositions with error. Little biological data is available from this historic time period in the South Atlantic, so these length data could prove useful to stock assessment. The length methods are being pilot tested on King Mackerel and could be expanded to other species in the future. Additionally, the protocols and techniques developed for compiling, analyzing, and archiving historic for-hire fishing photos could be expanded to other regions.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Once the FISHstory pilot project is complete, the data will be available by request from the SAFMC. In the future, we would like to make data available either through the Atlantic Coastal Cooperative Statistics Programs data warehouse or other publicly accessible websites.

Product Description: Data available from FISHstory include a variety of information collected from historic for-hire fishing photos from the Daytona Beach, FL area in the 1940s-1970s. Metadata available for each photo include: trip date, vessel and captain name, and home port. Data available

from the for-hire catch component include counts of species or species group and people within each photo, as well as summarized species composition data. Data available from the length component include King Mackerel length compositions with error estimates. If sample size allows, annual length compositions will be produced.

Partnerships: The crowdsourcing or citizen science activity involved four partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Industry partner - retired fisherman, Rusty Hudson	Other	Other (historic photo provider; scanned and archived all photos; fishery expertise)	None reported	None reported	None reported
NOAA Fisheries	Federal Agency or Office	Funding; Other (in-kind staff time for the FISHstory Design Team and the Validation Team; additionally two NOAA Fisheries staff are helping measure fish for the length component of the project)	None reported	None reported	None reported
Zooniverse	Nonprofit Organization (excluding Academic Institutions)	Online support; Other (provided online crowdsourcing platform with project builder and project promotion and outreach to Zooniverse community)	None reported	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Validation Team - a team of species identification experts comprised of approximately 28 scientists and fishers across the South Atlantic region	Other	Other (members provide their in-kind time and species identification expertise)	None reported	None reported	None reported

Advancement of Agency Mission: The FISHstory project is helping advance NOAA Fisheries' and the SAFMC's mission to sustainably manage fisheries using the best available information. In the South Atlantic, few fishery dependent surveys were in existence prior to the 1970s and those that existed were limited in scope and lacked comprehensiveness and continuity. FISHstory is developing a standardized protocol for archiving and analyzing historic photos from the for-hire recreational fisheries from the 1940s-1970s to document the beginnings of the South Atlantic for-hire fisheries and collect data on catch and length composition prior to when dedicated for-hire monitoring programs began. The information in the photographs covers the nascent period of the recreational for-hire marine sector in the South Atlantic, which is widely regarded as a data-poor period for all finfish stock assessments in the US South Atlantic.

CCS Act Objectives: Collect and analyze data; Make discoveries

E.3.8. GPS on Bench Marks[279]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Coast and Geodetic Survey Act of 1947 (33 U.S.C. 883))

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: GPS on Bench Marks (GPSonBM) is the National Geodetic Survey's (NGS) crowdsourcing approach to obtaining survey-grade GPS data on a prioritized list of marks where new data will provide the most benefit. Surveyors, engineers and technicians that work for Federal and State government agencies, universities, professional societies, and private sector firms use their GPS equipment to take measurements on survey marks in the areas where they work and share them with NGS via our online tools. The public can also participate by finding the survey marks on the priority list

[279] The website for GPS on Bench Marks is accessible at https://www.ngs.noaa.gov/GPSonBM/.

and reporting back to NGS on their condition and suitability for GPS observations. This crowd-sourced data helps to improve the local accuracy of national scale models and tools that NGS builds to serve the nation.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Software development; Data entry or/and analysis; Federal employee travel; Training	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Software development; Data entry or/and analysis; Federal employee travel; Training
FTEs	1	1
Funding Estimate	$200,000	$200,000

Goal Types: Education; Digitization of agency-owned materials; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Crowdsourcing was used as a force magnifier, where the small investment in building the required online tools and developing outreach material enabled us to get access to orders of magnitude more data than we would have obtained had we spent the funds on contracting it out or gathering it ourselves. In addition, the outreach and communications efforts spent on GPSonBM helped to educate our stakeholders about changes and benefits coming up with modernizing the National Spatial Reference System (NSRS).

Participants:

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees; Other (Surveyors and Engineers)

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 01-2014

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	170
FY20	268

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	GPS data are collected at thousands of geodetic control mark locations across the USA, and are then shared via online forms. Location lists can be generated via search at https://noaa.maps.arcgis.com/apps/opsdashboard/index.html#/b3f9dcfde4c249bc9cd5817489c5d53c.
Virtual Activity	The activity highlights thousands of targeted marks which would provide the largest benefit to improving the local accuracy of national scale models and tools. For a list and map of target locations see https://geodesy.noaa.gov/GPSonBM.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: By feeding the creation of a series of increasingly accurate hybrid geoids, this activity has already made existing national height datums more accessible to GPS users, increasing user survey accuracy and facilitating more efficient surveying methods. The same dataset is expected to feed the creation of a new transformation tool which will provide Federal agencies and partners with an official transformation from existing datums to the new modernized national survey datums.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The GPSonBM Dashboard is available at: https://noaa.maps.arcgis.com/apps/opsdashboard/index.html#/449e3051fbf44202ba6606e2dbcb0e29GPS on Bench Marks dataset - https://doi.org/10.25921/d2rg-hv41?utm_medium=email&utm_source=GovDelivery.

Product Description: The GPSonBM Dashboard is an ArcGIS online tool that provides on overview of the data that has been received to date and the geographic areas where that data will improve the future transformation tool. The GPSonBM dataset is a file listing all of the GPSonBM data that was evaluated and considered for use in GEOID18. This file contains the ellipsoidal, orthometric, and geoid height information, along with computed residuals for each mark.

Partnerships: The crowdsourcing or citizen science activity involved no partners.

Advancement of Agency Mission: The agency mission to define, maintain, and provide access to the NSRS has historically required a tremendous field effort by Federal experts. NGS is now embracing the emerging availability of geodetic-grade GPS equipment owned and operated by states and private agencies to maintain the reference system. This crowd-sourced data helps to improve the local accuracy of the national scale models and tools that NGS builds to serve the nation.

CCS Act Objectives: Conduct scientific experiments; Collect and analyze data; Develop technologies and applications; Solve problems

E.3.9. HABScope[280]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA) 2014)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: In Florida and soon in Texas, citizen scientists are helping to protect public health and the economy by supporting the Red Tide Respiratory Forecast. This beach-level risk forecast activated during red tide conditions tells beachgoers what impacts are expected to be at individual beaches at different times of the day. The Forecast saves those susceptible to red tide impacts visits to their doctors and emergency rooms and supports businesses that can lose thousands of dollars during red tides because visitors have not been able to make informed decisions about whether or not going to the beach is safe. The citizen scientists use HABscope, a portable microscope system that utilizes video and artificial intelligence (AI) to quickly analyze water samples for near real-time cell counts of *Karenia brevis*, the organism that causes red tides in the Gulf of Mexico. These samples are combined with other environmental data and the result is the Red Tide Respiratory Forecast.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	$40,000	$40,000

[280] The website for HABScope is accessible at habscope.gcoos.org https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/hab-monitoring-system/hab-forecasts/.

Funding	FY19	FY20
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Web portal or application development and support; Software development; Data entry or/and analysis; Federal employee travel; Training	Purchase of consumable materials; Purchase or rental of equipment; Web portal or application development and support; Software development; Data entry or/and analysis; Federal employee travel; Training
FTEs	1 FTE	1 FTE
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: The HABscope needs to cover a large geospatial distance among west coast Florida beaches. It would be impossible and extremely expensive to have employees at every beach on the west coast of Florida. Therefore, citizen scientists volunteered to cover different beaches near where they live, saving the project numerous dollars and providing the needed beach coverage along the west coast of Florida.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Urban populations

Participation:

Activity Open Date: 10-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	34
FY20	36

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	West coast of Florida; coastal beach locations

Location Type	Description
Virtual Activity	West coast of Florida; coastal beach locations

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: The engaged community gathers data to substantially reduce the public impact of K. brevis blooms by providing a capability for daily monitoring and three-hour forecasting of these blooms at the level of individual beaches. This project uses an inexpensive microscope system, called the HABscope, which allows volunteers to collect samples and take videos from individual beaches daily. These videos are uploaded and processed within minutes to estimate cell counts, then combined with high-resolution wind speed and direction to predict respiratory risk at individual beaches. This project has the major objectives of: 1) establishing a viable operational and sustainable volunteer network; 2) refining the HABscope to assess accuracy and improve reliability; 3) coordinating with State and local governments to enhance their monitoring with the HABscope capability; and (4) establishing a robust, automated forecast system capability through the Gulf of Mexico Coastal Ocean Observing System (GCOOS) assuring distribution of publicly useful forecasts of health risk due to brevetoxins.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: habscope.gcoos.org.

Product Description: The respiratory forecasts resulting from the HABscope data set (and other less frequent measurements of cell concentrations) are publicly available on a website and is intended for the public to engage. The forecast map describes beaches as low, medium, or high risk for exposure to respiratory irritation. By observing the health risk forecasts, beachgoers can decide which Florida beach is safe to go to under K. brevis bloom conditions when brevetoxin aerosols are present.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Gulf of Mexico Coastal Ocean Observing System	Other	Personnel	Sampling and training, volunteer network	None reported	None reported
Florida Fish and Wildlife Research Institute	State or Local Government	Personnel	Sampling and training; volunteer network	None reported	None reported

Advancement of Agency Mission: Under HABHRCA (2014), NOAA has a responsibility to develop and implement monitoring and forecasts of harmful algal blooms. These blooms on the west Florida coast are quite variable, changing each day. In order to reliably forecast these blooms, we need more

frequent observations at more beaches, which is beyond the capability of standard Federal or local government monitoring programs. This CCS activity may provide sufficient information on these blooms so that we can forecast their location and impact, in response to HABHRCA.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Make discoveries

E.3.10. Meteorological Phenomena Identification Near the Ground (mPING)[281]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Weather Service Organic Act, 15 U.S.C. 313)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: To know how well precipitation type algorithms perform and whether new algorithms are an improvement, observations of winter precipitation type are needed. Unfortunately, the automated observing systems cannot discriminate between some of the more important types. Thus, human observers are needed. Yet, to deploy dedicated human observers is impractical because the knowledge needed to identify the various precipitation types is common among the public. To most efficiently gather such observations requires the public to be engaged as citizen scientists using a very simple, convenient, nonintrusive method. To achieve this, an application program interface (API) that can be contained in a simple app was developed. This API is the citizen science tool that makes the Meteorological Phenomena Identification Near the Ground (mPING) possible. The apps using the mPING API run on smartphones or, more generically, web-enabled devices with GPS location capabilities. Using mPING, anyone with a smartphone can pass observations to researchers and National Weather Service personnel at no additional cost to their phone service or to the research project. Deployed in mid-December 2012, mPING has proven to be not only very popular, but also capable of providing consistent, accurate observational data.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Database development; Software development; Contracted services	Database development; Software development; Contracted services
FTEs	0.5	0.5
Funding Estimate	$0	None reported

[281] The website for Meteorological Phenomena Identification Near the Ground (mPING) is accessible at https://mping.ou.edu.

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Other (Create new/better post-processing of meteorological numerical weather prediction models and quantify any improvements.)

Justification for Using CCS: This activity provides a natural way for citizen scientists to help advance meteorological science.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 12-19-2012

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	25,000
FY20	27,000

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Any location on the globe -- there is no fixed location of activity.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates.

Results: These data are already being used by the National Weather Service (NWS) to better inform NWS forecasters; the data are also being used by National Centers for Environmental Prediction to better post-process computer model output. In addition, NWS personnel use mPING observations to better verify weather warnings and forecasts.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://mping.ou.edu/static/mping/access.html.

This license offers real-time download access to all the data in the mPING report database via the mPING API, and the ability to submit reports to the mPING database via a third-party app. The limitations on this type of license are that the data cannot be redistributed or sold, and is typically intended for people who are conducting research, disaster or community management, government employees and entities or other non-revenue generating activities. To see a copy of this license please click here. To see if you qualify for this license type and apply please complete the form found here.

Product Description: Formats include JSON, GeoJASON, XML, and CSV. Data include time and date, GPS location, and report type category as an integer.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
University of Oklahoma	State or Local Government	Personnel; Space; Other (Web servers)	Database maintenance and backup	None reported	None reported
National Severe Storms Laboratory	Federal Agency or Office	Funding; Space	None reported	None reported	None reported

Advancement of Agency Mission: Observations from mPING inform forecasters about current conditions and weather in places that do not have observational instrumentation. The mPING data help numerical weather prediction model developers develop and refine better post-processing algorithms and techniques.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Collect and analyze data; Interpret the results of data

E.3.11. Nurdle Patrol[282]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (Coastal Zone Management Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Nurdle Patrol is a citizen science project run by the Mission-Aransas National Estuarine Research Reserve at the University of Texas Marine Science Institute, and started in November 2018 after a large number of plastic pellets (nurdles) washed up on Mustang and North Padre Islands in Texas. Nurdles are small plastic pellets and are the basis of everything plastic. They

[282] The website for Nurdle Patrol is accessible at www.NurdlePatrol.org.

look like food to animals, and they absorb chemicals in the environment, so could be harmful to animals. The program is looking to gather information about where nurdles are located, remove the nurdles from the environment, and create awareness about the nurdle issue so that State and Federal policy changes can be made that prevent pellets from reaching the ocean. As of November 2020, over 2,300 volunteers have added nurdle survey data to www.NurdlePatrol.org, with over 6,600 surveys completed at over 3,000 sites across the United States. Over 90 partner organizations are helping to organize volunteers and gather nurdle concentration data on their local beaches, riverbanks, and lake shorelines.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Federal employee travel	Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Federal employee travel
FTEs	.1	.1
Funding Estimate	$5,000	$5,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Nurdle Patrol's methodology is simple, effective, and anyone can conduct a survey. Crowdsourcing data across the United States gives us a greater picture of how large the plastic pellet problem is compared to a single small-scale project being conducted under a grant or contract.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 11-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	2,000
FY20	2,000

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Across the United States at beaches, riverbanks, and lake shorelines.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: A number of communities around the country, (e.g., Charleston, South Carolina, Corpus Christi, Texas, and New Orleans, Louisiana) are using the Nurdle Patrol data to engage their State agencies in changing state discharge permits for any business handling plastic pellets. Policy changes in the permits are limiting the amount of plastic allowed to be released into waterways. Maps of nurdle concentration data can be printed directly from the Nurdle Patrol website that allow communities to explain the problem to their elected officials and State agencies, starting the conversation for change.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data can be accessed from the Nurdle Patrol map: https://nurdlepatrol.org/Forms/Map/index.php. An Excel spreadsheet of data can be requested as well from jace@utexas.edu.

Product Description: A map of the United States has color coded dots that symbolize concentrations of plastic pellets found during a 10-minute period. Zooming in and out on the map allows users to view their community of interest. Clicking on a color dot gives a window of what data has been collected at that specific site. All maps can be printed digitally or hard copy by clicking on the printer symbol in the upper right hand corner of the map. A legend on the map describes what each color dot represents for nurdle concentrations.

Partnerships: As of this month, Nurdle Patrol currently has 115 partners involved in the effort. Partners are defined by if they have given monetarily to the effort through donations, research, or other support, or if they have incorporated Nurdle Patrol surveys into their monitoring program. The following table lists five major partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Tampa Bay Estuary Program	State or Local Government	Personnel	Creating a volunteer program to collect nurdles in Tampa Bay, FL	None reported	None reported
11th Hour Racing	Nonprofit Organization (excluding Academic Institutions)	Funding; Online support	None reported	$10,000	$75,000
Parley for the Oceans	Nonprofit Organization (excluding Academic Institutions)	Personnel; Online support	Writing articles to promote Nurdle Patrol, collecting data monthly in the Yucatan Peninsula of Mexico	None reported	None reported
Surfrider Foundation	Nonprofit Organization (excluding Academic Institutions)	Personnel	Writing a bill, Texas Nurdle Bill, to submit to Texas legislators to change policy about plastics reaching the ocean from plastic manufacturing sites	None reported	None reported
National Park Service - Padre Island National Seashore	Federal Agency or Office	Personnel	Sampling 60 miles of Texas shoreline in the National Park Service boundary during turtle nesting season	None reported	None reported

Advancement of Agency Mission: The number of plastic pellets (nurdles) being found along beaches and shorelines around the United States was a major data gap that Nurdle Patrol is filling. Nurdle Patrol surveys are identifying high plastic pellet concentration areas that can help guide cleanup efforts, new research on impacts of plastics in the environment, and possible sources of pollution.

CCS Act Objectives: Collect and analyze data

E.3.12. NWS Cooperative Observer Program[283]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

[283] The website for NWS Cooperative Observer Program is accessible at https://www.weather.gov/coop/.

Authority: Other authority (Organic Act of 1890)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Long before the term citizen science was coined, the National Weather Service (NWS) relied on engaged citizen volunteers to collect and report basic meteorological and climate data from across the country. The NWS's Cooperative Observer Program (COOP) is a weather and climate observing network of, by, and for the people. Observations are collected at more than 8,000 sites on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. The data are truly representative of where Americans live, work, and play and feed into the NWS mission of providing weather watch and warning information for protection of life and property. COOP has been in existence for over 125 years, since the first network of cooperative stations was formally codified in the Organic Act of 1890 that established the Weather Bureau, with informal participation at some sites reaching back 200 years. Many of the volunteers are multigenerational observers carrying on a long American tradition of weather observation dating all the way back to George Washington, Thomas Jefferson, and Benjamin Franklin, all of whom maintained weather records. Because of its many decades of relatively stable operation, high station density, and high proportion of rural locations, the COOP Network has been recognized as the most definitive source of information on U.S. climate trends for temperature and precipitation. In addition to NWS, the Federal Emergency Management Agency (FEMA) relies on COOP rainfall and snowfall data as a primary information source for disaster declaration and relief efforts, and the United States Department of Agriculture (USDA) risk management models get 80% of their data from COOP for agricultural disaster relief.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	$167,000 from US Army Corps of Engineers and Bureau of Reclamation for assistance to maintain COOP sites of interest.	$162,000 from US Army Corps of Engineers and Bureau of Reclamation for assistance to maintain COOP sites of interest.
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training
FTEs	70 FTEs	70 FTEs
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations

Justification for Using CCS: This program has existed informally long before the Weather Bureau was created, where volunteers were used to record climatic data. The program was codified in the Organic Act of 1890, and is still used today for this reason and more. Many of the volunteers enjoy being part of the program and part of the NOAA mission, and some of the volunteers are multigenerational observers.

Participants:

Intended Participants: Adults not affiliated with higher education

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: This Citizen Science project has been in existence for over 125 years formally, with informal participation for some sites of up to 200 years.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	10,000 volunteers
FY20	10,000 volunteers

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	8,000+ sites across the Nation provide daily observation data (see website).

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates.

Results: Aside from use by NWS, FEMA relies on COOP rainfall and snowfall data as the primary source for disaster declaration and relief efforts. USDA risk management models get 80% of the data from COOP for agricultural disaster relief and for baselines with the related insurance and reinsurance industries.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data is free and open to the public and made available via National Center for Environmental Information (NCEI) websites such as https://gis.ncdc.noaa.gov/maps/ncei/summaries/daily.

Product Description: Cooperative Observer observations, along with station metadata in the Historical Observing Metadata Repository (HOMR), are available at the NCEI websites in various formats. These include scanned copies of original observer forms, spatially displayed, such as in the GIS Portal for summaries of daily observations, and in formats available for researchers and other data users. Temperature is recorded in Fahrenheit and precipitation is recorded in inches.

Partnerships: The crowdsourcing or citizen science activity involved two partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
US Army Corps of Engineers	Federal Agency or Office	Funding	None reported	$151,000	$146,000
Bureau of Reclamation	Federal Agency or Office	Funding	None reported	$16,000	$16,000

Advancement of Agency Mission: Observing programs, such as COOP, provide observations that feed into the NWS mission of providing weather watch and warning information for protection of life and property.

CCS Act Objectives: Collect and analyze data

E.3.13. Old Weather[284]

Sponsoring Agency and Office: National Oceanic and Atmospheric Administration

Authority: Other authority (33 U.S.C. 883c and 15 U.S.C. 313)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Millions of weather, ocean, and sea-ice observations recorded by mariners and scientists over the past 150 years are being recovered by Old Weather. These data are made freely available in digital formats suitable for climate model assimilation, retrospective analysis (reanalysis), and other kinds of research. The performance of data-assimilating modeling and extended reanalysis systems is greatly improved, the uncertainty of results (especially in sparsely observed regions like the

[284] The website for Old Weather is accessible at https://www.oldweather.org/.

Arctic) is reduced, and new long-period calibration and validation data sets are being created. As the historical data resource is extended further back in time it will be possible to study a wider range of weather and climate phenomena and to better understand their impact on the Arctic and global environment, now and in the future.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Other (Minor assistance with partnership agreement with NARA.)	Publicity, advertising, outreach, or/and communications; Other (Minor assistance with partnership agreement with NARA.)
FTEs	None reported	None reported
Funding Estimate	$148,500	$149,500

Goal Types: Digitization of agency-owned materials; Public outreach or engagement; Other (Digitization of weather observations of the U.S. Navy, Coast Guard, and Coast Survey.)

Justification for Using CCS: Citizen science was chosen because it is impossible for machines to translate handwritten text into digital data with a high degree of accuracy, and it combined an element of education and outreach in design. The alternative, contract double-blind key entry, is less efficient and does not readily scale to the task at hand.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 10-2012

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	None reported

FY	Number of Individuals
FY20	None reported

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Arctic and global ocean.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: The data is being used to improve the performance of NOAA (and international) weather reanalysis, one of the most widely used tools in climatology, meteorology, and earth system science. These data also improve the quality of existing data infrastructure by filling in sparsely observed regions and time periods. A secondary effect has been the organic emergence of a volunteer community of subject area experts (aka superusers) that provide untold value to the effort (beyond transcription) by designing and implementing custom user interface components and carrying out a variety of essential tasks such as the reconstruction of a ship's 'Dead Reckoning' DR navigation, vastly increasing the value of the weather and sea ice data recovered by the project.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Repositories: International Comprehensive Ocean Atmosphere Data Set (ICOADS) https://icoads.noaa.gov/ (Dck 710); International Surface Pressure Databank (ISPD) https://reanalyses.org/observations/international-surface-pressure-databank. Both datasets contain up to hourly positions and n-weather variables. Arctic Data Center (doi:10.18739/A2S46H60V). Hourly navigation and sea-ice observations (1900-1938). Logbook images: https://www.archives.gov/research/catalog. These are high-resolution page images of the primary sources.

Product Description: Old Weather produces transcribed instrumental weather data from Federal ship logbooks from approximately 1844 to 1955. They are available from ICOADS in IMMA (International Maritime Meteorological Archive) format. Images of the logbooks themselves, produced as part of a collaboration between NOAA and the National Archives and Records Administration (NARA), currently funded by the Council on Library and Information Resources (CLIR) and the Andrew W. Mellon Foundation, are available via the National Archives Catalog (https://www.archives.gov/research/catalog).

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
University of Washington / Cooperative Institute for Climate, Ocean & Ecosystem Studies (CICOES)	Academic Institution	Funding; Personnel; Other (Grant management)	PI, project coordinator	$120,000	$120,000
National Archives and Records Administration	Federal Agency or Office	Personnel; Space; Consumable resources	personnel (document management)	None reported	None reported
National Archives Foundation	Nonprofit Organization (excluding Academic Institutions)	Personnel; Other (E&O development)	personnel for E&O development	$20,000	$20,000

Advancement of Agency Mission: Old Weather provided new-to-science historical data for integration into the ICOADS, a fundamental data resource managed by NOAA and utilized across government for weather and climate research. These data were explicitly recovered from historical records to improve NOAA's state-of-the-art retrospective analysis (reanalysis) products such as the NOAA-Department of Energy Twentieth Century Reanalysis. These tools contribute directly to NOAA's mission to understand and predict changes in climate, weather, oceans and coasts, and thereby protect lives and property and increase the safety and efficiency of maritime commerce.

CCS Act Objectives: Create and refine project design; Collect and analyze data; Develop technologies and applications; Solve problems

E.4. Department of the Interior (DOI)

E.4.1. Aquatic Insect Monitoring in Grand Canyon[285]

Sponsoring Agency and Office: U.S. Geological Survey (USGS)

[285] The website for Aquatic Insect Monitoring in Grand Canyon is accessible at:
- https://www.usgs.gov/centers/sbsc/science/citizen-science-light-trapping-grand-canyon
- https://www.usgs.gov/media/audio/outstanding-field-ep-2-citizen-science-your-data-action
- https://blog.nationalgeographic.org/2016/05/05/deeper-grand-canyon-more-communal-colorado-river-revealed-in-new-online-film
- https://youtu.be/2TxLWlrw7y4
- https://vimeo.com/164929241

Authority: Other authority (Organic Act of 1879, The Grand Canyon Protection Act of 1992 (Public Law 102-575))

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Aquatic insects are commonly used to gauge the health of streams and river ecosystems, yet collecting enough samples to adequately characterize a river segment as long as the Colorado River through Grand Canyon (+250 miles) would be essentially impossible using traditional sampling methods. The goal of this project is to monitor the Colorado River ecosystem and its response to flow management from dams, particularly Glen Canyon Dam. Aquatic insects are the cornerstone of food webs in and around rivers. Quantifying the abundance and diversity of aquatic insects over time and space is important to understanding the health of river ecosystems and how rivers are affected by dam management policies. Since 2012, our group has been collaborating with river guides, private boaters, and educational groups to deploy light traps to collect adult aquatic insects in this river segment. Every night in camp, citizen scientists set out a light trap at the river's edge for one hour at dusk. Traps consist of a fluorescent black light placed on top of a plastic pan containing ethanol. At the end of the hour, the sample is poured into a bottle, and eventually brought back to the lab where its contents are counted and identified by USGS personnel. These citizen scientists have generated an impressive quantity of samples and data that allows us to ask and answer questions about the Colorado River that are truly unprecedented in scale and yielding fundamentally new insights into the Colorado River ecosystem. Our results demonstrate that the abundance and diversity of aquatic insects in the Colorado River is constrained by hydropower production at Glen Canyon Dam. These results informed the design of experimental Bug Flows that have been released from Glen Canyon Dam in 2018 to 2020 to try to improve the health of the Colorado River ecosystem.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Database development; Data entry or/and analysis; Training	Purchase of consumable materials; Database development; Data entry or/and analysis; Training
Approximate FTEs	3	3
Approximate Funding	$30,000	$30,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Better understand the health of streams and river ecosystems)

Justification for Using CCS: Citizen science has been essential and critical to the success of this project. Sampling aquatic insects on a large scale over long periods of time is impossible for typical research groups of only a few people. However, sampling aquatic insects on a large scale, over long periods of time, can be achieved by working cooperatively with people who are on the river every day, like professional river guides and private boaters. Because of this citizen science collaboration, USGS researchers have been able to collect samples of aquatic insects across the entire Colorado River Basin throughout the entire year. From 2012 to 2020, USGS scientists collected 1,216 light trap samples and citizen scientists on commercial, private, and educational trips collected 8,045 samples. For every light trap sample collected by USGS personnel in Grand Canyon, 6.6 samples were collected by citizen scientists. An additional 1,623 samples were collected in Colorado River Basin outside of Grand Canyon, primarily by citizen scientists. More than 300 individuals have collected samples on river trips. Most samples were collected by commercial river guides that have different clients on each trip, so an estimated 2,500+ individuals have been on river expeditions that collected light trap samples in the Colorado River Basin.

Participants:

Intended Participants: Pre-k through 8th grade students; 9th-12th grade students; Other (Youth, Professional river guides, Private boaters, Educational groups - The project targets anyone river rafting on the Colorado River through the Grand Canyon.)

Underrepresented Groups: Indigenous populations; Women and girls

Emphasized Populations: None reported

Participation:

Activity Open Date: 04-2012

Anticipated End Date: 10-31-2030

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	100
FY20	100

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Colorado River, Grand Canyon, Arizona

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates; Other (Every night in camp, citizen scientists set out a light trap at the river's edge for one hour at dusk. Traps consist of a fluorescent black light placed on top of a plastic pan containing ethanol. At the end of the hour, the sample is poured into a bottle, and eventually brought back to the lab where its contents are counted and identified by USGS personnel. Although some participants are truly unpaid volunteers, USGS does offer a modest stipend for each sample provided and most participants choose to accept the stipend.)

Results: This project led to a change in flow management policies at Glen Canyon Dam starting in 2018. Specifically, during times when hydropower demands were lowest, flow releases were adjusted to try to enhance aquatic insect abundance and diversity. These Bug Flows were tested at Glen Canyon Dam from May to August of 2018-2020 and news of the flow experiment has been widely reported in mass media including the New York Times, Washington Post, and US News & World Report.[286]

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access:

1) Kennedy, T.A., Muehlbauer, J.D., Yackulic, C.B., Lytle, D.A., Miller, S.W., Dibble, K.L., Kortenhoeven, E.W., Metcalfe, A.M., and Baxter, C.V. (2016). Flow Management for Hydropower Extirpates Aquatic Insects, Undermining River Food Webs: BioScience, Volume 66, Issue 7, 01 July 2016, pp 561-575. https://doi.org/10.1093/biosci/biw059.
2) Grand Canyon Aquatic Ecology Web Application: https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=dc10c33b399c4578abc4db368a90a8f5
3) Grand Canyon Citizen Science Story Map: https://usgs.maps.arcgis.com/apps/MapSeries/index.html?appid=0c7ec4cb0cfc46928f6b6c8a7ffe82f9&
4) Metcalfe, A.N., Muehlbauer, J.D., Kennedy, T.A., and Ford, M.A. (2020). Bug flows: Don't count your midges until they hatch. 32. 8:11, https://www.gcrg.org/bqr/pdfs/32-4.pdf.

   Metcalfe, A.N. (2020). Insect catch rates and angler success data during Bug Flows at Glen Canyon Dam, 2012-2018: U.S. Geological Survey data release, https://doi.org/10.5066/P9WA8D0G.
5) Metcalfe, A., Muehlbauer, J., Kennedy, T., Yackulic, C., Dibble, K., & Marks, C. (2020). Net-spinning caddisfly distribution in large regulated river. Freshwater Biology, 66(1): 89-101. https://doi.org/10.1111/fwb.13617.

[286] "Bug Flow" experiments at Glen Canyon Dam during 2018 – 2020 widely reported in mass media:
- https://www.usgs.gov/media/audio/outstanding-field-ep-2-citizen-science-your-data-action
- https://nypost.com/2019/05/06/its-getting-extremely-buggy-at-the-grand-canyon/
- https://undark.org/2018/02/16/wilo-doyle-colorado-river-insects/
- https://www.tu.org/magazine/bugs-unlimited/
- https://www.wapa.gov/newsroom/NewsFeatures/2020/Pages/Bug-flow-experiment-supports-the-Colorado.aspx
- https://www.watereducation.org/western-water/can-steadier-releases-glen-canyon-dam-make-colorado-river-buggy-enough-fish-and

6) Muehlbauer, J.D., Lupoli, C.A. and Kraus, J.M. (2019). Aquatic–terrestrial linkages provide novel opportunities for freshwater ecologists to engage stakeholders and inform riparian management. Freshwater Science, 38(4), pp.946-952. https://doi.org/10.1086/706104.
7) Making Waves Podcast Episode on "River Guides are Science Guides": https://freshwater-science.org/news/making-waves-ep-49

Product Description:

1) *BioScience* article "Flow Management for Hydropower Extirpates Aquatic Insects, Undermining River Food Webs": The predictions presented in this journal article are supported by a more than 2,500 sample of citizen science data set of aquatic insects from the Colorado River in the Grand Canyon and by a survey of insect diversity and hydropeaking intensity across dammed rivers of the Western United States.
2) Grand Canyon Aquatic Ecology Web Application: This application allows for the exploration of a select set of insect emergence data collected as part of a citizen science project initiated by the Grand Canyon Monitoring and Research Center (GCMRC). Data present in this application relate to the BioScience publication from USGS scientists and collaborators that investigated the effects of dam operations on downstream aquatic insects, and subsequently, entire river food webs.
3) Grand Canyon Citizen Science Story Map: This story map application provides an interactive map showing light trap locations along the Colorado River as well as other content further describing this Citizen Science initiative. Data are currently available for the years 2012 through 2014, with more recent efforts coming soon.
4) "Bug Flows" article and "Insect catch rates and angler success" supplementary data: These data were compiled to evaluate the effects of low steady weekend flows on emergent aquatic insects during the first year of experimental Bug Flows below Glen Canyon Dam (2018) and recreation in Glen Canyon in the second year of Bug Flows (2019). These data were compiled for an outreach article providing Citizen Scientists with an update on ongoing research evaluating the effects of Bug Flows. The purpose of the data are to provide a preliminary update on the effects of Bug Flows on aquatic insect production and recreation to the river running community in the greater Grand Canyon community. The majority of these data were collected by river runners participating in a Citizen Science project. While this data release is only a subset of ongoing data collection and analysis, it is important to provide outreach and progress updates to community partners engaged in Citizen Science powered research.
5) This journal article reports on how they collaborated with more than 200 citizen scientists to collect 2,194 light trap samples across 2 years and more than 2,000 river km. Samples contained 16,222 net-spinning caddisfly (*Hydropsyche*) individuals across six species. The results show that net-spinning caddisflies have species-specific responses to environmental variation and suggest that environmental flows designed to reduce diel stage change and destabilise water temperatures may improve habitat quality for these ubiquitous and important aquatic insects.
6) This journal article presents three case studies as examples of how aquatic–terrestrial linkages research can be leveraged to achieve multifaceted goals of improving riparian and freshwater management, engaging stakeholders, and advancing ecological understanding. In the 3rd case study, terrestrial vertebrates feeding on adult aquatic insects are used to show how research into aquatic–terrestrial subsidies connects freshwater ecologists, youth groups, and commercial river guides. By focusing on how in-stream processes propagate onto land through ecological subsidies, they argue that freshwater ecologists also gain a platform for

communicating their science to riparian managers and the public, which can improve the potential for stream and riparian co-management and restoration success.

7) The "Making Waves" podcast for Society for Freshwater Science developed an episode called "River guides are science guides" that discusses their use of citizen science to explain the connections between river guides, science, and conservation. River guides aren't just aquatic athletes and tourism specialists. They're contributors to scientific knowledge, important figures to both western science and traditional Indigenous knowledge.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Bureau of Reclamation (USBR)	Federal Agency or Office	Funding	None reported	$250,000	$250,000
Grand Canyon National Park	Federal Agency or Office	Other (Research permits; Outreach)	None reported	None reported	None reported
Western Area Power Administration (WAPA)	Federal Agency or Office	Funding	None reported	$25,000	None reported

Advancement of Agency Mission: The mission of the USGS Grand Canyon Monitoring and Research Center is providing science in support of adaptive management experimentation at Glen Canyon Dam. This project has fundamentally advanced this mission by identifying links between flow management policies and the health of river food webs, including native endangered fish and highly valued sport fish like rainbow trout. This citizen science effort allows us to ask and answer questions about the Colorado River that are truly unprecedented in scale, such as how hydropower releases from Glen Canyon Dam affect aquatic insect populations and the health of river food webs, how the phenology (seasonal timing) of aquatic insects varies by species and with distance downstream from the Dam, and how aquatic insect populations vary from year-to-year throughout the entire Grand Canyon.

CCS Act Objectives: Conduct scientific experiments; Collect and analyze data

E.4.2. Denali National Park and Preserve Snowshoe Hare Pellet Project[287]

Sponsoring Agency and Office: National Park Service (NPS)

Authority: Other authority (NPS Organic Act)

Status:

FY19: Ongoing

[287] There was no website provided for Denali National Park and PreserveSnowshoe Hare PelletProject.

FY20: Ongoing

CCS Activity Summary: Snowshoe hare are an important species in boreal and subarctic ecosystems. Standardized fecal pellet surveys are a common tool for estimating the abundance of hares on the landscape. In this project, student groups perform the pellet surveys and learn about wildlife and wildlife research. The goal is to provide high quality information to resource managers while providing teen-aged students opportunities to participate in the scientific process, immerse themselves in a natural ecosystem, and contribute to knowledge and stewardship of the park.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Other (Staff salaries)	Purchase of consumable materials; Other (Staff salaries)
FTEs	0.27	0.27
Funding Estimate	$600	$1,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Citizen science is the only appropriate mechanism to achieve education and outreach goals because it involves students directly in data collection and other aspects of the scientific process. Other mechanisms (contracts, etc.) cannot achieve those goals even if they enable data collection.

Participants:

Intended Participants: 9th-12th grade students

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 06-01-2016

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: None reported

FY	**Number of Individuals**
FY19	60
FY20	15

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Denali National Park and Preserve

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected

Results: The data become part of Denali National Park and Preserve's (DNPP) wildlife data set, used for resource management and further research.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: Results are available to the public upon request of the project coordinator.

Partnerships: The crowdsourcing or citizen science activity involved 1 partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Alaska Geographic	Nonprofit Organization (excluding Academic Institutions)	Personnel	Assist with leading student groups	$960	None reported

Advancement of Agency Mission: The NPS is charged with preserving natural resources inside parks, including wildlife populations. This project advances the mission by providing scientific information that informs preservation.

CCS Act Objectives: Collect and analyze data

E.4.3. Did You Feel It? (DYFI)[288]

Sponsoring Agency and Office: U.S. Geological Survey

Authority: Other authority (Organic Act of 1879, Earthquake Hazards Reduction Act (National Earthquake Hazards Reduction Program (NEHRP), 42 U.S.C. 7701)

[288] The website for Did You Feel It? (DYFI) is accessible at:

- https://earthquake.usgs.gov/data/dyfi
- https://earthquake.usgs.gov/earthquakes/eventpage/tellus
- https://earthquake.usgs.gov/data/dyfi/summary-maps.php
- https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=9310990e7ce84e3b8567109616b0944d

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The U.S. Geological Survey (USGS) Did You Feel It? (DYFI) system is an automated system for rapidly collecting macroseismic intensity data from internet users through shaking and damage reports and generating intensity maps immediately following earthquakes. Although the collection and assignment of DYFI-based Macroseismic Intensity (MI) data depart from traditional assignments, they are made more quickly, provide more complete coverage at higher spatial resolution, offer citizen input and interaction, and allow data collection at rates and quantities that were not previously possible. These aspects of internet-based data collection, in turn, allow for data analyses, graphics, and ways to communicate with the public, opportunities that were not feasible with traditional data collection approaches. DYFI decimal MI assignments are based on regression against traditional MI, and geocoding allows for spatial averaging; both of these strategies facilitate quantitative data analyses. DYFI questionnaire can be found at: https://earthquake.usgs.gov/earthquakes/eventpage/tellus. The Did You Feel It? (DYFI) project is designed to gather information available about earthquakes from the people who experience them. By tapping an immense number of users online that just felt an earthquake, DYFI can get a detailed characterization of what people were experiencing during the earthquake, the impacts of the earthquake, and the amount of damage it caused, beyond the scope of traditional information gathering techniques. Data input from users is immediately available on the website, and its interactive platform encourages users to gain a deeper understanding of earth sciences while they participate. The DYFI data are used to inform earthquake response and scientific studies about earthquake shaking and damage.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Database development; Software development; Contracted services	Web portal or application development and support; Database development; Software development; Contracted services
FTEs	1	1
Funding Estimate	$60,000	$62,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: DYFI is fundamentally an ongoing citizen science endeavor. The DYFI project taps into a natural crowdsourcing and citizen science (CCS) audience to report the shaking experienced at their location felt immediately after earthquakes. It is one of the most suitable and

cost effective uses of CCS, since participants are eager to share their observations with the Federal Government, and USGS seismologists and scientists benefit from this citizen science data.

Participants:

Intended Participants: Other (People that felt an earthquake or some kind of shaking)

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 12-1999

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	200,000
FY20	200,000

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Any location around the world where earthquakes occur or where shaking is felt.
Virtual Activity	Activity occurs online by volunteers filling out an online questionnaire about observations of their physical location where shaking was felt.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates; Other (At least three questions are required but a total of 20 questions on the occurrence, extent, and nature of shaking effects.)

Results: DYFI also allows for valuable positive interactions of the citizenry with a Federal science agency. The widespread adoption of DYFI along with ShakeMap has facilitated the general acceptance of the very concept of shaking intensity, fundamentally improving our agency's ability to communicate both hazard and risk to the population. ShakeMap provides the macroseismic intensity, which is a classification of the severity of ground shaking based on the shaking level experience and observed effects. DYFI effectively confirms the importance of reporting and inculcating the public's understanding of intensity in addition to magnitude for a proper perspective of earthquake risk

related decision-making. Furthermore, the vast amount of DYFI data allows for data-rich analyses of otherwise intractable seismological, sociological, and earthquake impact studies, such as quantifying the shaking due to induced earthquakes, human response and risk perception, relating recorded shaking metrics to macroseismic effects, and the attenuation of intensity with magnitude and distance.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://earthquake.usgs.gov/data/dyfi/summary-maps.php and http://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=9310990e7ce84e3b8567109616b0944d

Product Description: Individual intensity reports are not made publicly available since they may contain Personally Identifiable Information (PII). Aggregated data for each earthquake are available online at the ZIP code level, and both 10-km and 1-km geocoded cells. Data are available in a variety of formats: ASCII/CSV, geoJSON, GIS, KML, web, and via data feeds at: https://earthquake.usgs.gov.

Partnerships: No partners were indicated.

Advancement of Agency Mission: For the past 20 years the DYFI system has collected shaking and damage reports from internet users immediately following earthquakes around the globe. DYFI has become vital for collecting macroseismic data for all felt seismic events in the United States, and it is also one of the most popular interactive websites within the Federal Government. DYFI gives the USGS a quick indication of the occurrence, extent, and nature of shaking effects. DYFI data are automatically used as constraints in the USGS ShakeMap system, which is the hazard input for the USGS Prompt Assessment of Global Earthquakes for Response (PAGER) system; both of these systems are vital post-earthquake information tools used by USGS, emergency responders, Federal Emergency Management Agency (FEMA), other disaster managers, the media, and the public.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data

E.4.4. FLOW PERmanence (FLOwPER)[289]

Sponsoring Agency and Office: U.S. Geological Survey

Authority: Other authority (Organic Act of 1879)

Status:

FY19: Launched

[289] The website for FLOW PERmanence (FLOwPER) is accessible at:

- https://www.usgs.gov/center-news/flowper-user-s-guide-collection-flow-permanence-field-observations
- https://arcg.is/0a4iGi0
- https://doi.org/10.3133/ofr20201075
- https://www.fs.usda.gov/pnw/projects/western-oregon-stream-flow-permanence-flowper
- https://www.fs.usda.gov/pnw/sites/default/files/FLOwPER%20flyer%20June2020.pdf

FY20: Ongoing

CCS Activity Summary: The accurate mapping of streams and their streamflow conditions in terms of presence or absence of surface water is important to both understanding physical, chemical, and biological processes in streams and to managing land, water, and ecological resources. The FLOW PERmanence (FLOwPER) field form provides standardized data collection to map the presence of flow in streams and upload the input data to an ArcGIS database. These data can be used for multiple purposes, such as archiving where flowing water is present in forest planning units, informing modeling efforts of streamflow permanence, and providing information needed to update stream classifications across any spatial extent. FLOwPER uses the ArcGIS Online (AGOL) Survey123 platform, which operates on a variety of mobile devices, including those from agencies and personal mobile devices. FLOwPER is designed for seamless communication with ArcGIS Online for easy uploading of collected observations into a publicly available master database (FLOwPER Database) that can include any geographic region. FLOwPER focuses on the rapid collection of a set of simple visual observations that can be recorded from a road over a stream or while standing on the bank of a stream. Use of FLOwPER requires a mobile device that can access the FLOwPER field form through the Survey123 app and an accurate Global Positioning System (GPS) antenna with a rated accuracy of 1 meter or less. With crowdsourced observations collected by many users of FLOwPER, it is possible to collect a large number of observations from a wide geographical range from all parts of the stream network at any time of the year. Although seasonal drying of streams is often of interest, FLOwPER can be used to evaluate patterns of flow permanence at any time of year, including times when stream networks are greatly expanded during wet cycles. To access FLOwPER, log in at https://arcg.is/0a4iGi0. Users must have an organizational AGOL account to request access.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Database development; Software development; Data entry or/and analysis; Training	Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Database development; Software development; Data entry or/and analysis; Training
FTEs	0.25	0.5
Funding Estimate	$50,000	$75,000

Goal Types: Collection of data or observations; Create or engage a specific community; Other (The goal of the FLOwPER project is to use the latest technology to more accurately characterize stream flow permanence and to increase the efficiency of collecting field observations into a standardized database. The open and flexible nature of the FLOwPER application allows internal collaborators, partners, and cooperators to seamlessly contribute to the field data collection effort for headwater streams either opportunistically or as part of an existing study design. Data collected by FLOwPER will contribute to updating stream classifications, where streams exist, and flow permanence.)

Justification for Using CCS: FLOwPER is designed to collect and classify streamflow conditions more efficiently and accurately in a quick and easy way. This flexible GIS mobile app standardizes the collection of field observations and leverages the advantages of cloud storage technology to support the spatio-temporal modeling required to characterize stream flow permanence of headwater streams. The FLOwPER mobile app enables us to crowdsource the collection of these field observations at a much larger scale, at a wider geographical range from all parts of the stream network, and at any time of the year. We target internal collaborators, partners, and cooperators to contribute to FLOwPER either opportunistically or as part of an existing study design, since they already are conducting field work in remote, hard to access areas, use a high-precision GPS device, and have specialized knowledge of stream flow conditions.

Participants:

Intended Participants: Other (Field personnel in USGS and other partner agencies (Bureau of Land Management (BLM), United States Forest Service (USFS), NPS, United States Fish and Wildlife Service (FWS), Environmental Protection Agency (EPA); Accessible to others with an Organizational AGOL account using a high-precision GPS device))

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 08-2019

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	15
FY20	100

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	FLOwPER data collection occurs in forested streams throughout Oregon, western Washington, and Idaho.
Virtual Activity	FLOwPER data collection occurs through the FLOwPER field form in the Survey123 mobile app to allow users to submit streamflow observations with an external GPS device directly from the field. Currently, these observations are being collected throughout Oregon, western Washington, and Idaho.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates; Other (FLOwPER refers to flow permanence, or whether streams have water throughout the year. The FLOwPER field form is available in the Survey123 and S1 Mobile Mapper mobile apps. Users record their field observations by filling out the FLOwPER field form, but it requires a high-precision GPS device and specialized knowledge on stream classifications and how to characterize stream flow permanence of headwater streams.)

Results: Stream classifications have a host of implications for regulations that apply to land and water uses. We are working across Federal and State agencies and private groups across the United States to adopt FLOwPER on a long-term basis to measure, model, and map status and trends of flow permanence in the millions of miles of waters that lack formal instrumentation for tracking streamflow conditions. Data will be used to develop and improve streamflow permanence models, which will be used to inform land management decisions regarding water resources. Streamflow permanence also influences forest management and planning activities. FLOwPER data can help reduce the cost of pre-project planning and monitoring of these activities. Improved understanding of flow permanence may also help define the upstream limit of fish distributions, estimate habitat suitability for various aquatic species, and potentially enhance our understanding about the influence of changing climate on flow permanence. The results of this project will also feed into efforts to update the USGS National Hydrology Dataset and streamflow classifications.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Heaston, E.D., Jaeger, K.L., Burnett, J., Wondzell, S., Chelgren, N., Dunham, J.B., and Johnson, S., 2020, FLOwPER Database: StreamFLOw PERmanence field observations, August 2019 - October 2019: U.S. Geological Survey data release, https://doi.org/10.5066/P91ZA4J4 .

Product Description:

The FLOwPER Database StreamFLOw PERmanence field observations from August 2019 - October 2019 includes Shapefiles with spatial locations where streamflow permanence observations (continuous flow, discontinuous flow, and dry) were recorded using FLOwPER. Photographs associated with FLOwPER data points are included. Field observations in the FLOwPER Database have not been processed for quality control including spatial data accuracy or association with a stream network. Observations are collected from several governmental and non-governmental organizations on a continuing basis.

Partnerships: The crowdsourcing or citizen science activity involved 2 partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
U.S. Forest Service (USFS)	Federal Agency or Office	Funding; Personnel; Consumable resources; Online support	Survey development, Publication, Training, Outreach	$75,000	$50,000
Bureau of Land Management (BLM)	State or Local Government	Funding; Personnel	Funding, Data collection	$10,000	$25,000

Advancement of Agency Mission: The accurate mapping of streams and their streamflow conditions is important to the understanding of physical, chemical, and biological processes in streams and how to better manage land, water, and ecological resources. However, streamflow classifications across the Nation are not up-to-date. FLOwPER enables us to rapidly update streamflow classifications and streamflow conditions to advance the understanding of flow permanence. By crowdsourcing these observations from trusted and expert users that understand streamflow conditions, this dramatically increases the density and geographic extent in data sparse areas. FLOwPER data can also be used for multiple purposes, such as archiving where flowing water is present in forest planning units, informing modeling efforts of streamflow permanence, and providing information needed to update stream classifications across any spatial extent.

CCS Act Objectives: Collect and analyze data

E.4.5. George Washington Memorial Parkway All Taxa Biodiversity Inventory[290]

Sponsoring Agency and Office: National Park Service

Authority: Other authority (NPS Organic Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Volunteers help the NPS inventory insect species in the park. They use microscopes in a field laboratory to sort and identify insects that were captured in traps set by NPS staff and volunteers. The goals are more complete information about biodiversity that the park is charged with preserving, and more opportunity for public volunteers to learn science and contribute to public lands stewardship.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[290] There was no website provided for George Washington Memorial Parkway All Taxa Biodiversity Inventory.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Other (Curatorial supplies)	Purchase of consumable materials; Other (Curatorial supplies)
FTEs	0.25	0.25
Funding Estimate	$41,500	$41,500

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Other (Help with park staff workload)

Justification for Using CCS: With training, this work can be accomplished using volunteers, at no cost to the government, and is much simpler than going through a government contracting award or cooperative agreement.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 05-1-2008

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	12
FY20	12

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	McLean, VA

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants processed data or other materials provided by the agency

Results: We have a better understanding of species' presence or absence, abundance, and location so we can track change over time—including new species. We use these results to inform planning processes and resource management actions.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://irma.nps.gov/DataStore/SavedSearch/Profile/3797

Product Description: Published peer reviewed journal articles that report insect biodiversity and taxonomy based in part on specimens collected and processed by volunteers.

Partnerships: No partners were indicated.

Advancement of Agency Mission: Without the help of volunteers, staff would not have the time to sort through each of the samples and thus our knowledge of the park's biodiversity would be much less than it is today. The project enables the park to achieve the NPS mission by informing resource management and providing for public enjoyment of the park.

CCS Act Objectives: Collect and analyze data; Make discoveries

E.4.6. Great Smoky Mountains National Park Species SnapIt & MapIt[291]

Sponsoring Agency and Office: National Park Service

Authority: Other authority (NPS Organic Act)

Status:

FY19: Launched

FY20: Ongoing

CCS Activity Summary: The Species SnapIt & MapIt project empowers visitors to Great Smoky Mountains National Park to record and report valuable information about the animals, plants and other organisms they see in the park. Participants are encouraged to look for certain under-studied species in the park and to share their observations using an app called iNaturalist. Their observations are used to develop new species distribution maps for a public NPS web tool called Atlas of the Smokies. This tool allows users to visualize where a species has been found across the park and see where else it is likely to occur, based on a number of environmental factors. Park officials use these maps to make informed land management decisions, while researchers use them to better understand the spatial distribution of life across the Smokies.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[291] The website for Great Smoky Mountains National ParkSpeciesSnapIt& MapIt is accessible at https://dlia.org/snapit-mapit.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	N/A: no agency funds or other non-employee resources were used	N/A: no agency funds or other non-employee resources were used
FTEs	0	0
Funding Estimate	$0	$0

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: The large size and mountainous terrain of Great Smoky Mountains National Park make it a challenge for park officials and researchers to gather location records for each of the 20,000 plus species that call the park home. However, the park is visited by millions of annual visitors, many of which carry smartphones with them. We saw this as an opportunity to engage visitors in learning about the park's biodiversity and gather valuable scientific data at the same time. The cumulated contribution of participants provides more data than the NPS could ever afford to collect without their help.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 03-2019

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	1,220
FY20	1,267

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Great Smoky Mountains National Park (Tennessee and North Carolina)
Virtual Activity	Great Smoky Mountains National Park (Tennessee and North Carolina)

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: Data gathered through this project will be used to develop Species Distribution Models for species of Great Smoky Mountains National Park, which will be added to the Park's existing public web tool called Atlas of the Smokies and to its GIS data library in the National Park Service information portal Data Store (https://irma.nps.gov/DataStore/). The GIS layers derived from this data allow the Park to identify biodiversity hotspots, map overlaps with potential stressors and impacts, and assess impacts of proposed actions through the compliance process. Identification of biodiversity hotspots can be used to direct visitors interested in experiencing diversity of certain species groups, such as birds or dragonflies. Participants also become more engaged in conservation of the Park's natural resources by their involvement. Scientific research can build on this data.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Raw species observations are available on iNaturalist at https://www.inaturalist.org/projects/discover-life-in-america-atbi and species maps are available from Atlas of the Smokies at http://nationalparks.utk.edu/species/.

Product Description: Species observations are geo-tagged records on iNaturalist, which include evidence in the form of photos and/or recorded sounds. These can be downloaded from inaturalist.org. Species maps are dynamic, customizable, multi-layered maps that can be visualized through a web browser interface.

Partnerships: The crowdsourcing or citizen science activity involved 1 partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Discover Life in America	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Consumable resources; Online support	Coordinates and manages the project.	$11,000	$13,000

Advancement of Agency Mission: This project provides data on biodiversity, allowing the Park to be better conserved and increasing public knowledge about the Park. Scientific research can build on this data. The public can access results through NPS interfaces, such as Atlas of the Smokies. The GIS layers derived from these data allow the Park to identify biodiversity hotspots, map overlaps with potential stressors and impacts, and assess the impacts of proposed management and development

actions through the environmental review and compliance process. Participants also become more engaged in conservation of the Park's natural resources by their involvement.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Make discoveries; Solve problems

E.4.7. Indiana Dunes National Park Chronolog Environmental Monitoring[292]

Sponsoring Agency and Office: National Park Service

Authority: Other authority (NPS Organic Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Visitors have the opportunity to be a community scientist by taking photographs at five landscape monitoring locations in Indiana Dunes National Park and submitting them to a web-based system called Chronolog. In return, the visitor receives an e-mail with a description and a time-lapse video of the restoration work being monitored at that location. The photographs help the park and its partners monitor and understand landscape change following restoration activities.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Web portal or application development and support; Contracted services	Purchase or rental of equipment; Web portal or application development and support; Contracted services
FTEs	0.01	0.01
Funding Estimate	$600	$800

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Utilizing Chronolog photo monitoring allows visitors to be engaged in long-term restoration projects and develop a better understanding of the park's habitats, instead of just seeing one moment in time. Other mechanisms to enable science cannot provide this benefit.

[292] The website for Indiana Dunes National Park Chronolog Environmental Monitoring is accessible at
- https://www.nps.gov/subjects/citizenscience/be-a-citizen-scientist.htm
- https://www.nps.gov/indu/getinvolved/environmental-monitoring.htm
- https://www.chronolog.io/project/Indiana-Dunes-National-Park.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 04-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Indiana Dunes National Park, Indiana.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: Park resource managers have used these images to observe change in habitats under restoration as well as share these changes with visitors, giving them a better understanding of the dynamic process of restoration and erosion. Images taken at West Beach and Portage Lakefront will be used to document erosion and steer management decisions.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.chronolog.io/project/Indiana-Dunes-National-Park.

Product Description: Chronologic images taken from the five different monitoring stations at the park can be viewed online. Descriptions of the locations are also provided on the website. When an image is submitted, an e-mail is automatically sent thanking the volunteer for participating and includes a time-lapse and description of that particular site.

Partnerships: The crowdsourcing or citizen science activity involved 1 partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Chronolog	Private Industry	Online support	None reported	$300	$300

Advancement of Agency Mission: The park's natural resource management team actively manages and restores thousands of acres of wetlands, oak savannas, and other fragile ecosystems to protect the biodiversity of the park. Engaging visitors by means of Chronolog provides time-series information about the status of habitats and effects of restoration. It also allows visitors to learn about changes in these ecosystems and how to protect them. Therefore, the project advances the NPS mission of preservation and public enjoyment.

CCS Act Objectives: Collect and analyze data

E.4.8. Indigenous Observation Network[293]

Sponsoring Agency and Office: U.S. Geological Survey

Authority: Other authority (Organic Act of 1879)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Indigenous Observation Network (ION) is a collaborative Community-Based Monitoring (CBM) program with both permafrost and water-quality monitoring components operating in the Yukon River Basin (YRB) of Alaska and Canada. ION is jointly facilitated by the Yukon River Inter-Tribal Watershed Council (YRITWC), an indigenous non-profit organization, and the U.S. Geological Survey (USGS), a federal agency. The YRB is the fourth largest drainage basin in North America encompassing 855,000 square kilometers in northwestern Canada and central Alaska and is essential to the ecosystems of the Bering and Chuckchi Seas. Water is also fundamental to the subsistence and culture of the 76 Tribes and First Nations that live in the YRB providing sustenance in the form of drinking water, fish, wildlife, and vegetation. Despite the ecological and cultural significance of the YRB, the remote geography of sub-Arctic and Arctic Alaska and Canada make it

[293] The website for Indigenous Observation Network (ION) is accessible at:
- https://www.usgs.gov/centers/casc-sc/science/yukon-river-basin-indigenous-observation-network
- https://cascprojects.org/#/project/4f831626e4b0e84f6086809b/59efa6d0e4b0220bbd99b1b5
- https://www.sciencebase.gov/catalog/item/59efa6d0e4b0220bbd99b1b5
- https://www.yritwc.org/science
- https://yukon.next.fieldscope.org/
- NSF Grant: Collaborative Research: Indigenous Observation Network 2.0: Impacts of Environmental Change on the Yukon and Kuskokwim Watersheds - https://www.nsf.gov/awardsearch/showAward?AWD_ID=1753389
- NSF Grant: The Yukon River Basin Indigenous Observation Network: Uniting Traditional Ecological Knowledge and Western Science to Address and Understand Water Resources in the Arctic - https://www.nsf.gov/awardsearch/showAward?AWD_ID=1020417

difficult to collect scientific data in these locations and led to a lack of baseline data characterizing this system until recently. In response to community concerns about the quality of the Yukon River and a desire by USGS scientists to create a long-term water-quality database, the USGS and YRITWC collaborated to create ION in 2005. Surface water samples are collected by trained community technicians from Tribal Council Environmental Programs or First Nation Lands and Resources staff from over 35 Alaska Native Tribes and First Nations that reside along the Yukon River and/or one of the major tributaries. Samples are analyzed at USGS laboratories in Boulder, Colorado and more recently the University of Alaska, Fairbanks, and results are disseminated to participating YRB communities and the general public.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Federal employee travel; Training	Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Federal employee travel; Training
FTEs	0.25	0.25
Funding Estimate	$8,255	$8,255

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (ION is a community-based monitoring project that engages Yukon River Basin indigenous communities in Alaska and Canada to complement and capitalize on existing long-term, professional USGS monitoring and research infrastructure in order to combine it with long-term USGS collected data related to water-quality and active layer dynamics data.)

Justification for Using CCS: ION is a Community-Based Monitoring program and a transboundary Indigenous initiative that aims to combine Western Science and Indigenous Knowledge to research, sustain, and protect the water of the Yukon River Basin and empower the Indigenous people of the Yukon River Basin, who are facing the dramatic effects of global environmental change and resource development. ION is supported by a Memorandum of Understanding between USGS and YRITWC, a formal agreement to cooperate and engage in research that incorporates Indigenous culture, knowledge, and perspectives in conjunction with high-quality field, laboratory, and data analysis methods to develop and sustain a baseline water quality monitoring program using protocols and methods derived from the USGS. The community-based monitoring approach has strengthened data quality and credibility, trust and legitimacy, and the use of ION data in decision-making processes.

Participants:

Intended Participants: Other (Community technicians that are staff of Tribal Environmental Program or First Nation Lands and Resources departments in the Yukon River Basin)

Underrepresented Groups: Indigenous populations; Other (Rural Communities in Alaska Native and Canadian First Nation communities in the Yukon River Basin)

Emphasized Populations: Rural populations

Participation:

Activity Open Date: 04-2005

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	16
FY20	10

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	The Indigenous Observation Network takes place in rural communities across the Yukon River Basin in Alaska and Canada. Location of actual sample collection varies year to year based on the interest and availability of community environmental technicians.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates; Other (This is the largest indigenous international monitoring network in the world that has engaged over 300 community members collecting over 2,000 samples across over 30 different parameters. Community technicians are given annual training to perform complex calibration and sample collection procedures to produce high quality data. Specifically, they are trained to collect surface-water geochemistry samples (e.g., water-quality data such as major ions, dissolved organic carbon, and 18O and 2H) and active layer dynamics data (e.g., maximum thaw depth, soil temperature and moisture).To close the loop in how these data are used, participating communities in Alaska use the results of these data to develop climate adaptation plans, which has increased the sustainability of these community-based monitoring programs.)

Results: The results of the Indigenous Observation Network have been used by federal agencies to better understand changing water chemistry in the Yukon River Basin (https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016GL070817). The ION data is publicly available online and our peers in the scientific community have also made use of the active layer data collected in collaboration with community members. ION data has informed important regional

differences in geochemistry and active layer parameters linked to permafrost continuity and tributaries. Understanding these hydrological changes through annual trends and seasonal dynamics with spatial and temporal heterogeneity of the watershed has assisted the global effort to characterize Arctic river fluxes and their relationship to the carbon cycle, weathering, and permafrost degradation to better understand the effects of climate change to inform climate adaption planning for Indigenous communities in the Yukon River Basin.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access:

1) Schuster, P.F., Maracle, K.B., and Herman-Mercer, N. (2010). Water quality in the Yukon River Basin, Alaska, water years 2006–2008: U.S. Geological Survey Open-File Report 2010–1241, 220 p. DOI: https://doi.org/10.3133/ofr20101241.

2) Schuster, P.F. and Herman-Mercer, N.M (2015). Water Quality in the Yukon River Basin, Alaska and Canada, Water Years 2009-2013. DOI: https://doi.org/10.5066/f7sn0706.

3) Toohey, R., Herman-Mercer, N., Mutter, E., Schuster, P., and J. Koch. (2016). Multi-decadal increases in Yukon River Basin chemical fluxes as indicators of changing flowpaths, groundwater, and permafrost. Geophysical Research Letters. DOI: https://doi.org/10.1002/2016GL070817.

4) Herman-Mercer, N.M. (2016). Water-Quality Data from the Yukon River Basin in Alaska and Canada: U.S. Geological Survey data release, http://dx.doi.org/10.5066/F77D2S7B.

5) Herman-Mercer, N.M. (2017). Active Layer Data from the Yukon River Basin in Alaska and Canada: U.S. Geological Survey data release, https://doi.org/10.5066/F7NC5ZFM.

6) Herman-Mercer, N., Antweiler, R., Wilson, N., Mutter, E., Toohey, R., & Schuster, P. (2018). Data Quality from a Community-Based, Water-Quality Monitoring Project in the Yukon River Basin. Citizen Science: Theory and Practice. 3(2), p.1. DOI: http://doi.org/10.5334/cstp.123

7) Nicole J. Wilson, Edda Mutter, Jody Inkster, Terre Satterfield. (2018). Community-Based Monitoring as the practice of Indigenous governance: A case study of Indigenous-led water quality monitoring in the Yukon River Basin. Journal of Environmental Management, Volume 210, 2018, Pages 290-298, ISSN 0301-4797. DOI: https://doi.org/10.1016/j.jenvman.2018.01.020.

Product Description:

1) This PDF report contains water-quality data from samples collected in the Yukon River Basin during water years 2006 through 2008. A broad range of chemical analyses from 44 stations throughout the YRB are presented.

2) This PDF report contains water-quality data from samples collected in the Yukon River Basin during water years 2009 through 2013. A broad range of chemical analyses from 61 locations throughout the YRB are available here.

3) The Yukon River Basin, underlain by discontinuous permafrost, has experienced a warming climate over the last century that has altered air temperature, precipitation, and permafrost. We investigated

a water chemistry database from 1982 to 2014 for the Yukon River and its major tributary, the Tanana River. These trends explained in this PDF report suggest increased active layer expansion, weathering, and sulfide oxidation due to permafrost degradation throughout the Yukon River Basin.

4) This PDF report contains water-quality data from 2009 to 2014 collected as part of a collaborative monitoring project between the US Geological Survey, Yukon River Inter-Tribal Watershed Council, and Yukon River Basin communities known as the Indigenous Observation Network. Through this partnership over 300 community members have been trained in water sample collection, which has resulted in over 1500 samples collected at more than 50 sites covering the entire 2,300 mile reach of the Yukon River since the program began. This program has allowed the USGS to create and maintain a baseline record (long-term at some sites) of water-quality in the river basin, critical for understanding climate change impacts.

5) This PDF report contains the active layer data from 2009 to 2014 collected as part of a collaborative monitoring project between the US Geological Survey, Yukon River Inter-Tribal Watershed Council, and Yukon River Basin communities known as the Active Layer Network (ALN). ALN monitoring sites were installed across the Yukon River Basin, in Alaska and Canada, in 2009 and 2010. Each monitoring site consists of a 45 meter by 45 meter grid and sensors. Active layer depth measurements are taken every 5 meters across the grid resulting in 100 measurements made each year. Sensors installed at each location include soil moisture, soil temperature, and air temperature sensors. Sensor data is collected throughout the year and downloaded annually. Active layer depth measurements and sensor data are presented here.

6) This paper examines the quality of data collected by the Indigenous Observation Network, a community-based water-quality project in the Yukon River Basin of Alaska and Canada. The Indigenous Observation Network relies on community technicians to collect surface-water samples from as many as fifty locations to achieve their goals of monitoring the quality of the Yukon River and major tributaries in the basin and maintaining a long-term record of baseline data against which future changes can be measured. This paper addresses concerns about the accuracy, precision, and reliability of data collected by non-professionals. The data of the Indigenous Observation Network are statistically compared to those collected by professional scientists through a retrospective analysis of a set of water-quality parameters reported by all three projects over a number of years. Our results suggest that Indigenous Observation Network data are of high quality, and with consistent protocols and participant training, community based monitoring projects can collect data that are accurate, precise, and reliable.

7) Indigenous peoples are increasingly developing Community-Based Monitoring (CBM) programs to protect the waters and lands within their territories in response to multiple ecological and political stressors. This paper explores CBM through a governance lens by understanding CBM as a strategy for the assertion of Indigenous sovereignty and jurisdiction. We provide three recommendations to improve linkages between CBM programs and Indigenous governance: Indigenous governments must take a leading role in CBM programs; networked capacity between Indigenous governments can be built using a bridging organization; and CBM programs should be closely coupled with Indigenous environmental governance strategies. Results are derived from interviews with twenty samplers and ten other stakeholders with attention to ways to better inform internal and external decision-making processes.

Partnerships: The crowdsourcing or citizen science activity involved 1 partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Yukon River Inter-Tribal Watershed Council (YRITWC)	Nonprofit Organization (excluding Academic Institutions)	Funding; Personnel; Space; Consumable resources	Program management, Outreach, Training, Consumables, Data entry	$7,632	$7,632

Advancement of Agency Mission: Water information is fundamental to national and local economic well-being, protection of life and property, and effective management of the nation's water resources. The USGS works with partners to monitor, assess, conduct targeted research, and deliver information on a wide range of water resources and conditions including streamflow, groundwater, water quality, and water use and availability. ION achieves the collection of a large amount of water-quality data in an important high latitude watershed that would be impossible to achieve without a community-based network. ION has allowed the USGS to create and maintain a long-term baseline record of water-quality in the river basin, critical for understanding climate change impacts. Measuring the depth of the active layer (soil above the permanently frozen ground) also provides better understanding of climate change effects to permafrost.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Solve problems

E.4.9. Longfellow House Distance Transcriber[294]

Sponsoring Agency and Office: National Park Service

Authority: Other authority (NPS Organic Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Distance Transcriber Volunteer Program at Longfellow House-Washington's Headquarters National Historic Site (NHS) increases digital access to the rich letters and journals in the park's archives. Volunteers from around the country are given access to scans of historic documents and asked to transcribe them, puzzling out 19th century handwriting. This crowd-sourcing project enables the park to increase access to the archives while reducing in-person use and potential damage to this valuable collection. Since the start of the program in March 2020, the park

[294] The website for Longfellow House Distance Transcriber is accessible at https://www.nps.gov/long/getinvolved/volunteer.htm

has signed up 25 volunteers, everyone from a family transcribing together during the COVID-19 pandemic, to teachers stuck at home.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	N/A: no agency funds or other non-employee resources were used	N/A: no agency funds or other non-employee resources were used
FTEs	0	0.04
Funding Estimate	$0	$3,335

Goal Types: Digitization of agency-owned materials; Public outreach or engagement

Justification for Using CCS: The goal of the project is to help digitize the contents of historic documents and create a strong sense of stewardship among the volunteer group. During the COVID-19 pandemic, this project provided a way for participants to feel connected to the site, its history and each other at a time when they could not physically access the archives or fellow volunteers. It is unlikely that the park could fund completion of this same work by a contractor. A contract would not have achieved the agency's goals of connecting people to parks and fostering a stewardship ethic in the broader population.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 11-01-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	0
FY20	23

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Longfellow House-Washington's Headquarters NHS, Cambridge, MA

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants processed data or other materials provided by the agency

Results: Digitized transcriptions of historic documents increase access to park resources for researchers and park staff, who incorporate the rich and diverse stories into books, dissertations, and public programming. Many of the letters and journals preserved in the park archives were written by women. They provide a unique and often underrepresented historic perspective in agency and partner publications.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: The park shares drafts of the transcriptions on request. It intends to publish transcribed documents on https://www.nps.gov/index.htm and https://npgallery.nps.gov/.

Product Description: Currently the archives specialist sends PDF versions of the transcriptions to interested researchers via email. Final products on the website will include text transcriptions and images.

Partnerships: No partners were indicated.

Advancement of Agency Mission: By reading and transcribing the personal writings of people from the past, volunteers are able feel a deep connection to American history preserved by this NPS unit. By digitizing the archives, volunteers enable the park to share information widely online. By creating digital versions of the letters, volunteers help the park to safeguard resources from decay.

CCS Act Objectives: Enable the formulation of research questions; Make discoveries

E.4.10. Nature's Notebook[295]

Sponsoring Agency and Office: U.S. Geological Survey

Authority: Other authority (Organic Act of 1879)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Nature's Notebook is a customizable program used by individual observers and Federal Government partners to document patterns in phenology, the timing of seasonal activity of plants and animals over the course of the calendar year. The USA National Phenology Network (USA-

[295] The website for Nature's Notebook is accessible at:

- https://www.naturesnotebook.org
- https://www.citizenscience.gov/natures-notebook/#
- https://pbskids.org/video/scigirls/2365471131

NPN) established Nature's Notebook in 2009 to create a standard approach for collecting phenology data on plants and animals across the country. Currently, about half of the data are submitted by independent backyard observers at individual sites and half are submitted by groups of participants as part of a Local Phenology Program. The USA National Phenology Network (USA-NPN) is a national-scale monitoring and research initiative focused on collecting, organizing, and delivering phenological data, information, and forecasts. It supports natural resource management and decision-making to advance the scientific field of phenology and promote the understanding of phenology to a wide range of audiences, including researchers, resource managers, educators, communication specialists, non-profit organizations, human health organizations, science networks, and the public.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Training	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Training
FTEs	9.25	8.5
Funding Estimate	$742,158	$182,007

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Support natural resource management and decision-making to advance the scientific field of phenology and promote the understanding of phenology to a wide range of audiences.)

Justification for Using CCS: We opted to develop and maintain a citizen science program for collecting phenology observations because of the great potential for citizen scientists to collect data at a national scale but at a relatively low cost. Engaging volunteers in collecting observations of plant and animal phenology dramatically increases the volume of data that can be amassed, while increasing the taxonomic and geographic breadth that can be covered relative to what paid individuals could accomplish. Furthermore, engaging volunteers in this activity involves them directly in conservation science and management, leading to increases in scientific and environmental literacy.

Participants:

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees; Other (Professional Scientists, Natural Resource Managers, and Amateur Naturalists)

Underrepresented Groups: Hispanic or Latino populations; Indigenous populations; Women and girls

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 03-2009

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	3,950
FY20	3,726

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	National across the United States. The activity occurs in physical locations anywhere in the United States where participants can observe the phenology of plants and animals.
Virtual Activity	The phenology observations can be collected on paper, through a mobile app, or online at a computer logged into Nature's Notebook.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates; Other (Consistently observe and record observations of changes in plants and animals in a routine way depending on the species and/or season.)

Results: Data are used by university or government scientists for research on topics ranging from understanding, detecting and controlling plant invasions; predicting effects of frost on tree fruit crops; documenting drought impacts on corn and soybean production; and validating satellite-based assessments of foliage coloration in autumn. About 100 peer-reviewed articles have been published in high-quality ecological journals. All information products with USGS authors are compliant with Fundamental Science Practice review, approval and release standards established by the Office of Science Quality and Integrity. Data are also used by Federal, municipal and Tribal natural resource managers for field-based decision-making. For example, managers have used the data to plan restoration of degraded habitats in flood-plains; to map invasive plant species to support detection and control activities; to prioritize habitat for migratory animals such as birds and monarch butterflies; to understand patterns of tree pollen production as a hazard to human health; and to plan street-sweeping activities designed to improve water quality in local municipalities.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access:

- https://www.usanpn.org/data
- https://www.usanpn.org/data/observational
- https://www.usanpn.org/nn/connect/visualizations
- https://www.usanpn.org/data/maps
- https://www.usanpn.org/data/quality
- https://doi.org/10.3133/ofr20181060

Product Description: The USA-NPN offers two suites of data products: observational data and phenology maps. These products are freely available for download and use for research, management, and outreach needs and can be explored via the Visualization Tool. The USA-NPN National Coordinating Office freely and readily delivers observational data on plant and animal phenology collected through Nature's Notebook in several formats, including minimally processed status and intensity datasets as well as derived phenometrics for individual plants, sites, and regions. The following document describes the suite of observational data products delivered by the USA National Phenology Network, covering the period 2009–present for the United States and accessible via the Phenology Observation Portal (http://dx.doi.org/10.5066/F78S4N1V) and via an Application Programming Interface: Rosemartin, A.H., E.G. Denny, K.L. Gerst, R. L. Marsh, T.M. Crimmins, and J.F. Weltzin. 2018. USA National Phenology Network Observational Data Documentation. U.S. Geological Survey Open-File Report 2018-1060 https://doi.org/10.3133/ofr20181060.

Partnerships: The crowdsourcing or citizen science activity involves over 300 partners. The following table lists the five primary partners and their contributions.

Partner Name	**Partner Type**	**Contribution Type(s)**	**Personnel Contributions**	**FY19 Contribution**	**FY20 Contribution**
US Fish and Wildlife Service (FWS)	Federal Agency or Office	Funding; Personnel	Coordination on monitoring	$175,354	$187,269
National Park Service (NPS)	Federal Agency or Office	Personnel; Other (Volunteer participation; Stakeholder engagement)	Coordination on monitoring	None reported	None reported
National Aeronautics and Space Administration (NASA)	Federal Agency or Office	Funding	None reported	$73,866	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Audubon Society	Nonprofit Organization (excluding Academic Institutions)	Other (Volunteer participation)	None reported	None reported	None reported

Advancement of Agency Mission: USGS science protects and conserves the nation's fish and wildlife heritage by bridging the gap between science and management for at-risk species and species of management concern. Within the Ecosystems Mission Area, the Status and Trends Program which funds the USA-NPN, provides (1) science, technology, and information that resource managers use to understand the current condition or status of plants, animals, and habitats under management responsibility of Interior bureaus and other Federal, State, and Tribal partners, and (2) collects, analyzes, and delivers data and information about past and potential future changes to species and habitats.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Make discoveries; Solve problems

E.4.11. The National Map Corps (TNMCorps)[296]

Sponsoring Agency and Office: U.S. Geological Survey

Authority: Other authority (Organic Act of 1879)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The National Map Corps (TNMCorps) is a crowdsourcing program that is part of the U.S. Geological Survey (USGS) National Geospatial Program's The National Map, which collaboratively improves and delivers topographic information for the nation. The National Map is free to the public and the government, and its uses range from disaster planning and emergency response to scientific analysis and recreation. The use of TNMCorps, which encourages citizen participation in volunteer map data collection activities, will result in more complete, current, and accurate national datasets for The National Map.

[296] The website for The National Map Corps (TNMCorps) is accessible at:

- https://www.usgs.gov/core-science-systems/ngp/tnm-corps
- https://youtu.be/-ANP-n0Wrko
- https://edits.nationalmap.gov/tnmcorps
- https://www.usgs.gov/news/step-challenge
- https://www.usgs.gov/core-science-systems/ngp/tnm-corps/newsletters
- https://www.citizenscience.gov/the-national-map-corps/#
- https://www.volunteer.gov/s/volunteer-opportunity/a09t0000008GtXWAA0/volunteer-map-editor

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis; Training	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis; Training
FTEs	None reported	None reported
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Other (Update and verify structures data that will contribute to and enhance the USGS National Structures Database, The National Map, and U.S. Topo Maps.)

Justification for Using CCS: The USGS National Geospatial Program (NGP) is currently pursuing a two-pronged approach for acquiring and maintaining structures data (e.g., data on schools, hospitals, post offices, fire stations, cemeteries, and other important public buildings). Where available the program is seeking authoritative national sources. To fill the gaps and improve the completeness, currency, and accuracy of the structures data, NGP's strategy is to deploy The National Map Corps (TNMCorps) in using new technologies and internet services to enable members of the public to produce volunteered geographic information (VGI) that will update and enhance the datasets.

Participants:

Intended Participants: 9^{th}-12^{th} grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees; Other (Anyone that can go online; Retired and Novice Geographers, Cartographers, Mappers)

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 03-2012

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	611
FY20	762

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	National - All 50 states, Puerto Rico, and the U.S. Virgin Islands

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates; Other (Update and verify the locations, names, and addresses of public structures, such as schools, hospitals, police stations, cemeteries, and other important public buildings. Volunteers are awarded Virtual Recognition Badges the more they contribute. Volunteers can also become a Peer Reviewer when they have contributed more and improved other updates and verifications from other volunteer contributions.)

Results: The use of The National Map Corps encourages citizen participation in volunteer map data collection activities and has resulted in more complete, current, and accurate (position and attributes) national datasets in The National Map, which is free to the public and the government and has many uses ranging from disaster planning and emergency response to scientific analysis and recreation. The volunteer effort of TNMCorps to collect and improve structures data provides many benefits to the program, its users, and the Nation. Volunteer participation improves government efficiency, public access to data, and data quality. Participation in The National Map Corps is easy and completely voluntary and raises geographic awareness and improves users skills in using web-based tools. Developing more complete and current structures data in The National Map may improve emergency preparedness and response. Furthermore, The National Map Corps benefits the agency and the participants by providing opportunities for citizen participation in USGS science as well as creating opportunities for collaboration with other Federal agencies and partners.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access:
1) https://www.usgs.gov/core-science-systems/national-geospatial-program/national-map and https://www.sciencebase.gov/catalog/item/4f70b240e4b058caae3f8e1b

2) https://www.usgs.gov/core-science-systems/ngp/tnm-corps/volunteer-contributions

Product Description:

1) The data collected by volunteers becomes part of the National Structures Dataset (NSD), which is one of the publicly available layers within The National Map. The National Map structures data is commonly combined with other data themes, such as boundaries, elevation, hydrography, and

transportation, to produce general reference base maps. The National Map viewer allows free downloads of public domain structures data in either Esri File Geodatabase or Shapefile formats.

2) The National Map Corps Status Map Volunteer Contributions in PNG image formats showing contributions since the start of the project in 2012, unedited points, edited points, and finished points.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The mission of the USGS National Geospatial Program (NGP) is to organize, maintain, publish, and disseminate the geospatial baseline of the nation's topography, natural landscape, and built environment through The National Map, which consists of basic geospatial information provided as a variety of mapping products and services. The use of The National Map Corps and Volunteered Geographic Information (VGI) will result in more complete and consistent national datasets in The National Map with improved positional and attribute accuracy.

CCS Act Objectives: Collect and analyze data

E.5. Department of Health and Human Services (HHS)

E.5.1. *All of Us* Research Program[297]

Sponsoring Agency and Office: National Institutes of Health

Authority: Other authority (21st Century Cures Act)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The *All of Us* Research Program is a historic effort to collect and study data and biological samples from one million or more people living in the United States, with the mission of accelerating health research and medical breakthroughs that enable individualized prevention, treatment, and care for all of us. The program began national enrollment in 2018 and is expected to last at least 10 years. Participants provide data over time that researchers can use to learn more about how environmental, behavioral, social, and biological factors interact and contribute to human health. Already, this is one of the largest and most diverse datasets of its kind ever assembled. The program has been designed as a collaboration between researchers, health care providers, community partners, and participants. As part of this program, the *All of Us* Researcher Workbench was developed to make participant data available to a broad range of researchers (including, eventually, citizen and community scientists) and to answer important biomedical research questions. The Workbench is a cloud-based research platform and suite of custom tools available to authorized researchers. The Workbench allows researchers to create, review, and annotate cohorts and analyze unique datasets.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[297] The website for All of Us is accessible at https://allofus.nih.gov https://www.researchallofus.org https://www.joinallofus.org .

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training
FTEs	48	65
Funding Estimate	$376,000,000	$500,000,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Anyone living in the United States who is eligible and willing may voluntarily enroll and contribute health data, lifestyle data, environmental data, and biological specimens to the program. In addition, the involvement of participant partners in this project is critical, as they provide not only their health data, but also valuable insight into other aspects of design and implementation. For example, our participant ambassadors are part of the program governance, serving on committees and boards that inform our scientific priorities, policies, and processes. The data and research platform in the *All of Us* Research Hub allows a broad range of researchers (including citizen scientists and community researchers in the future) to access data and assess the long-term impact of the environment, lifestyle, social, and biological factors on individual and population health and well-being.

Participants:

Intended Participants: Other (Adults age 18 and older are currently eligible to enroll)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls; Other (all adults)

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 05-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	268,100 as of 09-2019
FY20	358,500 as of 09-2020

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	All of Us is a nationwide program. Individuals living across the United States may enroll. Participants may contribute data and biospecimens in physical locations including medical offices, clinics, and hospitals. The program is also piloting approaches for participants to contribute biospecimens from home with saliva sampling kits returned via mail.
Virtual Activity	*All of Us* is a nationwide program. Individuals living across the United States may enroll and provide data through the participant portal via the internet or mobile app. Registered researchers have access to cloud-based tools for data analysis in the Researcher Workbench.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: Aggregate data from the *All of Us* Research Program are available to the public through the Data Browser. Individual-level data are available in our Researcher Workbench (currently in beta) to authorized researchers. Researchers using the platform are required to provide a project description, and these descriptions are made publicly available in the Research Projects Directory. The Researcher Workbench is currently open to researchers whose institutions have signed a Data Use and Registration Agreement with the *All of Us* Research Program. Researchers must also apply individually for access by registering, connecting their eRA Commons account, completing the *All of Us* Responsible Conduct of Research Training, and signing the Data User Code of Conduct. *All of Us* plans to open the Researcher Workbench to a broader researcher audience, including citizen scientists, in the future. Researchers will be able to use this large and diverse database of health data to advance biomedical research discoveries and the delivery of personalized healthcare.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Full details about *All of Us* data and access requirements are available at researchallofus.org. Data access and use policies are available at https://www.researchallofus.org/data-tools/data-access/.

Product Description: Participant data is in the form of health and lifestyle surveys, electronic health records, physical measurements, biospecimens, and eventually mobile health data from wearable devices (e.g., Fitbit). For additional information on how our data is curated, harmonized, refined, and more, please go to: https://www.researchallofus.org/methods/.

Partnerships: The crowdsourcing or citizen science activity involved many partners. Please visit https://allofus.nih.gov/funding-and-program-partners for more information.

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. By establishing a diverse longitudinal cohort of one million or more people in the United States, *All of Us* will provide a valuable resource with health and lifestyle data from different communities and populations. This is designed to be one of the largest, most diverse, and most broadly accessible datasets of its kind ever assembled, to create opportunities for biomedical researchers to answer previously unanswerable scientific questions.

CCS Act Objectives: No CCS Act objectives were addressed

E.5.2. CURE ID[298]

Sponsoring Agency and Office: National Institutes of Health

Authority: Public Health Services Act

Status:

FY19: Launched

FY20: Ongoing

CCS Activity Summary: CURE ID is a platform developed by the FDA and NIH (National Center for Advancing Translational Sciences) to crowdsource clinical experience from health care providers on hard to treat or understudied infectious diseases. It is an internet-based repository, accessible via smartphone app or website, that allows clinicians to report novel uses of existing drugs. Health care providers submit case report forms documenting their experience using an approved product in an unapproved indication. Other users can browse these documented cases and add to the knowledge bank. Ultimately, the collection data in this repository may identify promising drug candidates for further study. In response to the COVID-19 pandemic, CURE ID has been updated to allow for the collection of information specific to coronavirus infection.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported

[298] The website for CURE ID is accessible at https://cure.ncats.io/.

Funding	FY19	FY20
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Contracted services	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Contracted services
FTEs	1	2
Funding Estimate	$659,661	$452,301

Goal Types: Collection of data or observations; Create or engage a specific community

Justification for Using CCS: CCS is critical to this activity, as it involves the collection of real-world experiences in real time from healthcare providers around the world. Clinicians in the fields treating patients with rare, neglected, or challenging diseases may prescribe commercial drugs when medically appropriate. Because this treatment occurs on an individual patient basis, there is traditionally no method to compile these singular cases into a larger body of evidence. The CURE ID app enables the rapid collection of these individual experiences, in a more comprehensive and detailed manner than could be accomplished using other research methods.

Participants:

Intended Participants: Other (medical professionals/clinical community)

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 12-05-2019

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	7,000

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected

Results: CURE ID collects case report forms describing the novel use of marketed drugs to treat challenging diseases. The app allows for information to be amassed in a volume that has previously been impossible. This comprehensive collection of evidence has the potential to lead to novel drug approvals by the FDA and other regulatory agencies, particularly by identifying approved drugs that are candidates for additional clinical research to identify treatments for new diseases.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://cure.ncats.io/.

Product Description: CURE ID is available as a mobile app, as well as via internet browser. Clinicians are able to view case report forms submitted by their peers, describing the treatment of a disease with a commercial drug.

Partnerships: The crowdsourcing or citizen science activity involved five partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
FDA	Federal Agency or Office	Funding; Personnel; Space; Other (outreach)	software development, data modeling, user research, clinical research, other outreach and testing	$450,000	$2,958,478
Critical Path Institute	Nonprofit Organization (excluding Academic Institutions)	Personnel; Other (outreach)	data modeling, outreach and testing	None reported	None reported
World Health Organization	Other	Other (consultants)	None reported	None reported	None reported
JHU Center for Clinical Global Health Education	Academic Institution	Other (consultants)	None reported	None reported	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
HHS	Federal Agency or Office	Funding	None reported	None reported	None reported

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. CURE ID collects evidence on the use of marketed drugs to treat difficult diseases. This data can inform the practice of healthcare providers on a global scale, enhancing the health and reducing illness of patients with no other options. Additionally, this app potentially offers a novel drug development pathway for diseases with a dearth of therapeutic options.

CCS Act Objectives: Collect and analyze data; Develop technologies and applications; Make discoveries; Solve problems

E.5.3. Memorability of Words in Arbitrary Verbal Associations Modulates Memory Retrieval in the Anterior Temporal Lobe[299]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

Status:

FY19: Ongoing

FY20: Completed

CCS Activity Summary: This research study, led by National Institute of Neurological Disorders and Stroke Functional and Restorative Neurosurgery Unit researchers, relied on clinical trial and crowdsourced data to investigate why some simple words may be more memorable than others. In a cohort of intractable epilepsy patients, the team found that in simple word pairing memory tests, some words were more often successfully remembered than others, regardless of pairing. They then posted the word pair test on Amazon Mechanical Turk, and saw similar results from over 2,600 healthy volunteers. They used these results to develop a computational model to predict the memorability of words. The team found that memorable words are semantically more related to other words on average and can be more rapidly retrieved in the brain. Their findings suggest the human brain prioritizes memorable information to facilitate the retrieval of past experiences.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported

[299] The website for Memorability of Words in Arbitrary Verbal Associations Modulates Memoral Retrieval in the Anterior Temporal Lobe is accessible at https://www.nature.com/articles/s41562-020-0901-2.

Funding	FY19	FY20
Agency Fund Use	Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Federal employee travel; Training	Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Federal employee travel; Training
FTEs	2	2
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations

Justification for Using CCS: We used online Amazon Mechanical Turk to obtain data on volunteers that are more representative of the general population. This approach is more advantageous than other behavioral research methods because online crowdsourcing allows us to reach a larger sample size from broader geographical areas to determine whether an observation from a small clinical sample is robust or not in the general population. Traditional behavioral research methods often force us to collect data from a local region, limiting our ability to generalize the findings.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 02-16-2019

Anticipated End Date: 04-16-2019

Activity End Date: 04-16-2019

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	2,623
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Bethesda, Maryland
Virtual Activity	Amazon Mechanical Turk

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants processed data or other materials provided by the agency

Results: The results generated in the project have been used to answer scientific questions about human memory. De-identified data from the participants, therefore, have been made public to the scientific community. These results will serve as a foundation for future research projects along this line, including being cited or discussed in future grant applications.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.nature.com/articles/s41562-020-0901-2.

Product Description: Peer reviewed publication

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. The project collected information on memorability, and how memorability influences associative memory retrieval. This fundamental knowledge about memory, as well as the computer model produced by this study, can be applied to the development of memory tests for Alzheimer's disease and other forms of dementia.

CCS Act Objectives: Collect and analyze data

E.5.4. NCBI Codeathons[300]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: National Center for Biotechnology Information Codeathons bring together researchers and coders from diverse backgrounds in order to collaborate and create tools and tutorials to solve complex biomedical research problems. They partner with other institutions and conferences to host these two-day to three-day events. They have also been able to pivot these events successfully into a virtual space.

[300] The website for NCBI Codeathons is accessible at https://ncbi-codeathons.github.io.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Federal employee travel; Training	Purchase of consumable materials; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Federal employee travel; Training
FTEs	1.5	1
Funding Estimate	$500,000	$200,000

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: Codeathons are a unique tool to gain insight into how users and potential users touch NIH-funded datasets, tools, and resources and when and why they choose the alternatives. They also create and implement novel and creative solutions to complex problems that require expertise across numerous backgrounds. Codeathons offer unique training opportunities in live and creative uses of cloud technologies and other NIH-based tools and datasets. These events also build bridges across multiple communities both locally and nationally for NIH, including researchers, data scientists, software engineers, educators and everyone in between. Finally, they are more flexible than other mechanisms as codeathon topics can be decided at any point during outreach to fit the interests and needs of the IC, target group or communities being engaged.

Participants:

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls

Emphasized Populations: None reported

Participation:

Activity Open Date: 01-2015

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: 03/11/2019-03/13/2019, 03/25/2019-03/27/2019, 04/15/2019-04/16/2019, 05/08/2019-05/10/2019, 08/13/2019-08/15/2019, 10/11/2019-10/13/2019, 11/04/2019-11/06/2019, 11/08/2019-11/10/2019, 01/08/2020-01/10/2020, 01/15/2020-01/17/2020, 03/11/2020-03/13/2020

FY	Number of Individuals
FY19	450
FY20	200

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Chapel Hill, North Carolina; Santa Cruz, California; Boston, Massachusetts; Bethesda, Maryland; Houston, Texas; College Park, Maryland; Dallas, Texas; Pittsburgh, Pennsylvania; New York City, New York

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates

Results: Results of codeathons have been used to improve datasets, tools, and platforms and will continue to do so. Community engagement is continued long after each event in which we share other activities, training and materials between all participants. These are also places that allow for collaborations and networking long after the event.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://ncbi-codeathons.github.io.

Product Description: We have built tools, workflows, and analysis pipelines. We have also built automated visualizations and tutorials and walkthroughs for complex biomedical data analysis. Most of this content is in code format on the github repositories. We have also published a number of scientific articles on codeathon products.

Partnerships: The crowdsourcing or citizen science activity seven partners (if selected, we will reach out to you for information on additional partners). The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
UNC Chapel Hill	Academic Institution	Personnel; Space	Helping with organizing the community, advertising and finding space	None reported	None reported
UCSC	Academic Institution	Personnel; Space	Helping with organizing the community, advertising and finding space	None reported	None reported
New York Genome Center	Academic Institution	Personnel; Space	Helping with organizing the community, advertising and finding space	None reported	None reported
UTSW	Academic Institution	Personnel; Space; Online support	Helping with organizing the community, advertising and finding space	None reported	None reported
Baylor College of Medicine	Academic Institution	Personnel; Space	Helping with organizing the community, advertising and finding space	None reported	None reported
University of Maryland	Academic Institution	Personnel; Space	Helping with organizing the community, advertising and finding space	None reported	None reported
Carnegie Mellon University	Academic Institution	Personnel; Space	Helping with organizing the community, advertising and finding space	None reported	None reported

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. Codeathons are a place to offer unique training opportunities in live and creative use of cloud technologies and other NIH-based tools and datasets. These events also build bridges across multiple

communities both locally and nationally for NIH, researchers, data scientists, software engineers, educators and everyone in between.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.5.5. NCI-DOE Collaboration 2020 Virtual Ideas Lab: Towards Building a Cancer Patient Digital Twin[301]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

Status:

FY19: No activity occurred during FY19

FY20: Completed

CCS Activity Summary: Since 2016, the National Cancer Institute (NCI) and the U.S. Department of Energy (DOE) have been collaborating in the Joint Design of Advanced Computing Solutions for Cancer (JDACS4C) program to simultaneously accelerate advances in predictive oncology and scientific computing. A multidisciplinary community arose from that collaboration and identified aspirational cancer challenges that require shared efforts across cancer research, artificial intelligence, and advanced computing technologies. Digital twin technology is one of those challenges. In July 2020, 30 multidisciplinary scientists participated in a five-day interactive event, the NCI-DOE Collaboration Virtual Ideas Lab: Toward Building a Cancer Patient Digital Twin. They formed new collaborations and created innovative research projects focusing on a digital twin component that, within the next 2-3 years, will advance the development of a model of an individual cancer patient. Six multidisciplinary mentors from government, academia, and industry advised the project teams. Over 130 scientists applied. Participants were selected to create a balance of diverse expertise, career-level and demographics. A digital twin is a computer replica of the systems and processes needed to run simulations without disrupting or harming the real-world object. A digital twin would be a real-life replica of the human body able to show outcomes in the present and future. A cancer patient's digital twin (aka avatar or virtual patient) could be used as a holistic computer-based model to enable personalized medicine, support cancer research, pre-clinical development, clinical trials, aid diagnosis and support running treatment simulations. The research projects have the potential to lead to disease-specific and intervention-specific models and simulations, using mathematical, active learning, and ensemble model approaches.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[301] The website for NCI-DOE Collaboration 2020 Virtual Ideas Lab: Towards Building a Cancer Patient Digital Twin is accessible at Event site: https://events.cancer.gov/cbiit/dtwin2020 Community website: https://ncihub.org/groups/cicc/pastmeetings/2020ideaslab Virtual MicroLab held in April 2020 to generate interest in the Ideas Lab https://ncihub.org/groups/cicc/pastmeetings/april23microlab .

Funding	FY19	FY20
Additional Agency Resources	None reported	Development of event website on events.cancer.gov https://events.cancer.gov/cbiit/dtwin2020
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Contracted services	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Contracted services
FTEs	None reported	2
Funding Estimate	None reported	$431,689

Goal Types: Education; Create or engage a specific community; Other (Goals included expanded engagement with the broader biomedical research community; formation of new teams and collaborations; guidance from mentors; and development of innovative research projects .)

Justification for Using CCS: This NCI-DOE Collaboration 2020 Digital Twin Ideas Lab brought together a diverse, multidisciplinary group of participants to form new collaborations and create innovative research projects that would advance the development of a cancer patient digital twin. Over the course of the week, the group of 30 scientists worked together to deepen their shared understanding of this complex challenge, redefine the problems within the challenge, and generate innovative ideas for research proposals. Broad outreach was conducted to recruit applicants from all career stages and demographic groups. Since the purpose was to create new collaborations and teams as a starting point to refine research concepts for a long-term project, other mechanisms such as contracts, grants, cooperative agreements, and prize competitions would not have been able to address the collaborative goals of this meeting.

Participants:

Intended Participants: Adults not affiliated with higher education; Other (US and international cancer researchers, clinicians, biomedical engineers, bioinformaticians, AI researchers, data scientists, computational scientists, and mathematical modelers including mechanistic, data-driven and multi-scale modelers. Applicants were selected to create a balance of diverse expertise, career-level and demographics.)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Women and girls

Emphasized Populations: None reported

Participation:

Activity Open Date: 04-07-2020

Anticipated End Date: None reported

Activity End Date: 07-10-2020

Specific Dates for CCS Events: 07-06-2020 07-10-2020

FY	Number of Individuals
FY19	None reported
FY20	39

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit

Submission Types: Other (Research proposals were submitted for consideration of seed funding approximately two months after the event and represent an initial phase of a longer-term project. A progress report at the end of the 6-month period is required (Summer 2021, est.).)

Results: Following the Ideas Lab, participants were invited to submit their multidisciplinary research proposals for 6-month seed funding as the first phase of a longer-term research project. Data gathered or used, and analyses produced in these projects will be publicly available on a website following completion of the 6-month research projects (Summer 2021). These projects may include additional collaborators and resources from other communities, but only Ideas Lab participants could submit proposals. Longer-term research proposals to advance development of a cancer patient digital twin may evolve from these initial 6-month projects and are expected to engage the broader research community, such as pharma, industry, academia, other government organizations and non-profit organizations. Thus, a broader, multidisciplinary community will be engaged and will contribute additional datasets, analytical tools, algorithms, statistical models, computational models, and expertise as the cancer patient digital twin efforts progress. In addition, these projects should lead to disease and intervention-specific models and simulations, using mathematical, active learning, and ensemble model approaches.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://ncihub.org/groups/cicc/.

Product Description: A 12-page project report will be available for each research project following completion of the six-month projects (Summer 2021).

Partnerships: The crowdsourcing or citizen science activity involved four partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
US Department of Energy	Federal Agency or Office	Funding; Personnel	steering committee, project management, mentorship	None reported	None reported
Frederick National Laboratory for Cancer Research	Nonprofit Organization (excluding Academic Institutions)	Personnel; Other (project management and administration of funding)	steering committee, project management, and administration of funding	None reported	None reported
Knowinnovation, Inc	Private Industry	Personnel; Online support	event planning, management and facilitation	None reported	None reported
National Cancer Institute	Federal Agency or Office	Funding; Personnel	steering committee, project management, mentorship	None reported	None reported

Advancement of Agency Mission: A multidisciplinary community arose from the National Cancer Institute and the U.S. Department of Energy Joint Design of Advanced Computing Solutions for Cancer (JDACS4C) program and produced a report which identified aspirational cancer challenges that require shared efforts across cancer research, artificial intelligence, and advanced computing technologies at Federal laboratories across the United States. This Ideas Lab focused on one of those complex challenge areas, Creating Digital Twin Technology. Through the development of the digital twin technology, researchers seek to evaluate potential new therapeutics, incorporate diverse sets of biological data to answer cancer biology and treatment questions, and apply their knowledge of individual patient tumors to understand treatment options. This Ideas Lab helps to expedite the NCI mission to lead, conduct, and support cancer research.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.5.6. NCI Comparative Oncology Program[302]

Sponsoring Agency and Office: National Institutes of Health

[302] The website for NCI Comparative Oncology Program is accessible at https://ccr.cancer.gov/comparative-oncology-program.

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The National Cancer Institute (NCI) Comparative Oncology Program (COP) helps cancer researchers better understand cancer biology by studying naturally occurring cancers in pet animals (dogs and cats). The COP also conducts clinical trials of investigational oncology agents through a cooperative network of veterinary schools' teaching hospitals to evaluate new treatment options for cancer. Since cancers in animals share many features with human cancers, information gained through these clinical trials can benefit both pet animals and humans with cancer. Trial enrollment is dependent on pet owners enrolling their companion animals in different clinical trials. NCI has also established the Integrated Canine Data Commons (ICDC), a publicly-accessible cloud-based resource to allow analysis and integration of canine and human canine cancer data generated by oncology researchers and veterinarians.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Database development; Data entry or/and analysis; Federal employee travel	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Database development; Data entry or/and analysis; Federal employee travel
FTEs	3	5
Funding Estimate	$1,200,000	$1,350,000

Goal Types: Collection of data or observations

Justification for Using CCS: This project relied on the participation of pet dogs, enrolled into oncology trials by their owners. The program could not exist without the participation of the public and their pets.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 2003

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	44
FY20	7

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Nationwide. Veterinary Clinics
Virtual Activity	Nationwide. Integrated Canine Data Commons (ICDC)

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants submitted data or observations they collected

Results: These comparative oncology clinical trials allow assessment of novel agents in a veterinary clinical setting that supports serial biologic sample collections and exploration of dose, schedule, and corresponding pharmacokinetic/pharmacodynamic relationships. Further, the pet dogs' intact immune systems and natural co-evolution of tumors and microenvironments support exploration of novel immunotherapeutic strategies. Clinical trials carried out in dogs can assess efficacy in a variety of settings, including but not limited to single-agent or combination solid tumor response, inhibition of metastatic progression, and randomized comparison of multiple agents in a simultaneous head-to-head fashion. Such studies in pet dogs have been purposefully included in the developmental plan for several FDA-approved and up-and-coming anticancer drugs. The last 10 years has witnessed a noteworthy expansion in our collective understanding of companion animal cancers and the value these animal patients have within drug development and optimization efforts for humans. Indeed, this knowledge is also translating into new therapeutic approaches for companion animals themselves.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://ccr.cancer.gov/comparative-oncology-program/news-pubs.

Product Description: news articles and peer-reviewed publications

Partnerships: No partners were indicated

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. The NCI Comparative Oncology enrolls pet dogs who have tumors similar to those that develop in humans into clinical trials. By studying these dogs, researchers not only are able to help pets and advance veterinary oncology, but these results and treatments may translate into effect therapies for human cancer.

CCS Act Objectives: Collect and analyze data

E.5.7. NNLM Citizen Science Initiative[303]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Network of the National Library of Medicine has established several initiatives to encourage citizen science collaborations between the NNLM and local communities. These initiatives involve local communities in biomedical research. One example of this is the NNLM Wikipedia Edit-a-thon, which is an annual campaign to edit Wikipedia articles that focus on health and medicine. NNLM has also created resources for libraries, in partnership with SciStarter, to increase the involvement of the public in citizen science activities. One of these is a Test the Waters Citizen Science kit, offered to libraries and organizations to support citizen science outreach efforts in local communities through fun and accessible activities.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Contracted services	Publicity, advertising, outreach, or/and communications; Contracted services
FTEs	1	1
Funding Estimate	$70,000	$70,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (analyze existing data)

[303] The website for NNLM Citizen Science Initiative is accessible at https://nnlm.gov/national/guides/ccs.

Justification for Using CCS: Collaborations between communities and researchers build capacity to address problems and meet research goals. Community participation in the research process also builds trust between NNLM and the communities that we serve.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 04-18-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Nationwide. Participants took part in these activities where they live.
Virtual Activity	Nationwide. Some of these activities have virtual components, such as the Wikipedia Edit-a-thon.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Other (analyzing existing data)

Results: The results will inform future NNLM citizen science activities.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://nnlm.gov/wiki

https://nnlm.gov/national/guides/ccs/kits

Product Description: The objective of #CiteNLM Wikipedia Edit-a-thons is to improve the credibility and content of medical and health-related articles on Wikipedia by adding citations and information from National Library of Medicine (NLM) sources. The Test the Waters Citizen Science kits were developed for public libraries to use in their STEM public programming. They include tree activities that focus on health, environment, and lifestyle. The kit includes activities designed for blind and visually impaired participants. SciStarter.org/NLM is a collection of citizen science projects with a health focus.

Partnerships: The crowdsourcing or citizen science activity involved one partner. The following table lists this partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
SciStarter	Other	None reported	None reported	None reported	None reported

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. A major strategic goal of NNLM is to reach more people in more ways through enhanced dissemination and engagement pathways. NNLM offers funding, training, community outreach, and partnerships to increase health awareness and access to NLM resources. NNLM encourages member organizations to provide opportunities for members of the community to participate in citizen science activities. Through citizen science and crowdsourcing, NNLM engages communities in addressing societal needs and accelerating biomedical science, technology, and innovation.

CCS Act Objectives: Conduct scientific experiments; Collect and analyze data

E.5.8. OMics Compendia Commons[304]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: OMics Compendia Commons (OMiCC) is a free online crowdsourcing platform for creating and analyzing annotated gene expression data collections from over 40,000 human and mouse studies. The platform takes publicly available genomic data from various databases and puts it in one place for members of the research community to categorize and annotate using standardized terms. Users can contribute to the online community by sharing metadata for data collation and analysis results across different studies. This online tool allows users to pool groups of data and perform meta-analyses to develop novel biological insights. All of these various data groupings are saved for further use and investigation.

[304] The website for OMics Compendia Commons is accessible at https://omicc.niaid.nih.gov.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Web portal or application development and support; Database development; Software development; Data entry or/and analysis	Web portal or application development and support; Database development; Software development; Data entry or/and analysis
FTEs	0.2	0.2
Funding Estimate	$15,000	$10,000

Goal Types: Collection of data or observations; Analyzing existing agency data

Justification for Using CCS: Using the collective expertise of a large number of individuals from around the world is the most cost-effective mechanism to accurately annotate the huge collection of datasets that have been deposited into publicly available databases. The alternative is to apply computational approaches to go through and automatically annotate all the data. However, since review of the original publications describing the datasets is often required and machines are still not nearly as accurate as human experts in this task, CCS is the better solution. The other benefit of this approach is community engagement, allowing community members to contribute and share insights with others on the platform.

Participants:

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 06-2016

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	None reported
FY20	539

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	worldwide

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants processed data or other materials provided by the agency

Results: Members of the NIH/FDA community hosted a one-day jamboree session to annotate datasets using OMiCC. The subsequent publications of the analysis results (PMID: 28491277 and PMID: 28002728) provided evidence showing that the CCS approach is a viable method for a crowd of biologists to work together across geographic and institutional boundaries to utilize existing, publicly available data to test and generate hypotheses. OMiCC demonstrates that when the appropriate tools and environment are made available, biologists and even the general public can explore and answer many scientific questions using existing data with little barrier of entry. The tool helps researchers formulate and design further experiments and put scarce resources to their best use. Federal agencies and partners can use our experience to develop tools and guidelines for producing reliable crowdsourced data.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://omicc.niaid.nih.gov.

Product Description: Publicly available database of gene annotations

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. OMiCC facilitates hypothesis generation and scientific discovery by promoting reuse and integration of public datasets. The computational methodologies OMiCC provides increase power for discovery by taking advantage of multiple independent studies with similar aims. The functionalities are delivered in a user-friendly web platform, allowing biologists without computational backgrounds to explore the data and run analyses themselves.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Interpret the results of data

E.5.9. Partnerships for Environmental Public Health (PEPH)[305]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

[305] The website for Partnerships for Environmental Public Health (PEPH) is accessible at https://www.niehs.nih.gov/research/supported/translational/peph/index.cfm https://www.niehs.nih.gov/research/supported/translational/community/index.cfm .

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Partnerships for Environmental Public Health (PEPH) network brings together scientists, community members, clinicians, public health officials, and policymakers in order to better understand and advance the impact of environmental public health research at all levels, from community to nationwide. This program coordinates and integrates new and existing National Institute of Environmental Health Sciences-funded collaborative initiatives between communities and scientists focused on environmental public health and develops strategies to communicate public health messages to diverse audiences. This includes the creation of educational materials to increase environmental health literacy. Program highlights include projects that empower rural, tribal, and vulnerable communities, engage communities in assessing water quality data and its connection to quality of life, and increasing awareness of public health concerns in underserved communities.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Database development; Data entry or/and analysis; Contracted services; Training	Publicity, advertising, outreach, or/and communications; Database development; Data entry or/and analysis; Contracted services; Training
FTEs	1	1
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (inform public health action plans)

Justification for Using CCS: To understand and address the effects of local environmental concerns on community health, the PEPH program and the projects it supports must engage people at the local, regional, and national level. Community-engaged research and citizen science are the most effective and collaborative methods to achieve this, and lead to the development of impactful environmental public health research initiatives.

Participants:

Intended Participants: Other (academic researchers, public health officials, policymakers, clinicians)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 09-09-2008

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Nationwide. Activities are diverse and may include physical and virtual components.
Virtual Activity	Nationwide. Activities are diverse and may include physical and virtual components.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates

Results: Given the local focus of many of the projects that fit within PEPH, most results have been used by state and local agencies to inform public health actions. Following are three highlights: 1) A Community-Engaged Pilot Study Leads to EPA Site Investigation. This outcome was the result of a pilot project supported through the Environmental Health Sciences Core Center at Emory University and their Community Engagement Core (https://emoryhercules.com/news/a-community-engaged-pilot-study-leads-to-epa-site-investigation/). 2) Imperial County Community Air-Monitoring Project. This project was a part of the Research to Action program (https://www.niehs.nih.gov/research/supported/translational/community/imperial/index.cfm). 3) Studying Exposure to Legacy Contaminants and Health Effects on St. Lawrence Island. This project was an investigator-initiated project led by the community-based organization, Alaska Community Action on Toxics (ACAT) (https://www.niehs.nih.gov/research/supported/translational/community/acat/index.cfm).

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data and results are shared in various ways. We try to highlight grantee accomplishments in a variety of ways, including grantee highlights, project summaries, webinars, podcasts, and news features. Various web pages from grant programs also have links to community-engaged accomplishments.

Product Description: This is dependent on the distinct projects within the PEPH portfolio. Research results are shared in peer-reviewed publications, educational materials, on podcasts, at national conferences, and among community groups. Examples can be found on the PEPH Resources page: https://www.niehs.nih.gov/research/supported/translational/peph/resources/index.cfm.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. The PEPH program focuses on how the environment impacts individual and community health, and works to increase the impact of environmental public health research. As such, the PEPH program advances the NIH mission to enhance health.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.5.10. Science Education Partnership Awards (SEPA)[306]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown, Other authority (1991 NCRR Omnibus Budget Appropriation)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Science Education Partnership Awards (SEPA) program supports pre-kindergarten to 12th grade (P-12) and informal science education (ISE) activities that enhance the diversity of the biomedical, behavioral, and clinical research workforce and foster a better understanding of NIH-funded biomedical, behavioral, and clinical research and its public health implications. The SEPA program targets two primary audiences: 1) SEPA formal or classroom-based projects, provide STEM content, pedagogical expertise, and problem-solving skills to teachers, students, and families in communities not generally supported by advanced and innovative educational practices; 2) SEPA informal science education (ISE) activities, conducted in outside-the-classroom venues as well as in science centers and museums, target both workforce diversity and improved public health literacy. The SEPA program supports any area of NIH-funded basic or clinical research. Supported projects may involve developing curricula, mobile laboratories, science exhibits, and workshops that enhance the understanding of biomedical research and the life sciences. The materials developed as part of the SEPA program are made available to students, teachers, families,

[306] The website for Science Education Partnership Awards (SEPA) is accessible at https://www.nigms.nih.gov/education/sepa-teaching-resources.

and the general public. One notable project supported by the SEPA program is Barcode Long Island, organized by the DNA Learning Center at Cold Spring Harbor Laboratory. This program gives students in New York, many in underserved communities, the opportunity to design their own research projects that use DNA barcoding to study biodiversity trends in New York. Another SEPA-funded project at Mount Desert Island Laboratory where students will collect well water data for arsenic analysis, and learn to analyze and communicate their findings, to effectively inform their communities and move people to action. Their data will inform the Maine Center for Disease Control and the New Hampshire Department of Environmental Service (https://mdibl.org/press-release/mdi-biological-laboratory-receives-funding-to-address-arsenic-threat/).

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Training; Other (support for SEPA projects and the development of resources)	Purchase of consumable materials; Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Training; Other (support for SEPA projects and the development of resources)
FTEs	1	1
Funding Estimate	None reported	None reported

Goal Types: Education; Digitization of agency-owned materials; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The SEPA program is a peer-reviewed NIH Research Education mechanism. SEPA, established in 1991, has funded (beginning in the mid-2000s), projects with a citizen science focus. This was prior to the common use of the phrase "citizen science." SEPA projects focus on a wide range of health-related topics and develop resources to improve workforce diversity and public health literacy. SEPA, therefore, promotes partnerships between scientists, teachers, education organizations, and students to develop interactive resources for training in the biomedical sciences. The resources developed by SEPA-supported educators are available for use by P-12 educators and for the general public. This is an example of effectively crowdsourcing the creation of educational materials.

Participants:

Intended Participants: Pre-k through 8th grade students; 9th-12th grade students; Adults not affiliated with higher education; Retirees; Other (informal science education, citizen science, science centers and museums)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 1991

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Nationwide, including Hawaii, Puerto Rico, and Alaska. Activities take place where participants live, work, and go to school. A wide range of methods are used to implement these activities.
Virtual Activity	Nationwide, including Hawaii, Puerto Rico, and Alaska. Activities take place where participants live, work, and go to school. A wide range of methods are used to implement these activities.

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates; Other (creation of educational resources and evaluation methods)

Results: Resources created by SEPA-supported educators are publicly available. These educational tools can be used to increase the scientific literacy of not just children and students, but the general public as well.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.nigms.nih.gov/education/sepa-teaching-resources.

Product Description: digital interactive resources, educational resources, science center/museum exhibits

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. The goal of SEPA is to support educational activities that enhance the scientific training of students in pre-kindergarten to 12th grade. By providing students, teachers, and the general public with a better understanding of the life sciences, SEPA improves national health and science literacy.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.5.11. The Dog Genome Project[307]

Sponsoring Agency and Office: National Institutes of Health

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: This project collects DNA samples from dog owners with all types of dogs to better understand how different genes interact to create traits in modern dog breeds, and how inherited diseases develop in affected breeds. Project researchers are interested in genomic variation across dog breeds, particularly those with susceptibility to certain types of cancer. The goal of this part of the project is identify genes and variants that create these susceptibilities. Because many diseases in dogs are similar to those in humans, findings from this project can provide insight into human diseases. It also requires large numbers of samples, all provided by dog owners. The project is also interested in building genomic resources for the dog genomic and comparative genomic community through large-scale sequencing, studies of dog breed relatedness, and development of markers for specific traits. In this capacity, researchers are working with collaborators to assemble sequences of the world's dog breeds, as well as wild canids and village dogs, to best understand the architecture of the dog genome. NIH Dog Genome researchers are also working to learn how various breeds relate one to another and how they originated. This contributes to efforts to find genes responsible for morphologic variation. Genes responsible for such, when mutated in humans, are often associated with disease. Finally, the project seeks to learn why dog breeds behave as they do. This is important for understanding more about the types of genes that contribute to mammalian behavior overall. Such genes when mutated, as above, are also frequently responsible for disorders in humans.

[307] The website for The Dog Genome Project is accessible at https://research.nhgri.nih.gov/dog_genome/index.shtml.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	National Institute of General Medical Services (NIGMS) supports one postdoc through the PRAT program for 3 years.	NIGMS supports one postdoc through the PRAT program for 3 years.
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Database development; Software development; Data entry or/and analysis; Federal employee travel; Other (lab work/experiments)	Purchase of consumable materials; Purchase or rental of equipment; Database development; Software development; Data entry or/and analysis; Federal employee travel; Other (lab work/experiments)
FTEs	2	4
Funding Estimate	None reported	None reported

Goal Types: Collection of data or observations; Analyzing existing agency data; Other (answer important scientific questions of interest to basic science, companion animal health, and human health and biology)

Justification for Using CCS: This project relies on the contribution of canine biospecimens from dog owners. These contributions are critical for the establishment of a comprehensive database of canine genomic information and to answer key questions in genetic health care.

Participants:

Intended Participants: Other (anyone whose dog meets eligibility criteria)

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Indigenous populations; Women and girls; Other (seek collaboration with people all over the world)

Emphasized Populations: None reported

Participation:

Activity Open Date: 11-2004 (08-1993, pre-dating NIH support)

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	None reported
FY20	None reported

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	NIH is located in Bethesda, MD. The project was started in Berkeley, California and then moved to Seattle, WA prior to NIH. Samples are collected from all over the world.

Consent: Participants were asked to provide formal consent to participate in the CCS activity

Submission Types: Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates; Other (blood or saliva samples)

Results: The conclusions drawn from these research studies inform further research on human biology and health. Studies of cancer genetics identify genes and variants that contribute to bladder and gastric sarcomas. These are critical for understanding suceptibility to these diseases. Other studies identify genes important in tumor progression. Studies of canine relatedness show how genetic power can be increased to identify genes associated with any trait. Studies of morphologic variation identify genes that control breed-specific traits such as body size or leg length that, when mutated, are responsible for human growth disorders. Finally, the effort to build genomics resources for comparative genomic studies is the responsibility of National Human Genome Research Institute researchers. Data produced by the lab has impacted the work of nearly every companion animal geneticist in the world, by providing genetic foundations for ongoing studies.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://research.nhgri.nih.gov/dog_genome/index.shtml Many public databases including the NCBI Sequence Read Archive, NCBI Short Read Archive, and UCSC browser.

Product Description: Peer-reviewed publications, white papers, summary reports. There have been over 200 papers published on this project.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: The mission of the NIH is to seek fundamental knowledge about the nature of living systems, and apply that knowledge to enhance health, lengthen life, and reduce illness. By studying the genetic underpinnings of various dogs' traits leading to morphological differences as well as disease predisposition in dog breeds, The Dog Genome Project researchers are able to answer basic questions about genes, animal biology, and animal illness. The knowledge gained from these studies can inform how we understand human biology and disease.

CCS Act Objectives: Collect and analyze data

E.6. National Aeronautics and Space Administration (NASA)

E.6.1. GLOBE Program[308]

Sponsoring Agency and Office: Space Technology Mission Directorate

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Global Learning and Observations to Benefit the Environment (GLOBE) Program is an international science and education program that provides students and the public worldwide with the opportunity to participate in data collection and the scientific process, and contribute meaningfully to our understanding of the Earth system and global environment. Announced by the U.S. Government on Earth Day in 1994, GLOBE launched its worldwide implementation in 1995. GLOBE Observer is the citizen science app that allows volunteers in GLOBE countries to take observations for a subset of GLOBE protocols and contribute to the GLOBE community. GLOBE is sponsored by NASA and supported by the National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA) and Department of State.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	The parts of GLOBE dedicated to citizen science cannot be separated	The parts of GLOBE dedicated to citizen science cannot be separated
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training	Purchase of consumable materials; Purchase or rental of equipment; Transportation of participants; Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Data entry or/and analysis; Contracted services; Federal employee travel; Training
FTEs	The parts of GLOBE dedicated to citizen science cannot be separated	The parts of GLOBE dedicated to citizen science cannot be separated
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

[308] The website for GLOBE Program is accessible at https://www.globe.gov.

Justification for Using CCS: Citizen science and crowdsourcing provide a practical and efficient means to collect local observations of the Earth system globally and over long time periods. GLOBE also engages students and teachers as a way for them to learn more about their own environment (local, regional, and global).

Participants:

Intended Participants: Pre-k through 8th grade students; 9th-12th grade students; Undergraduate College/University/Technical students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 04-1995

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	None reported
FY20	None reported

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Global - GLOBE is in 123 countries, including the United States
Virtual Activity	Global - GLOBE is in 123 countries, including the United States

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions included information on location or geospatial coordinates

Results: GLOBE observations are made publically available and can be used by anyone for research purposes. Students use the data for their research projects and can participate in regional research symposia and the GLOBE International Virtual Science Symposium. GLOBE data have also been used to inform science and education publications.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: GLOBE data are publically available and can be accessed at https://www.globe.gov/ru/globe-data. There is a visualization system (https://vis.globe.gov/GLOBE/),

Advanced Data Access Tool (ADAT; https://datasearch.globe.gov/), and API (https://api.globe.gov/search/swagger-ui.html).

Product Description: Data from 55 scientific protocols covering the Earth system atmosphere, biosphere, pedosphere, and hydrosphere are available. Protocols can be found here: https://www.globe.gov/ru/do-globe/globe-spheres. See above for data links.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
NSF	Federal Agency or Office	Personnel	in kind	None reported	None reported
NOAA	Federal Agency or Office	Personnel; Other (in kind)	in kind	None reported	None reported
Department of State	Federal Agency or Office	Personnel; Other (in kind)	in kind	None reported	None reported

Advancement of Agency Mission: GLOBE contributes to NASA's strategic goal to expand human knowledge through new scientific discoveries, and specifically the strategic objective that includes understanding the Earth. GLOBE also contributes to the strategic goal to address national challenges and catalyze economic growth, specifically the strategic objective to inspire and engage the public in aeronautics, space, and science.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

E.6.2. JunoCam[309]

Sponsoring Agency and Office: Science Mission Directorate

Authority: Other authority (NASA Juno project)

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The JunoCam camera on the Juno mission in orbit around Jupiter serves as public outreach tool and provides the public a way to participate in the Juno mission. The website offers five ways for people to get involved in activities that parallel efforts carried out nominally by a mission's science team: planning, discussion, decision-making (voting), processing, and analysis (the

[309] The website for Junocam is accessible at https://www.missionjuno.swri.edu/junocam.

think tank) portals. Amateur astronomers are invited to post pictures via the planning portal from their own telescopes. These images are used to assess the current state of the Jovian atmosphere, and to identify storms that would be within JunoCams field of view at each close (perijove) pass. The discussion page provides an opportunity for people to engage with each other and the Juno team by posting questions and comments. The voting pages are populated with rationale for selection of the image targets at each perijove pass, along with discussion of lighting considerations and campaigns. The processing page is very popular raw and lightly processed JunoCam images are posted and the public is invited to download and process them further, with a request to upload their processed contributions. Processed contributions are showcased in the public gallery. Selections of contributed images are presented in the featured submission gallery. Submissions range from true color to abstract art. The think tank page offers the opportunity to thread discussions as science topics or particular perijoves. Links are provided to the British Astronomical Society reports. Links to Planetary Data System labels, USGS image processing tools, trajectory documentation and other auxiliary information are provided. Citizen scientists have analyzed images and co-authored peer reviewed papers.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding Type	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Data entry or/and analysis; Contracted services
Approximate FTEs	0.1 FTE	0.1 FTE
Approximate Funding	None reported	None reported

Goal Types: Analyzing existing agency data; Public outreach or engagement

Justification for Using CCS: The Juno team had a goal for the public to perform data analysis and share in the excitement of space exploration. A website was developed to provide an opportunity for a diverse population of people to become involved, encompassing a wide range of age groups, education level and scientific knowledge. The goal was to reach the widest potential audience, from children to seniors.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 07-2016

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	419,381 visitors; 11,290 activated user accounts
FY20	331,353 visitors; 12,238 activated user accounts (948 new users)

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Participants submitted data or observations they collected and images from submissions were shared on NASA social media accounts.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions or materials included images

Results: Although intended to be an outreach instrument, JunoCam images are used for scientific research and included in press releases, scientific publications, social media and showcased by various art forms. The collaboration of the amateur astronomy community with professional earth-based observers and the Juno project has enabled scientific research that might otherwise have not occurred. This collaboration has led to a better understanding of Jupiter's atmospheric dynamics and a number of peer-reviewed papers.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://www.missionjuno.swri.edu/junocam/processing.

Product Description: JunoCam images are accessible in 3 formats: 1) raw framelets (for the most experienced amateurs); 2) reconstructed as monochrome images (red, green, blue, and methane); and 3) map-projected color reconstruction in .png format (suitable for readily-available image processing tools such as Photoshop). Metadata such as spacecraft altitude and sub-spacecraft latitude and longitude are also provided, and full image headers can be downloaded.

Partnerships: There were no partners indicated.

Advancement of Agency Mission: JunoCam images processed by citizen scientists engage, inspire and educate the public and provide a platform for the public to become involved in a NASA mission. Citizen scientists have processed Juno images contributing their own ideas and creations involving processing choices that have assisted with the interpretation and understanding of the structure, dynamics, and characteristics of Jupiter's atmosphere. STEM-related education and opportunities are aligned with the processing activity. JunoCam embodies NASA's goal to inspire, as only NASA can.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Develop technologies and applications; Make discoveries; Solve problems

E.7. Smithsonian Institution (SI)

E.7.1. Chesapeake Bay Parasite Project[310]

Sponsoring Agency and Office: Smithsonian Environmental Research Center

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: White-fingered mud crabs are native to the Chesapeake Bay. These small scavengers are commonly found in nearshore habitats, like oyster reefs and woody debris. Mud crabs play an important role in the Bay food web and are prey for many animals. Unfortunately, an invasive, parasitic barnacle called *Loxothylacus panopaei* (Loxo) is infecting mud crabs. The parasite makes the infected crabs act like zombies! Loxo sterilizes the crab so that it cannot produce any baby crabs and instead carries and cares for Loxo larvae. Scientists want to know how Loxo affects the mud crab population, where Loxo are spreading throughout the Bay, and why the number of infected crabs changes from year to year.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Training; Other (Organizing and managing volunteers)	Purchase or rental of equipment; Publicity, advertising, outreach, or/and communications; Data entry or/and analysis; Training; Other (Organizing and managing volunteers)
FTEs	1	1.5
Funding Estimate	$14,000	$25,000

Goal Types: Collection of data or observations; Public outreach or engagement

[310] The website for Chesapeake Bay Parasite Project is accessible at https://serc.si.edu/citizen-science/projects/chesapeake-bay-parasite-project.

Justification for Using CCS: Using CCS allows the expansion of the number of sites that can be sampled and speed of sample analysis. There are very limited funds available for this project and it could not happen at its current scale without the engagement of citizen scientists.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: Summer 2014

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: None reported

FY	Number of Individuals
FY19	156
FY20	8

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Edgewater, Maryland Oxford, Maryland St. Leonard, Maryland

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants processed data or other materials provided by the agency.

Results: The results were published in peer-reviewed journals.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Summary data are available on the project website. Raw data are available upon request.

Product Description: Excel spread sheet and Access database

Partnerships: No partners were indicated.

Advancement of Agency Mission: The project supports the Smithsonian's mission to create and diffuse knowledge by better understanding the natural world and engaging volunteers in that process.

CCS Act Objectives: Conduct scientific experiments; Collect and analyze data; Interpret the results of data

E.7.2. eMammal[311]

Sponsoring Agency and Office: Conservation Biology Institute/National Zoo

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: eMammal is a data pipeline and repository for wildlife images obtained using camera traps. It contains multiple current and past projects that rely on citizen volunteers or students to set-up the cameras, obtain the images, identify the animals and upload the images and metadata to the repository.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase or rental of equipment; Web portal or application development and support; Database development	Purchase or rental of equipment; Web portal or application development and support; Database development
FTEs	1.5	1.5
Funding Estimate	$120,000	$120,000

Goal Types: Collection of data or observations

Justification for Using CCS: The system relies on maintaining a dispersed network of camera traps; not possible for a limited staff.

Participants:

Intended Participants: Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: No specific intended group

[311] The website for eMammal is accessible at emammal.si.edu .

Emphasized Populations: None reported

Participation:

Activity Open Date: 06-2014

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: The activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	300
FY20	250

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	all 50 states participated in 2019

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants submitted data or observations they collected; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: The data and images collected are accessible to the general public and conservationists through our website.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Data is accessible through the website https://emammal.si.edu/.

Product Description: A carousel of images are available. The data can be accessed through projects or through an interactive map that allows you to select locations and download an Excel file of data.

Partnerships: The crowdsourcing or citizen science activity involved 1 partner. The following table lists the partner and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
North Carolina Museum of Natural Sciences	State or Local Government	Personnel	IT support and supervision of projects	$40,000	$40,000

Advancement of Agency Mission: The Smithsonian Conservation Biology Institute has a mission to document and sustain biodiversity. Recording mammal species across the world and making this data accessible fits well with that mission.

CCS Act Objectives: Enable the formulation of research questions; Collect and analyze data; Make discoveries

E.7.3. Environmental Archaeology at the Smithsonian Environmental Research Center[312]

Sponsoring Agency and Office: Smithsonian Environmental Research Center

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: People lived on the land that is now the Smithsonian Environmental Research Center campus for hundreds of years. Our Environmental Archaeology Lab digs up, cleans, and catalogs artifacts that these people left behind. These objects help us understand how people used and changed the land through time. The lab is run entirely by citizen scientists, and we are grateful for their dedication and hard work. Not only do our citizen scientists help with daily tasks, such as sieving sediments and washing artifacts, they also contribute to analyses and even develop their own research projects.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Other (Staff time)	Other (Staff time)
FTEs	.1	.05
Funding Estimate	$6,000	$2,000

Goal Types: Collection of data or observations; Public outreach or engagement

Justification for Using CCS: There is no dedicated funding for this project. Without citizen science efforts, this program would not exist.

Participants:

Intended Participants: No specific intended group

[312] The website for Environmental Archaeology at the Smithsonian Environmental Research Center is accessible at https://serc.si.edu/citizen-science/projects/environmental-archaeology-serc.

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 04-2014

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: None reported

FY	Number of Individuals
FY19	130
FY20	39

Location:

Location Type: Combination of both physical locations and virtual activities.

Location Type	Description
Physical Location	Edgewater, Maryland
Virtual Activity	Central Maryland

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants processed data or other materials provided by the agency.

Results: The results become part of Smithsonian collections that can be used by researchers from all agencies.

Data Availability: No, data and/or results have not been made publicly accessible.

Data Access: There are insufficient funds available for this project to support data management infrastructure.

Partnerships: No partners were indicated.

Advancement of Agency Mission: This project contributes to the Smithsonian's mission related to the creation and diffusion of knowledge by researching Mid-Atlantic archaeology and sharing that information through presentations and peer-reviewed journal articles.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

E.7.4. Fossil Atmospheres[313]

Sponsoring Agency and Office: National Museum of Natural History

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Ginkgo trees evolved before the dinosaurs, survived three mass extinctions, and one species is still living today. We are researching how the cells of leaves on ginkgo trees have changed over time and how we can use this knowledge to learn about the ancient atmosphere of the Earth. Fossil Atmospheres is a National Science Foundation-funded project based out of the National Museum of Natural History and the Smithsonian Environmental Research Center. We work to bring together researchers at the Smithsonian Institution and citizen scientists across the world in climate change research. Fossil Atmospheres offers several ways citizens can be involved in active climate change research, from data generation to sample collection. Learn more about each component and find out how anybody can participate.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	0	0
Agency Fund Use	Federal employee travel	Federal employee travel
FTEs	1.8	1.8
Funding Estimate	$250,000	$250,000

Intended Goals: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The work of the Fossil Atmospheres project requires a tremendous amount of time and energy to conduct. We decided to harness the power of the public to economically conduct the research, while educating the public about climate change. Specifically, we are collecting and imaging lots of modern and fossil Ginkgo leaves, including leaves submitted by citizen scientists across the nation, in order to help us better understand how variable the stomatal index can be across environments. From there, more citizen scientists are helping us count stomata to calculate the stomatal index. We will combine the data with the results from experiments with living Ginkgo trees to produce a record of past environments. Having citizen scientists submit leaves and count stomata means that we can collect far more data and more reliable data than we would be able to do otherwise.

Participants:

[313] The website for Fossil Atmospheres is accessible at https://www.si.edu/fossil-atmospheres.

Intended Participants: No specific intended group

Underrepresented Groups: Black/African-American populations; Hispanic or Latino populations; Women and girls

Emphasized Populations: Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: 07-2017

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	400
FY20	200

Location:

Location Type: Combination of both physical locations and virtual activities

Location Type	Description
Physical Location	Washington, D.C. Edgewater, Maryland
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit

Submission Types: Participants processed data or other materials provided by the agency; Submissions or materials included images; Submissions included information on location or geospatial coordinates

Results: This is an ongoing project. The data collected by online citizen scientists is being used to interpret the progress of the experiment, and to understand deep time climate change events to put modern day climate change into perspective. We have used the data collected in public and scientific presentations, and have published scientific papers on the citizen science we continue to conduct.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Public talks are hosted online; scientific papers are available from the journal directly.

Product Description: We have presented our work as part of many online virtual presentations. These are accessible online through the Smithsonian's websites. Scientific papers are also online, though are more limited due to their proprietary nature. Where possible, we make them open-access.

Partnerships: The crowdsourcing or citizen science activity involved three partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
NOVA/PBS	Nonprofit Organization (excluding Academic Institutions)	Personnel	Produced television program	None reported	None reported
iNaturalist.org	Nonprofit Organization (excluding Academic Institutions)	Online support	None reported	None reported	None reported
Zooniverse.org	Nonprofit Organization (excluding Academic Institutions)	Online support	None reported	None reported	None reported

Advancement of Agency Mission: The Fossil Atmospheres project advanced the Smithsonian's mission by studying climate change and providing educational activities. In particular, the project is focused on revealing the sensitivity of climate to CO2, which has enormous economic and societal implications because of the effect climate change will have on sea level, food production, storm strength, water availability, and many other factors. By improving our ability to quantify the effects of CO2 on climate, you will be contributing to the basic science underlying projections of future environmental change.

CCS Act Objectives: Collect and analyze data; Make discoveries

E.7.5. Global Change Research Wetland Plant Census[314]

Sponsoring Agency and Office: Smithsonian Environmental Research Center

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

[314] The website for Global Change Research Wetland Plant Census is accessible at https://serc.si.edu/citizen-science-research/projects/salt-marsh-census.

CCS Activity Summary: The Global Change Research Wetland (G-CREW) has been studying the effect of gases on marsh growth since 1987 and continues to this day. Salt marshes are unique ecosystems that serve as nurseries and habitat for wildlife. They also protect coastal communities from things like flooding and storms. We want to know how the plants in marshes like ours will react to a changing climate. Atmospheric changes in gases and sea level rise could have a big impact on where, how quickly, and how much plants in salt marshes grow.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	N/A: no agency funds or other non-employee resources were used	N/A: no agency funds or other non-employee resources were used
FTEs	.2	.2
Funding Estimate	$20,000	$20,000

Goal Types: Collection of data or observations

Justification for Using CCS: Using CCS helps to expand the number of samples that can be collected and decreases processing time.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 07-2014

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Late July-Early August

FY	**Number of Individuals**
FY19	42
FY20	1

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	Edgewater, Maryland

Consent: Participants were asked to provide formal consent to participate in the CCS activity.

Submission Types: Participants processed data or other materials provided by the agency.

Results: The data are used as part of sea level rise and climate change impacts on wetlands by the National Oceanic and Atmospheric Administration (NOAA) and the Department of Energy (DOE).

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://serc.si.edu/gcrew/data.

Product Description: CSV files

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Global Change Research Wetland Plant Census advances the Smithsonian's mission of the creation and diffusion of knowledge by collecting and analyzing more samples to better understand the impacts of climate change and anthropogenic impacts on wetlands. These data are presented publicly and shared in peer-reviewed literature.

CCS Act Objectives: Collect and analyze data

E.7.6. Invader ID[315]

Sponsoring Agency and Office: Smithsonian Environmental Research Center

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: By tracking changes in the types of organisms and how abundant different groups of organisms are, we can see how ecosystems are changing over time. We are particularly interested in how introducing new organisms to an area can change the numbers and types of other organisms in the fouling community. By doing surveys of bays through time, we can see how the types and abundances of the organisms change, and how different species interact with one another. It also gives us a chance to detect new invasive species before they become problematic. Researchers use the data collected through the fouling community surveys to look at how fouling communities change through time and between one location and another. They combine that information with other data, such as weather data, to try to understand what causes the patterns that they observe. By understanding these patterns, we can better predict which species are likely to invade nearby areas and what kinds of impacts they could have. The survey data also helps us understand whether or not

[315] The website for Invader ID is accessible at https://serc.si.edu/citizen-science/projects/plate-watch https://www.zooniverse.org/projects/serc/invader-id.

efforts to prevent invasions or limit the impact of invasions are working. We share our findings with natural resource managers and policy makers so that they can implement the most effective strategies possible to deal with marine invasive species.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Data entry or/and analysis	Data entry or/and analysis
FTEs	.3	.3
Funding Estimate	$12,000	$12,000

Goal Types: Analyzing existing agency data; Public outreach or engagement

Justification for Using CCS: Invader ID is a way to speed up the processing of images and provides the possibility of expanding the sampling domain to include more geographic locations.

Participants:

Intended Participants: No specific intended group

Underrepresented Groups: No specific intended group

Emphasized Populations: None reported

Participation:

Activity Open Date: 03-2018

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: The activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	1784
FY20	3013

Location:

Location Type: Virtual activity

Location Type	**Description**
Virtual Activity	None reported

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency.

Results: These results are used to help monitor patterns of invasive coastal marine species.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Summary results are publicly available online, raw data available upon request.

Product Description: CSV file, Github, R code

Partnerships: The crowdsourcing or citizen science activity involved 2 partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Katchemak Bay NERR	Federal Agency or Office	Other (Sharing data/samples)	None reported	None reported	None reported
University of Massachusetts, Amherst	Academic Institution	Other (Sharing data/samples)	None reported	None reported	None reported

Advancement of Agency Mission: Invader ID supports the Smithsonian mission of the creation and diffusion of knowledge by providing an expanded way to analyze samples.

CCS Act Objectives: Make discoveries; Solve problems

E.7.7. Neighborhood Nestwatch[316]

Sponsoring Agency and Office: National Zoological Park

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Neighborhood Nestwatch provides an outdoor educational experience for backyard wildlife enthusiasts and underserved youth. Participants contribute to important scientific research by re-sighting banded birds and monitoring nests. The Neighborhood Nestwatch approach features face-to-face interaction on an annual basis between Smithsonian scientists, participants, and neighborhood birds. Taking place in several metropolitan regions in the Eastern U.S., Nestwatch seeks to determine how well backyard birds are coping amid rapid land use change and simultaneously educate the public about threats and habitat enhancements that affect bird survival.

[316] The website for Neighborhood Nestwatch is accessible at https://nationalzoo.si.edu/migratory-birds/neighborhood-nestwatch.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	Purchase of consumable materials; Purchase or rental of equipment; Web portal or application development and support; Data entry or/and analysis; Other (internships)	Purchase of consumable materials; Purchase or rental of equipment; Web portal or application development and support; Data entry or/and analysis; Other (internships)
FTEs	None reported	None reported
Funding Estimate	$65,000	$22,000

Goal Types: Education; Collection of data or observations; Public outreach or engagement; Create or engage a specific community; Other (Scientific research)

Justification for Using CCS: Members of the public give direct access to properties and offer first-hand observations of banded birds and nests.

Participants:

Intended Participants: Pre-k through 8th grade students; Other (metro area residents (families))

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations

Participation:

Activity Open Date: 05-2000

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	**Number of Individuals**
FY19	400
FY20	250

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	In FY 19:metro areas of Washington, DC, Springfield, MA, Pittsburgh, PA, Denver, CO, and Raleigh, NC. In FY 20: metro areas of Washington, DC, Springfield, MA, Pittsburgh, PA, and Raleigh, NC

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Participants processed data or other materials provided by the agency; Submissions or materials included images; Submissions included information on location or geospatial coordinates.

Results: More than twenty articles have been published directly from Nestwatch data since project inception by federal scientists. Scientific publications in recent fiscal years include "Characterizing avian survival along a rural-to-urban land use gradient" in the journal *Ecology*, and "Native plants improve breeding and foraging habitat for an insectivorous bird" in the journal *Biological Conservation*. Currently a research project is underway to better understand sociological underpinnings of participant involvement.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: https://nationalzoo.si.edu/migratory-birds/neighborhood-nestwatch.

Product Description: Data has been used in scientific journal articles, and is available through on-line banded bird summaries, re-sightings, and nest-monitoring accounts.

Partnerships: The crowdsourcing or citizen science activity involved 5 partners. The following table lists these partners and their contributions.

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
Atlanta Audubon Society	Nonprofit Organization (excluding Academic Institutions)	None reported	None reported	$250	None reported
North Carolina Science Museum	State or Local Government	None reported	None reported	$500	None reported
Bird Conservancy of the Rockies	Nonprofit Organization (excluding Academic Institutions)	Personnel; Space; Consumable resources	Neighborhood Nestwatch field activities	$7,500	None reported

Partner Name	Partner Type	Contribution Type(s)	Personnel Contributions	FY19 Contribution	FY20 Contribution
National Aviary	Nonprofit Organization (excluding Academic Institutions)	Personnel; Space; Consumable resources	Neighborhood Nestwatch field activities	$10,000	None reported
U.S.Forest Service	Federal Agency or Office	Personnel; Space; Consumable resources	Neighborhood Nestwatch field activities	$10,000	$5,000

Advancement of Agency Mission: The citizen science project has brought greater attention to Neighborhood Nestwatch thereby promoting an understanding of the conservation of backyard birds as well as educating the public about local bird survival.

CCS Act Objectives: Enable the formulation of research questions; Conduct scientific experiments; Collect and analyze data; Interpret the results of data; Make discoveries

E.7.8. Smithsonian Transcription Center[317]

Sponsoring Agency and Office: NA

Authority: NA

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: The Smithsonian Transcription Center was created to increase and improve the access and use of Smithsonian digital collections, enhance the quality of public engagement and participation, create new pathways of learning and knowledge, and maintain and build trust with communities of interest. In short, it was designed as an easy-to-use, free, online platform where the public from anywhere in the world could interact with digitized collections from around the Smithsonian and help enhance those materials through crowdsourced transcription and review. This process allows public participants to engage with Smithsonian materials and increase the accessibility and discoverability of these collections by creating readable, text-searchable transcriptions.

Budget and Resources: The following table indicates the budget and resources to support the activity.

[317] The website for Smithsonian Transcription Center is accessible at https://transcription.si.edu/.

Funding	FY19	FY20
Additional Agency Resources	None reported	None reported
Agency Fund Use	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Contracted services	Publicity, advertising, outreach, or/and communications; Web portal or application development and support; Database development; Software development; Contracted services
FTEs	2	2
Funding Estimate	None reported	None reported

Goal Types: Education; Digitization of agency-owned materials; Collection of data or observations; Analyzing existing agency data; Public outreach or engagement; Create or engage a specific community

Justification for Using CCS: The Transcription Center was designed as a crowdsourcing project because there was a defined need across the institution to increase and improve the accessibility of collections that could not be achieved by staff due to limited time and financial resources. Previous transcription projects were done by staff members, contractors, or interns, on a project-by-project basis, when time and resources permitted. Through crowdsourcing with digital volunteers, the stories and information locked within digitized collections is made accessible on a level far beyond the abilities of Smithsonian staff. On average, digital volunteers transcribe and review over 400 pages of material per day. The choice to enlist the public in this project for crowdsourcing transcriptions additionally fits into the Smithsonian Institution's mission of engaging the public in the increase and diffusion of knowledge.

Participants:

Intended Participants: 9th-12th grade students; Undergraduate College/University/Technical students; Master/PhD students; Adults not affiliated with higher education; Retirees

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations; Urban populations; Economically disadvantaged or recognized low-income communities

Participation:

Activity Open Date: The Transcription Center project started in 06-2013 and remains ongoing.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	13,567
FY20	31,656

Location:

Location Type: Virtual activity

Location Type	Description
Virtual Activity	Materials that are posted for transcription pertain to areas across the United States and around the world; and digital volunteers in over 75 countries participate in the Transcription Center.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants processed data or other materials provided by the agency; Other (Volunteer participants are asked to transcribe and review digitized Smithsonian archival, library, and museum collections. During FY19 and FY20, volunteers completed 252,314 pages.)

Results: Because all transcriptions are made publicly available on multiple platforms, Smithsonian staff, researchers, and the public, can find and use the information transcribed for their own research purposes. Smithsonian curators have used transcribed data to identify content for exhibitions; individuals have located genealogical and historical information in transcriptions; and data from transcribed field notes and scientific specimens have been used to connect disparate museum collections within and outside the Smithsonian. Major projects completed in the Transcription Center during FY19 and 20: (1) Records of the Bureau of Refugees, Freedmen, and Abandoned Lands (collaborative project between the National Museum of African American History and Culture and the U.S. National Archives, https://s.si.edu/3nvGn20); (2) Field Book Project (scientific field notes from around the Smithsonian, https://s.si.edu/38MejDs); (3) Letters of American Artists in Paris https://s.si.edu/38T4h3A; (4) The Papers of Sally Ride from the National Air and Space Museum Archives, https://s.si.edu/3pCKICp; and (5) The Papers of S. Ann Dunham from the National Anthropological Archives, https://s.si.edu/3pzXIbU.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: All transcribed content is available on the Transcription Center website and downloadable as PDFs: https://transcription.si.edu/. Completed transcriptions are also fully text-searchable across the Smithsonian's internal databases: http://collections.si.edu/search/ and https://sova.si.edu/.

Product Description: Completed transcriptions total more than 650,000 pages, and include historic diaries, letters, audio segments, ephemera, field notes, scientific specimen labels, currency sheets, scrapbooks, and more from across the Smithsonian's many museum collections, archives, and

libraries. Content relates to the history of art, science, culture, race, gender, and more, and dates from the 16th century to the present day.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Smithsonian Transcription Center advances the Institution's historic mission to increase and diffuse knowledge by providing a digital platform where the public can take part in making treasures now held in Smithsonian museums, libraries, and archives accessible to the world. The program, which presents materials for transcription spanning the fields of science, history, art, and culture, supports the goals of the current Strategic Plan of engaging and inspiring millions more people locally and around the globe through audience-focused pan-Institutional initiatives.

CCS Act Objectives: Enable the formulation of research questions; Create and refine project design; Collect and analyze data; Interpret the results of data; Make discoveries; Solve problems

E.7.9. Virginia Working Landscapes: Grasslands Biodiversity Survey[318]

Sponsoring Agency and Office: Smithsonian Conservation Biology Institute

Authority: Unknown

Status:

FY19: Ongoing

FY20: Ongoing

CCS Activity Summary: Virginia Working Landscapes (VWL) is a program of the Smithsonian Conservation Biology Institute (SCBI) that promotes the conservation of native biodiversity and sustainable land-use through research, education, and community engagement. Its goals are to: (1) Advance the science of land management and develop best practices relevant both to working farmers and conservationists; (2) Network landowners with State and Federal agencies that can provide them with specific technical and financial assistance; (3) Establish and highlight demonstration sites on working farms that showcase best practices for different land uses, agricultural production, and biodiversity management; and (4) Create a community network to promote dissemination of information from neighbor to neighbor.

Budget and Resources: The following table indicates the budget and resources to support the activity.

Funding	**FY19**	**FY20**
Additional Agency Resources	None reported	None reported
Agency Fund Use	No agency funds or other non-employee resources were used	No agency funds or other non-employee resources were used
FTEs	None reported	None reported

[318] The website for Virginia Working Landscapes: Grasslands Biodiversity Survey is accessible at https://www.vaworkinglandscapes.org/.

Funding	FY19	FY20
Funding Estimate	None reported	None reported

Goal Types: Education; Collection of data or observations; Public outreach or engagement

Justification for Using CCS: Citizen science allows VWL to gather data over a large geographic area (incorporating 16 counties) from private landholdings. VWL's focus is on engagement with the community of concerned citizens over a multi-county region of central and northern Virginia, over the broad topic of biological conservation. Citizen science is a means to recruit, train, and continuously provide outreach and education materials to the community. In turn, citizen scientists become ambassadors for the program and the Smithsonian Institution (SI). The citizen scientists make a direct contribution to research, increase their scientific understanding, and are allowed to immerse themselves in the field of conservation. This all results in highly impactful, personally transformative experiences for the citizen scientist volunteers. The project encourages not only good conservation, but also community-based networking.

Participants:

Intended Participants: Adults not affiliated with higher education; Retirees

Underrepresented Groups: No specific intended group

Emphasized Populations: Rural populations

Participation:

Activity Open Date: The project started in 01-2010 and is ongoing.

Anticipated End Date: None reported

Activity End Date: None reported

Specific Dates for CCS Events: Activity did not occur as discrete events on specific dates.

FY	Number of Individuals
FY19	57
FY20	22

Location:

Location Type: Physical location(s)

Location Type	Description
Physical Location	The project is located in Northern and Central Virginia, Northern Blue Ridge and Northern Piedmont ecoregions.

Consent: Participation was voluntary; consent was implicit.

Submission Types: Participants submitted data or observations they collected; Submissions included information on location or geospatial coordinates.

Results: Through the development of consistent survey protocols and rigorous volunteer training, the data from VWL surveys has begun to yield results that can be applied to local land management. For example, it is now known that native warm-season grass meadows, such as those established through bobwhite quail conservation programs, support higher densities of declining shrubland birds and overwintering birds. Similarly, citizen scientists study how human activities influence movement patterns of the region's carnivores, explore how urban development impacts bumblebee populations, and identify relationships between native plants, land management, and wildlife. These studies can help delineate areas of conservation priority while engaging landowners and educating them regarding best practices for biodiversity. The results of the analyses derived from data collected through our citizen science project are disseminated to regional planning entities, policy makers, the scientific community, VWL's partner organizations, and landowners. Results appear in peer-reviewed journals and publications as well as through SI media channels and other popular print and online publications.

Data Availability: Yes, data and/or results have been or will be made publicly accessible.

Data Access: Publications will be shared at www.vaworkinglandscapes.org as they become available.

Product Description: Data will be shared in publications.

Partnerships: No partners were indicated.

Advancement of Agency Mission: The Smithsonian's mission is to increase and diffuse knowledge. Virginia Working Landscapes is a program of the Smithsonian Conservation Biology Institute that promotes the conservation of native biodiversity and sustainable land-use through research, education, and community engagement. Our goals are to not only conduct rigorous scientific research relating to conservation ecology, but to also disseminate and share the results of our research with our local community. Furthermore, involving the community directly in the data collection helps to solidify our message and connect our community to scientific knowledge.

CCS Act Objectives: Collect and analyze data; Make discoveries

Appendix F. Surveys Used to Collect Information on FY19-20 Federal Prize Competitions and Challenges and Crowdsourcing and Citizen Science Activities

This Appendix contains the two surveys used to collect information on Federal Prize Challenges and Crowdsourcing and Citizen Science activities conducted in FY19-20. Please note the survey took advantage of the online survey platform's *display logic*[319] that allowed specific subsequent questions to display depending upon the respondent's previous responses. Also, the "Q" numbers in front of each section are an internal reference number within the online survey platform. Information within the brackets (either "[ ]" or "{ }") indicate where fields were auto-populated with existing information (e.g., contact name, title of activity) to personalize the surveys.

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[319] Qualtrics—an online survey platform used for this report's data collection—allows you to customize the survey to each respondent. "When a specific question or answer choice pertains only to certain respondents, you can set display logic on it so that it shows conditionally based on previous information." For more information, refer their support page: https://www.qualtrics.com/support/survey-platform/survey-module/question-options/display-logic/

Survey: Prize Competitions and Challenges

Q1 FY2019–20 Reporting on Federal Prize Competitions

This survey is associated with [name of prize competition].

Submission details: By no later than November 20, 2020, please report to the White House

Office of Science and Technology Policy (OSTP) all prize competitions your agency carried out

(i.e., *launched, ongoing,* or *completed*) during Fiscal Years 2019 and 2020 under Section 24 (15 U.S.C. 3719) of the Stevenson-Wydler Technology Innovation Act of 1980 (commonly referred to as the COMPETES authority). Please note that the Implementation of Federal Prize and Citizen Science Authority Fiscal Years 2019-20 Report will be submitted to Congress and made publicly available.

Reporting information for prize competitions conducted or otherwise supported under other authorities provides visibility for the effort, and can be valuable for the overall prize competitions community, as well as the public, to see how competitions can be used to advance agency missions. Agencies are highly encouraged, but not required, to complete this survey for prize competitions conducted under authorities other than COMPETES during this reporting period.

OSTP is leading the data collection for the final consolidated report. The Institute for Defense Analyses (IDA) Science and Technology Policy Institute (STPI) is a Federally funded research and development center (FFRDC) created by Congress to provide the OSTP with technical support and analysis. STPI is working with OSTP to support this data collection and analysis effort.

Required Reporting Information: Only information on activities entered via this online survey tool will appear in the biennial report.

Please complete the following survey once for each prize competition or challenge that is *launched, ongoing,* or *completed* under Section 24 during this reporting period. Prize competitions run under the broader umbrella of Grand Challenge programs supporting a variety of activities should be reported individually. For prize competitions in which multiple Federal agencies are involved, reporting should be completed only once by the lead agency.

If applicable, please remember to contact your agency lead or coordinator as they will be the first step in this review and clearance process at your agency. If you are unsure who your agency lead or coordinator may be, please contact STPI at prizes@ida.org.

Please note that this survey employs display logic and the questions presented will be determined by the answer choices you select.

If you have any questions or are experiencing technical issues please contact STPI at: prizes@ida.org.

Definitions: The following terms are defined as follows:

Participant—an individual or other entity (e.g., a team) that participated in a prize competition. Does not include other contributors like activity leaders, managers, or reviewers.

Full-Time Equivalent (FTE)—refers to the total amount of effort put forth by employees of the sponsoring Federal agency; one FTE represents the hours worked by one employee on a fulltime basis over one year. The concept provides a means of allocating the effort of an employee among different responsibilities and summing the efforts of multiple employees, both part-time and full-time, who

spend part of their time working on the project. On an annual basis, an FTE is considered to be 2,080 hours (8 hours per day x 5 work days per week x 52 weeks per year = 2,080 hours per year). In this context, FTE is intended to convert the total number of hours contributed by all employees to a standard scale, which may not be the equal to the total number of full-time agency employees who contributed to the activity if it was only a part of their total responsibilities.

Q2 Welcome! This is the data collection survey for the following initiative: [name of prize competition].

Q3 Primary point of contact within your agency for ${e://Field/Title} (response required).

- ○ First name _____
- ○ Last name _____
- ○ Email address _____
- ○ Phone number _____

Q4 Link - Please provide a URL to the homepage for [name of prize competition], if available.

You may enter more than one, if appropriate. If no URL exists, please answer "N/A."

_____

Q5 Please provide a summary of [name of prize competition] suitable for broad, public dissemination. This summary may be included in the formal report to Congress as, for example, a case study (max 300 words) (response required).

_____

_____

_____

Q6 Status FY19 - Please select the status of [name of prize competition] during FY19 (select all that apply) (response required).

- ☐ Launched
- ☐ Ongoing
- ☐ Completed
- ☐ No activity occurred during FY19

Q7 Status FY20 - Please select the status of [name of prize competition] during FY20 (select all that apply) (response required).

- ☐ Launched
- ☐ Ongoing
- ☐ Completed
- ☐ No activity occurred during FY20

Q8 Authority - Please select the authority under which [name of prize competition] was conducted (response required).

- ○ America COMPETES Reauthorization Act of 2010
- ○ Other authority (please specify) _____
- ○ Unknown

Q9 Provide name of sponsoring agency and office (if your office or component is not listed please select "other") (response required).

Agency

Office or component

▼ Administrative Conference of the United States ... World War I Centennial Commission ~ Other (774)[320]

Q10 If you selected "other" as an office or component please enter the name here.

- ○ Office or component _____

Q11 Does [name of prize competition] have multiple phases (response required)?

- ○ Yes
- ○ No

[320] Note: this survey option represents a drop-down list containing names of likely responding offices and agencies from the Challenge.gov website.

If "Yes" is selected in Q11, please show Q12; otherwise skip to Q16 if "No" is selected

Q12 Please provide the total number of phases planned for [name of prize competition].

- ○ 2 phases
- ○ 3 phases
- ○ 4 phases
- ○ 5 phases
- ○ 6 phases

If "Yes" is selected in Q11, please show Q13

Q13 Which phase(s) did [name of prize competition] go through during FY19-20 (select all that apply)?

- ☐ Phase 1
- ☐ Phase 2
- ☐ Phase 3
- ☐ Phase 4
- ☐ Phase 5
- ☐ Phase 6

Q14 Please provide the following phase specific information, if available, for [name of prize competition]. Please note that dates should be entered in the following format mm/dd/yyyy.

	Phase dates		Submissions
	Submissions open	Submissions closed	Number of submissions
Phase 1			
Phase 2			
Phase 3			
Phase 4			
Phase 5			
Phase 6			

If "Yes" is selected in Q11, please show Q15

Q15 Please provide the following phase specific information about [name of prize competition].

	Prize Purse	Award Information		Announcement Date
	Total prize purse for awards given out	Total number of awards available	Total number of awards given out	Date winners were announced (mm/dd/yyyy)
Phase 1				
Phase 2				
Phase 3				
Phase 4				
Phase 5				
Phase 6				

If "No" is selected in Q11, please show Q16

Q16 Please provide the following information, if available, for [name of prize competition]. Please note that dates should be entered in the following format mm/dd/yyyy

	Submission dates		Submissions
	Open date	Close date	Number of submissions
[name of prize competition]			

If "No" is selected in Q11, please show Q17

Q17 Please provide the following information about [name of prize competition] (response required).

	Prize Purse	Award Information		Announcement Date
	Total prize purse for awards given out	Total number of awards available	Total number of awards given out	Date winners were announced (mm/dd/yyyy)
[name of prize competition]				

If "Yes" is selected in Q11, please show Q18

Q18 Please indicate what submissions consisted of or included for each phase that took place in FY19-20 (select all that apply) (response required).

	Proposal or concept	Prototype device or object	Software or computer code	Business or commercial development plan	Creative media (e.g., images, videos, podcasts, logos)	Analysis or visualization of data	Other
Phase 1	☐	☐	☐	☐	☐	☐	☐
Phase 2	☐	☐	☐	☐	☐	☐	☐
Phase 3	☐	☐	☐	☐	☐	☐	☐
Phase 4	☐	☐	☐	☐	☐	☐	☐
Phase 5	☐	☐	☐	☐	☐	☐	☐
Phase 6	☐	☐	☐	☐	☐	☐	☐

If "No" is selected in Q11, please show Q19

Q19 Please indicate the type(s) of submissions sought by [name of prize competition] (select all that apply) (response required).

- ☐ Proposal or concept
- ☐ Prototype device or object
- ☐ Software or computer code
- ☐ Business or commercial development plan
- ☐ Creative media (e.g., images, videos, podcasts, logos)
- ☐ Analysis or visualization of data
- ☐ Other (please specify) _____

Q20 Please provide a description of the submission(s) sought by [name of prize competition] (max of 150 words).

_____

_____

_____

_____

_____

Q21 Please indicate whether the participants in [name of prize competition] were team-based or individual members. If some submissions come from teams and others from individuals, please indicate that participants were team-based with some teams having only one team member.

- ○ Participants were team-based
- ○ Participants were individual members

If "Participants were individual members" is selected in Q21, please show Q22

Q22 Please provide a best estimate of the total number of individuals participating in each fiscal year.

- ○ FY19 _____
- ○ FY20 _____

If "Participants were team-based" is selected in Q21, please show Q23

Q23 Please indicate the best estimate of the total number of teams participating in each fiscal year.

- ○ FY19 _____
- ○ FY20 _____

Q24 Please identify the intended participants of the challenge (select all that apply).

- ☐ No specific intended group
- ☐ Pre-k through 8th grade students
- ☐ 9th-12th grade students
- ☐ Undergraduate College/University/Technical students
- ☐ Master/PhD students
- ☐ Adult not affiliated with higher education
- ☐ Retiree
- ☐ Small businesses
- ☐ Large businesses
- ☐ Other (please specify): _____

Q25 Please select which of the following methods were used by the agency to publicize [name of prize competition], mobilize potential participants, and ensure high quality submissions (select all that apply) (response required).

- ☐ Social media (e.g., Twitter, Facebook)
- ☐ Email (e.g., listservs)
- ☐ Press release
- ☐ Live event(s) prior to the competition
- ☐ Live video streaming announcement
- ☐ Partnership with outside organizations (e.g., private companies, non-profit organizations, other Federal agencies)
- ☐ Publicity efforts from vendors/contractors
- ☐ Posted on challenge.gov
- ☐ Other (please specify): _____

Q26 Please describe the method(s) used to evaluate submissions to [name of prize competition] and to select winners. If appropriate, please indicate whether judges were internalto-agency, cross-agency, external, or a mix (max 150 words) (response required).

_____

_____

_____

_____

_____

Q27 Please indicate the types of goals [name of prize competition] achieved (select all that apply) (response required).

- ☐ Improve a process/procedure/service carried out by the sponsoring agency
- ☐ Generate innovative ideas/designs/concepts (ideation)
- ☐ Develop/demonstrate technology (hardware or software)
- ☐ Education/training
- ☐ Outreach/information dissemination
- ☐ Launch or scale up the use of an enterprise/promote commercialization (including technology transfer)
- ☐ Build or strengthen a community
- ☐ Other (please specify) _____

Q28 Please describe the problem or opportunity [name of prize competition] is/was designed to address (max 150 words) (response required).

_____

_____

_____

_____

_____

Q29 Please describe how [name of prize competition] advanced the agency's mission (max 150 words) (response required).

_____

_____

_____

_____

_____

Q30 Please indicate why a prize competition was the method chosen to achieve the activity's goals (select all that apply) (response required).

- ☐ Activity required diverse expertise or interdisciplinary collaboration
- ☐ Sought diverse and/or innovative solutions
- ☐ Incentivize a larger number of submissions
- ☐ Flexibility to implement project design and achieve project goals
- ☐ Permitted cost and resource sharing with Federal and/or non-Federal partners
- ☐ Develop solutions in a quick timeframe
- ☐ Most cost-effective approach
- ☐ Low risk approach and/or pay-for-performance structure
- ☐ Less burdensome to design and execute than alternatives
- ☐ Identify and work with new innovators
- ☐ Engage a specific community
- ☐ Target audience could not have been reached through traditional mechanisms
- ☐ Promote awareness of a specific topic or agency research area (13)
- ☐ Previous success with a prize competition
- ☐ Required by executive policy or congressional legislation
- ☐ Other (please specify): _____

Q31 Please comment on future agency plans for prize competitions for the next two fiscal years (FY21 and FY22) (If activities are not yet planned please respond with "N/A") (max ~200 words) (response required).

_____

_____

_____

_____

_____

Q32 Please indicate how agency funds were used in support of [name of prize competition] for each fiscal year (please select all that apply) (response required).

	FY19	FY20
Prize purse (monetary award) (13)	☐	☐
Non-monetary award(s)	☐	☐
Federal personnel (FTE)	☐	☐
Purchase of consumable materials	☐	☐
Purchase or rental of equipment	☐	☐
Transportation of participants	☐	☐
Publicity/advertising/outreach/communications	☐	☐
Web portal/app development and support	☐	☐
Database development	☐	☐
Software development	☐	☐
Data entry/analysis	☐	☐
Discovery and design support	☐	☐
Operations or administrative support	☐	☐
Solution acceleration	☐	☐
Other (please specify): _____	☐	☐

Q33 Please provide a detailed description of how agency funds were used in support of [name of prize competition] (do not include a description of the prize purse or non-monetary awards) (max 300 words) (response required).

_____
_____
_____
_____
_____

Q34 Provide a best estimate of the dollar amount the agency used in support of [name of prize competition] (do not include prize purse funding or the cost of FTE staffing) (response required).

- FY19 _____
- FY20 _____

Q35 Provide a best estimate of the total number of FTEs used to execute [name of prize competition] (please note that one work year, or one FTE, is equivalent to 2,080 hours of work) (response required).

- FY19 _____
- FY20 _____

Q36 Please provide the total amount of prize purse offered and awarded for each fiscal year (please write in "N/A" if not applicable) (response required).

	Total prize purse offered	Total prize purse awarded
FY19		
FY20		

Q37 Describe the non-monetary incentives that were offered to participants. Please write in "N/A" if no non-monetary incentives were offered (max 300 words) (response required).

_____

_____

_____

_____

_____

Q38 Please indicate how many partners were involved in [name of prize competition].

- ○ 0 partners
- ○ 1 partner
- ○ 2 partners
- ○ 3 partners
- ○ 4 partners
- ○ 5 partners
- ○ >5 partners (If selected, we will contact you for information on additional partners)

If "0 partners" is selected in Q38, please skip to Q45

Q39 Please provide the name for each partner that was involved in [name of prize competition].

- ○ Partner 1 _____
- ○ Partner 2 _____
- ○ Partner 3 _____
- ○ Partner 4 _____
- ○ Partner 5 _____

Q40 Please provide the following information for each partner that was involved in [name of prize competition].

	Federal Agency or Office	State or Local Government	Academic Institution	Nonprofit Organization (excluding Academic Institutions)	Private Industry	Other
Partner 1	○	○	○	○	○	○
Partner 2	○	○	○	○	○	○
Partner 3	○	○	○	○	○	○
Partner 4	○	○	○	○	○	○
Partner 5	○	○	○	○	○	○

Q41 Please indicate which FY each partner provided contributions to [name of prize competition] (select all that apply).

	FY19	FY20
Partner 1	☐	☐
Partner 2	☐	☐
Partner 3	☐	☐
Partner 4	☐	☐
Partner 5	☐	☐

Q42 Provide a best estimate of monetary value of each partner's contribution by FY.

	FY19	FY20
Partner 1		
Partner 2		
Partner 3		
Partner 4		
Partner 5		

Q43 Please indicate the type(s) of contributions provided by each partner for [name of prize competition] (please select all that apply).

	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5
Prize purse (monetary award)	☐	☐	☐	☐	☐
Non-monetary award(s)	☐	☐	☐	☐	☐
Purchase of consumable materials	☐	☐	☐	☐	☐
Purchase or rental of equipment	☐	☐	☐	☐	☐
Transportation of participants	☐	☐	☐	☐	☐
Publicity/advertising/outreach/communications	☐	☐	☐	☐	☐
Web portal/app development and support	☐	☐	☐	☐	☐
Database development	☐	☐	☐	☐	☐
Software development	☐	☐	☐	☐	☐
Data entry/analysis	☐	☐	☐	☐	☐
Discovery and design support	☐	☐	☐	☐	☐
Operations or administrative support	☐	☐	☐	☐	☐
Solution acceleration	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

If "Other" is selected in Q43, please show Q44

Q44 Please indicate what other resources, if any, were provided by each partner to support [name of prize competition]. If no other resources were provided, please enter "None."

- ○ Partner 1 _____
- ○ Partner 2 _____
- ○ Partner 3 _____
- ○ Partner 4 _____
- ○ Partner 5 _____

Q45 To the best of your ability, please select which practices were used to support [name of prize competition] (select all that apply).

- ☐ My office or agency has policy or guidance supporting the use of prize competitions and challenges
- ☐ My office or agency uses contract vehicle(s) to procure products and/or services for prize competitions and challenges
- ☐ My office or agency uses internal communication tools to support prizes competitions and challenges
- ☐ My office or agency carries out coordinated external communications or maintains a webpage for prizes competitions and challenges
- ☐ My office or agency has a dedicated, central prize competition and challenge coordinator
- ☐ My office or agency has identified a prize competition and challenge POC (not dedicated full-time to prize competitions and challenges)
- ☐ My office or agency has a distributed network or community of prize competition and challenge managers and/or POCs within the agency
- ☐ My office or agency provides centralized training and design support for staff conducting prize competitions and challenges
- ☐ My office or agency has developed or is in the process of developing centers for interagency challenges in specific topics related to prize competitions and challenges
- ☐ My office or agency has a distributed network or community of project managers and/or resource people within the agency with expertise in prize competitions and challenges
- ☐ Other (please specify): _____
- ☐ None or Unknown

Q46 Please indicate whether [name of prize competition] was designed and implemented in response to a national health crisis or emergency.

- ○ Yes
- ○ No

If "Yes" is selected in Q46, please show Q47

Q47 Please indicate whether this activity was implemented as part of a coordinated response to said national health crisis or emergency.

- ○ Yes
- ○ No

If "Yes" is selected in Q47, please show Q48

Q48 Please describe briefly how this activity supported the larger, coordinated effort. (max 200 words).

_____

_____

_____

_____

_____

Q49 This is the end of the survey. By clicking the "next page" button below you will have an opportunity to review your responses and print or save/export a PDF of your responses for any approval process you may need to execute at your agency prior to final submission to STPI.

Survey: Crowdsourcing and Citizen Science

Q1 FY19–20 Reporting on Crowdsourcing and Citizen Science

This data collection survey is associated with: [name of CCS activity].

Submission details: By no later than November 20, 2020, please report to the White House Office of Science and Technology Policy (OSTP) all crowdsourcing and citizen science (CCS) activities the agency conducted during Fiscal Years 2019 and 2020 under the Crowdsourcing and Citizen Science Act. Please note that the Implementation of Federal Prize and Citizen Science Authority Fiscal Years 2019-20 Report will be submitted to Congress and made publicly available.

Reporting information for crowdsourcing and citizen science activities conducted or otherwise supported under other authorities provides visibility for the effort, and can be valuable for the overall Federal CCS community, as well as the public, to see how CCS activities can be used to advance agency missions. Agencies are highly encouraged, but not required, to complete this survey for all Federal CCS activities conducted under authorities other than the Crowdsourcing and Citizen Science Act during this reporting period.

Background: The Crowdsourcing and Citizen Science Act (15 U.S.C. 3724) requires all crowdsourcing and citizen science activities carried out under this authority to be included as a component of the biennial report on Federal Prizes and Challenges, specified under Section 24 (15 U.S.C. 3719) of the Stevenson-Wydler Technology Innovation Act of 1980 (commonly referred to as the COMPETES authority).

OSTP is leading the data collection for the final consolidated report. The Institute for Defense Analyses (IDA) Science and Technology Policy Institute (STPI) is a Federally funded research and development center (FFRDC) created by Congress to provide the OSTP with technical support and analysis. STPI is working with OSTP to support this data collection and analysis effort.

Required Reporting Information: Only information on activities entered via this online survey tool will appear in the biennial report.

Please complete the following survey **once for each CCS project** that is *launched, ongoing, or completed* under the Crowdsourcing and Citizen Science Act during this reporting period. For CCS activities in which multiple Federal agencies are involved, reporting should be completed only once by the lead agency.

If applicable, please remember to contact your agency lead or coordinator as they will be the first step in this review and clearance process at your agency. If you are unsure who your agency lead or coordinator may be, please contact STPI at citizenscience@ida.org.

Please note that this survey employs display logic and the questions presented will be determined by the answer choices you select.

If you have any questions or are experiencing technical issues please contact STPI at: citizenscience@ida.org.

Definitions: The following terms and definitions are defined as follows by the Crowdsourcing and Citizen Science Act:

Citizen science—a form of open collaboration in which individuals or organizations participate voluntarily in the scientific process in various ways, including— Enabling the formulation of research questions; Creating and refining project design; Conducting scientific experiments; Collecting and analyzing data; Interpreting the results of data; Developing technologies and applications; Making discoveries; and Solving problems. Crowdsourcing—a method to obtain needed services, ideas, or content by soliciting voluntary contributions from a group of individuals or organizations, especially from an online community.

Participant—an individual or other entity (e.g., a team) that volunteered in a crowdsourcing or citizen science project.

Full-Time Equivalent (FTE)—refers to the total amount of effort put forth by employees of the sponsoring Federal agency; one FTE represents the hours worked by one employee on a fulltime basis over one year. The concept provides a means of allocating the effort of an employee among different responsibilities and summing the efforts of multiple employees, both part-time and full-time, who spend part of their time working on the project. On an annual basis, an FTE is considered to be 2,080 hours (8 hours per day x 5 work days per week x 52 weeks per year = 2,080 hours per year). In this context, FTE is intended to convert the total number of hours contributed by all employees to a standard scale, which may not be the equal to the total number of full-time agency employees who contributed to the activity if it was only a part of their total responsibilities.

Q2 Welcome! This is the data collection survey for the following initiative: [name of CCS activity].

Q3 Primary Point of Contact within your agency for ${e://Field/Title} (response required).

- ○ First name _____
- ○ Last name _____
- ○ Email address _____
- ○ Phone number _____

Q4 Please provide link to the webpage for [name of CCS activity]. You may enter more than one, if appropriate. If there is no on-line link, please answer “N/A."

_____

_____

_____

_____

_____

Q5 Please select the status of [name of CCS activity] during FY19 (select all that apply) (response required).

- ☐ Launched
- ☐ Ongoing
- ☐ Completed
- ☐ No activity occurred in FY19

Q6 Please select the status of [name of CCS activity] during FY20 (select all that apply) (response required).

- ☐ Launched
- ☐ Ongoing
- ☐ Completed
- ☐ No activity occurred in FY20

Q7 Please provide a summary of [name of CCS activity] suitable for broad, public dissemination. This summary may be included in the formal report to Congress as, for example, a case study (max 300 words) (response required).

_____

_____

_____

_____

_____

Q8 Please select the authority under which [name of CCS activity] was conducted (select all that apply) (response required).

☐ Crowdsourcing and Citizen Science Act

☐ Unknown

☐ Other authority (please specify): _____

Q9 Provide name of sponsoring agency and office (if your office or component is not listed please select "other") (response required).

Agency

Office or component

▼ Administrative Conference of the United States ... World War I Centennial Commission ~ Other (774)

Q10 If you selected "other" as an office or component please enter the name here.

○ Office or component _____

Q11 Please specify when the activity was opened to the public for participation (e.g., data collection, submission); include the month and year, if possible. If activity's start date precedes FY19, please state when it originally started.

_____

_____

_____

_____

_____

If "Ongoing" is selected in Q5 or Q6, please show Q12

Q12 You indicated that [name of CCS activity] is ongoing, please provide the anticipated end date in mm/dd/yyyy format. If there is no anticipated end date, please put "N/A."

_____

If "Completed" is selected in Q5 or Q6, please show Q13

Q13 You indicated that [name of CCS activity] has ended, please provide the date when participation ceased in mm/dd/yyyy format.

_____

Q14 Please indicate whether [name of CCS activity] occurred as discrete events on specific dates.

- ○ Yes, the CCS activity occurred as discrete events on specific dates.
- ○ No, the CCS activity did not occur as discrete events on specific dates.

If "Yes, the CCS activity occurred as discrete events on specific dates." Is selected in Q14, please show Q15

Q15 You indicated that [name of CCS activity] occurred within the FY19-20 reporting period as a discrete event(s) on specific dates. Please provide the specific dates (in mm/dd/yyyy format) during which the activity(ies) took place.

_____

_____

_____

_____

_____

Q16 Please indicate whether [name of CCS activity] took place in a physical location(s) (e.g., town, city, county, region) or if it was a virtual activity.

- ○ Physical location(s)
- ○ Virtual activity
- ○ Combination of both

If "Physical location(s)" or "Combination of both" is selected in Q16, please show Q17

Q17 Please indicate the physical location (e.g., town, city, county, region) where [name of CCS activity] took place. List multiple locations, if appropriate.

_____

_____

_____

_____

_____

If "Virtual activity" or "Combination of both" is selected in Q16, please show Q18

Q18 If the virtual activity focused on or targeted a particular location or region, please indicate the physical location (town, city, county, region, etc.) where [name of CCS activity] focused. List multiple locations, if appropriate.

_____

_____

Q19 Please indicate how the CCS participants provided consent to take part in the [name of CCS activity] (response required).

- ○ Participants were asked to provide formal consent to participate in the CCS activity
- ○ Participation was voluntary; consent was implicit

Q20 Please identify the intended participants of [name of CCS activity] (select all that apply).

- ☐ No specific intended group
- ☐ Pre-k through 8th grade students
- ☐ 9th-12th grade students
- ☐ Undergraduate College/University/Technical students
- ☐ Master/PhD students
- ☐ Adult not affiliated with higher education
- ☐ Retiree
- ☐ Other (please specify): _____

Q21 Did [name of CCS activity] intend to reach out to underrepresented populations in Science, Technology, Engineering, and Mathematics (STEM)?

- ○ Yes
- ○ No

If "Yes" is selected in Q21, please show Q22

Q22 Please select which underrepresented populations were targeted by [name of CCS activity] (select all that apply).

- ☐ Black/African-American populations
- ☐ Hispanic or Latino populations
- ☐ Indigenous populations
- ☐ Women and girls
- ☐ No specific intended group
- ☐ Other (please specify)

_____

Q23 Please indicate which of the following populations were emphasized by [name of CCS activity] (select all that apply).

- ☐ Rural populations
- ☐ Urban populations
- ☐ Economically disadvantaged or recognized low-income communities

Q24 Please provide an estimate of the total number of unique individuals who participated in [name of CCS activity] for each fiscal year. If it is not possible to estimate, please enter "N/A."

- ○ Estimated number of participants for FY19 _____
- ○ Estimated number of participants for FY20 _____

Q25 Please indicate any objectives of the CCS Act that were addressed by the participants (select all that apply) (response required).

- ☐ Enable the formulation of research questions
- ☐ Create and refine project design
- ☐ Conduct scientific experiments
- ☐ Collect and analyze data
- ☐ Interpret the results of data
- ☐ Develop technologies and applications
- ☐ Make discoveries
- ☐ Solve problems
- ☐ No CCS Act objectives were addressed

Q26 Please indicate the intended goals of [name of CCS activity] (select all that apply).

- ☐ Education
- ☐ Digitization of agency-owned materials
- ☐ Collection of data or observations
- ☐ Analyzing existing agency data
- ☐ Public outreach or engagement
- ☐ Create or engage a specific community
- ☐ Other (please specify):

_____

Q27 If applicable, please indicate the broad nature of the contributions or tangible deliverables provided by the participants (select all that apply).

- ☐ Participants submitted data or observations they collected
- ☐ Participants processed data or other materials provided by the agency
- ☐ Submissions or materials included images
- ☐ Submissions included information on location or geospatial coordinates
- ☐ Not applicable
- ☐ Other (please specify):

_____

Q28 Please include a brief statement of how [name of CCS activity] advanced the agency's mission (approximately 150 words) (response required).

_____

_____

_____

_____

_____

Q29 Please explain why CCS was chosen to achieve the intended goals (e.g., data analysis, data contribution) as opposed to other available mechanisms, such as contracts, grants, cooperative agreements, and prize competitions (approximately 150 words) (response required).

_____

_____

_____

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_____

Q30 Please describe how the results of [name of CCS activity] (e.g., data gathered, analyses produced, communities engaged) have been or will be used by Federal agencies or partners (approximately 200 words) (response required).

_____

_____

_____

_____

_____

Q31 Please indicate whether data or results generated from [name of CCS activity] have been or will be made publicly available (response required).

- ○ Yes, data and/or results have been or will be made publicly accessible
- ○ No, data and/or results have not been made publicly accessible
- ○ N/A: no data or results were collected as part of this project

If "Yes, data and/or results have been or will be made publicly accessible" is selected in Q31, please show Q32

Q32 Please indicate where and how the data can be accessed (e.g., web link; approximately 50 words).

_____

_____

_____

_____

_____

If "Yes, data and/or results have been or will be made publicly accessible" is selected in Q31, please show Q33

Q33 Please provide a brief description of the nature of the available product including its format, content, and any other properties of interest to other potential users (approximately 100 words).

_____

_____

_____

If "No, data and/or results have not been made publicly accessible" is selected in Q31, please show Q34

Q34 Please indicate why the data have not been made publicly available (approximately 100 words).

_____

_____

Q35 Provide a best estimate of the dollar amount the agency used in support of [name of CCS activity], including the cost of FTE staffing (note: partner contributions will be asked in a separate question) (response required).

○ FY19 _____

○ FY20 _____

Q36 Please indicate how agency funds were used to support [name of CCS activity] (select all that apply) (response required).

- ☐ Purchase of consumable materials
- ☐ Purchase or rental of equipment
- ☐ Transportation of participants
- ☐ Publicity, advertising, outreach, or/and communications
- ☐ Web portal or application development and support
- ☐ Database development
- ☐ Software development
- ☐ Data entry or/and analysis
- ☐ Contracted services
- ☐ Federal employee travel
- ☐ Training
- ☐ N/A: no agency funds or other non-employee resources were used
- ☐ Other (please specify):

_____

Q37 Please provide a best estimate of the total number of FTEs used to execute [name of CCS activity] (note: one work year, or one FTE, is equivalent to 2,080 hours of work) (response required).

- FY19 _____
- FY20 _____

Q38 If appropriate, please indicate all other agency resources other than FTEs or funding used to support [name of CCS activity] (input "N/A" if not applicable).

- FY19 _____
- FY20 _____

Q39 Please indicate the total number of partnering agencies or organizations involved with [name of CCS activity].

- 0 partners
- 1 partner
- 2 partners
- 3 partners
- 4 partners
- 5 partners
- >5 partners (if selected, we will reach out to you for information on additional partners)

Q40 Please provide the name of the partnering agency/organization.

- ○ Partner 1 _____
- ○ Partner 2 _____
- ○ Partner 3 _____
- ○ Partner 4 _____
- ○ Partner 5 _____

Q41 Please provide the type of partnering agency/organization.

	Federal Agency or Office	State or Local Government	Academic Institution	Nonprofit Organization (excluding Academic Institutions)	Private Industry	Other
Partner 1	○	○	○	○	○	○
Partner 2	○	○	○	○	○	○
Partner 3	○	○	○	○	○	○
Partner 4	○	○	○	○	○	○
Partner 5	○	○	○	○	○	○

Q42 Please indicate the type(s) of contribution provided by the partner(s) (select all that apply).

	Funding	Personnel	Space	Consumable resources	Online support	Other
Partner 1	☐	☐	☐	☐	☐	☐
Partner 2	☐	☐	☐	☐	☐	☐
Partner 3	☐	☐	☐	☐	☐	☐
Partner 4	☐	☐	☐	☐	☐	☐
Partner 5	☐	☐	☐	☐	☐	☐

If "Other" is selected in Q42, please show Q43

Q43 You indicated that the following partner(s) provided other contributions. Please specify the contribution(s) provided here:

- ○ Partner 1 _____
- ○ Partner 2 _____
- ○ Partner 3 _____
- ○ Partner 4 _____
- ○ Partner 5 _____

If "Personnel" is selected in Q42, please show Q44

Q44 Please list the activities or contributions made by the personnel.

- ○ Partner 1 _____
- ○ Partner 2 _____
- ○ Partner 3 _____
- ○ Partner 4 _____
- ○ Partner 5 _____

Q45 Please indicate which fiscal years the following partner(s) provided contributions.

	FY19	FY20
Partner 1	☐	☐
Partner 2	☐	☐
Partner 3	☐	☐
Partner 4	☐	☐
Partner 5	☐	☐

Q46 Please indicate the approximate monetary value of the contribution(s) provided by the following partner(s) by fiscal year.

	FY19	FY20
Partner 1		
Partner 2		
Partner 3		
Partner 4		
Partner 5		

Q47 Please indicate which of the following practices your agency uses to support crowdsourcing and citizen science activities. These questions specifically address practices at the level of an agency supporting individual CCS activities. In this context, "agency" can refer to a cabinet-level department, an independent agency, or a high-level division or unit within a department (select all that apply).

- [ ] Agency has issued agency-wide policy or guidance on the use of CCS
- [ ] CCS is included in agency-wide plans
- [ ] Agency has articulated connections of how the use of CCS activities support the agency's mission
- [ ] CCS integrally or routinely used in agency science products
- [ ] Agency leverages existing platforms or tools to conduct CCS activities
- [ ] Agency uses internal communication tools to support CCS
- [ ] Agency carries out coordinated external communications or maintains a webpage for CCS
- [ ] Agency has a dedicated, full-time CCS coordinator
- [ ] Agency has identified a CCS point of contact (not dedicated full-time to CCS)
- [ ] Agency has a distributed network or community of project managers and/or resource people within the agency with expertise in CCS
- [ ] Agency provides centralized training and design support for staff conducting CCS activities
- [ ] Agency has developed or is in the process of developing a generic Information Collection Request (ICR) for CCS activities
- [ ] Agency offers grant funding to support implementation of CCS
- [ ] Not Applicable (N/A) or Unknown

Q48 If available, please submit any additional media links, blog posts, videos, etc., and/or relevant public quotes from agency personnel, partners, or participants (approximately 100 words).

_____

_____

_____

_____

_____

Q49 Please indicate whether this crowdsourcing or citizen science activity was designed and implemented in response to a national health crisis or emergency.

- ○ Yes
- ○ No

If "Yes" is selected in Q49, please show Q50

Q50 Please indicate whether this activity was implemented as part of a larger, coordinated response to said national health crisis or emergency.

- ○ Yes
- ○ No

If "Yes" is selected in Q50, please show Q51

Q51 Please describe briefly how this activity supported the larger, coordinated effort (max 200 words).

_____

_____

_____

Q52 Does your office award grants or other forms of financial support to non-Federal entities (e.g., academic institutions, philanthropic organizations) to carry out crowdsourcing or citizen science activities?

- ○ Yes
- ○ No
- ○ Not Applicable (N/A) or Unknown

If "Yes" is selected in Q52, please show Q53

Q53 Please indicate how many non-Federal activities were active in any way during the following fiscal years.

- ○ FY19 _____
- ○ FY20 _____

If "Yes" is selected in Q52, please show Q54

Q54 Please indicate approximately how much funding your office expended on crowdsourcing and citizen science activities run by non-Federal entities in the following fiscal years.

- ○ FY19 _____
- ○ FY20 _____

If "Yes" is selected in Q52, please show Q55

Q55 For these activities that are carried out by non-Federal entities, please provide the following information: 1) Name of the activity; 2) primary sponsor of the activity (e.g., awardee or institution); and 3) a short description of the activity (e.g., who was the audience? what activity was done? was the activity online or in-person? what was the outcome?) (max 75 words per activity).

_____

_____

_____

_____

_____

Q56 Please indicate if you would like for this activity to be included in the catalog on Citizenscience.gov. If you answer "yes," you will be contacted by a member of the Citizenscience.gov team to assist with content implementation.

- ○ Yes, I would like to include this activity in the catalog on Citizenscience.gov.
- ○ No, I would not like to include this activity in the catalog on Citizenscience.gov.
- ○ The activity is already included in the catalog on Citizenscience.gov.

Q57 This is the end of the survey. By clicking the "next page" button below you will have an opportunity to review your responses and print or save/export a PDF of the survey questions and your responses for any approval process you may need to execute at your agency prior to final submission to STPI.