Introduction

The Conservation Innovation Grants (CIG) program celebrated its 17th consecutive year in 2020. The Natural Resources Conservation Service (NRCS) administers this critical program to support cutting-edge innovations that address natural resource challenges on private lands.

This biennial report briefly describes the history of CIG and how the program is managed. Most of the report is devoted to a discussion of the 2019 and 2020 National CIG competitions, program improvements undertaken by the agency during the last two years, and a survey of compelling CIG project results and successes drawn from three program components: the national CIG Classic competition, On-Farm Conservation Innovation Trials (On-Farm Trials), and State-administered CIG Classic competitions.

Program History

For over 80 years, NRCS has provided science-based, technically sound, and proven conservation practices, advice, and alternatives to America's farmers, ranchers, and forest landowners who own or manage private agricultural and forest land. Since launching the CIG program in 2004, the program has partnered with Tribes, universities, conservation districts, nongovernmental organizations, for-profit companies, and more to support innovative approaches and technologies through on-farm demonstrations, field tests, and producer outreach efforts. Some of the supported innovations are ultimately incorporated into NRCS's science-based tools and guidance. Others are designed to locate and incentivize third parties that complement NRCS's mission by finding new ways to get more conservation on the ground.

NRCS has administered both national and State CIG competitions since 2004. NRCS has awarded over $323 million to fund 778 projects through the national program's Classic component. Each grant requires a matching commitment from NRCS partners, leveraging NRCS funding and roughly doubling the total investment.

The 2018 Farm Bill introduced On-Farm Trials as a new program component. CIG On-Farm Trials provide incentive payments and technical assistance to help producers adopt and evaluate new or innovative conservation approaches in areas including precision agricultural technologies, nutrient management, and soil health management systems. In its first two years, NRCS awarded 30 grants totaling over $48 million through On-Farm Trials.

Program Authority

Section 2301 of the Farm Security and Rural Investment Act of 2002 (Public Law 107-171) amended section 1240H of the Food Security Act of 1985 (Public Law 99-198) to establish the CIG program with funding from the Environmental Quality Incentive Program (EQIP). Section 2509 of the Food, Conservation, and Energy Act of 2008 (Public Law 110-246), section 2207 of the Agricultural Act of 2014 (Public Law 113-79), and section 2307 of the Agriculture Improvement Act of 2018 (Public Law 115-334) reauthorized CIG.

Program Summary

Each CIG program component (Classic, State, and On-Farm Trials) is distinct and is administered through a unique competitive process with unique funding pools. Each year, the NRCS Chief designates a portion of EQIP funding for the CIG Classic Competition. On-Farm Trials is set at $25 million annually by statute. States can use up to 5% of their EQIP allocation for State CIG competitions.

For each program, NRCS publishes funding announcements that identify national priorities and program policy. CIG proposals for all program components are evaluated by peer review panels. Peer panels for national competitions generally consist of NRCS technical experts and technical specialists from other Federal agencies. Peer panelists evaluate and rank all eligible proposals based on the CIG proposal evaluation criteria specified in the relevant funding announcement. In 2020, both the CIG Classic and On-Farm Trials competitions initiated a supplementary review and ranking process for proposals benefitting Historically Underserved (HU) producers.

After USDA announces CIG awards, a grant agreement is negotiated and signed with each CIG awardee. CIG agreements are administered in accordance with 2 CFR 200, Federal regulation on grant management.

Experts from NRCS's National Headquarters and State offices are assigned to serve as technical specialists for CIG projects throughout the life of the project. These technical contacts specialize in fields relevant to the grant activity, provide support for issues and concerns, and track project milestones with grantees. Technical contacts also complete project evaluations and recommend whether additional actions are needed to disseminate project results or to develop supplementary documents or products.

CIG Classic – National Component

NRCS has administered CIG Classic (both national and State components) in largely the same fashion since 2004. All proposed CIG projects must involve farmers, ranchers, or forest landowners eligible to participate in EQIP.

Peer panel recommendations are ultimately shared with the NRCS Chief for final review and selection. The Chief and NRCS leadership may consider additional criteria such as geographic and partner diversity in making final award selections.

CIG Classic uses a competitive process to provide grants of up to 3 years in length to eligible individuals, nongovernmental organizations, private businesses, tribal organizations, and State and local governments. CIG is designed to transfer innovative conservation technologies, management systems, and approaches to EQIP-eligible producers in the form of technical manuals and guides and conservation practice standards, or to the private sector in the form of technical tools, new conservation approaches, or environmental markets.

To further encourage participation of HU producers (including beginning; socially disadvantaged; military veterans; and limited resource farmers, ranchers, and forest landowners),

up to 10 percent of CIG national annual competition funds are set aside for proposals that benefit HU producers.

Selected applicants may receive CIG grants of up to 50 percent of their total project cost; projects involving HU producers may be eligible for a reduction in required match. CIG recipients must match the USDA funds awarded from non-Federal sources with any combination of cash and in-kind contributions. Grantees must also provide the technical assistance to complete the project successfully.

Table 1: CIG Classic component information

Fiscal year	Proposals received	Grants awarded	Funding requested (millions)	Funding awarded (millions)
2004	148	40	$55.0	$14.2
2005	175	54	$70.7	$19.2
2006	199	63	$75.4	$19.3
2007	194	50	$121.3	$19.0
2008	260	58	$90.7	$18.9
2009	391	52	$170.2	$18.0
2010	388	58	$221.8	$17.7
2011	455	61	$176.8	$29.9
2012	475	59	$194.3	$26.1
2013	498	45	$196.6	$18.7
2014	394	48	$166.2	$15.8
2015	300	46	$119.0	$20.5
2016	170	46	$101.5	$26.6
2017	140	33	$82.0	$22.6
2018	144	22	$77.1	$10.6
2019	114	19	$91.8	$12.4
2020	100	24	$133.9	$14.6
Total	**4545**	**778**	**$2,144.3**	**$323.7**

CIG Classic - State Component

Each year, NRCS State offices may choose to administer and manage their own, small-scale CIG Classic competitions. On average, between 15–30 States offer this opportunity annually. The number of CIG awards and the amount of funding provided at the State level varies from year-to-year. The EQIP final rule published in 2020 eliminated the $75,000 per project cap that existed since the program's inception. Table 2 below lists funding amounts for the program beginning in 2014, the first year for which data is available.

Table 2: CIG Classic State component information

Year	Number of Awards	CIG Funding Amount (millions)

2014	69	$4.3
2015	44	$2.6
2016	39	$2.5
2017	77	$5
2018	59	$3.9
2019	60	$3.8
2020	48	$4.4

On-Farm Trials

CIG On-Farm Trials, introduced in 2019, uses a similar competitive process to award grants of up to 5 years in length to private entities whose primary business is related to agriculture, non-governmental organizations with experience working with agricultural producers, and non-Federal government agencies. These awards are intended to support more widespread adoption of innovative approaches, practices, and systems on working lands. Selected applicants may receive grants of up to 75 percent of their total project cost.

The 2018 Farm Bill gives NRCS the option of administering On-Farm Trials itself directly with producers or working through partners. To date, NRCS has administered On-Farm Trials as a competitive program through eligible partners. On-Farm Trials projects must include incentive payments made by the awardee to participating producers.

A key element of On-Farm Trials projects are the required environmental and economic/financial evaluations that every project must undertake. Environmental evaluations must be science-based analyses of the conservation value of the technologies and approaches carried out through On-Farm Trials projects. The economic evaluations examine the financial impact of conservation implementation on a farmer's bottom line, a critical factor to conservation adoption. On-Farm Trials partners may also choose to carry out social evaluations, an optional deliverable that is designed to explore the community-wide impact of conservation, as well as the factors that lead farmers to choose to implement the technologies and approaches in question. NRCS provides guidance to On-Farm Trials partners on how to conduct these evaluations.

Table 3: CIG On-Farm Trials component information

Fiscal year	Proposals received	Grants awarded	Funding requested (millions)	Funding awarded (millions)
2019	74	16	$140.4	$24.0
2020	101	14	$183.6	$24.3
Total	**175**	**30**	**$324.0**	**$48.3**

CIG in 2019 and 2020

2019 CIG Competitions

In 2019, NRCS made 19 awards totaling more than $12.4 million through the national CIG Classic competition. These awards were divided among priorities including:

- Increasing the pace and scale of conservation adoption
- Water Quantity

- Pollinator Habitat
- Urban Agriculture

NRCS selected 16 awards totaling nearly $24 million through the national CIG On-Farm Trials competition. The 2019 On-Farm Trials priorities were:

- Irrigation Management Technologies
- Precision Agriculture Technologies and Strategies
- Management Technologies and Strategies
- Soil Health Demonstration Trial

The Soil Health Demonstration Trial (SHD) is a sub-component of On-Farm Trials intended to demonstrate the value of long-term, successfully implemented Soil Health Management Systems (SHMS) and production systems being transitioned to a SHMS. SHD awardees agree to follow consistent soil health assessment protocols to evaluate the impacts of practice and system implementation.

In 2019, 27 States administered their own CIG Classic competitions. These States made 60 awards totaling over $3.8 million.

2020 CIG Competitions

In 2020, NRCS made 24 awards totaling more than $14.6 million through the national CIG Classic competition (see appendix A for a list and brief summaries of the awarded projects). 2020 priority areas included:

- Water Quality
- Water Reuse
- Wildlife
- Air Quality
- Energy Conservation

CIG On-Farm Trials retained Soil Health Demonstration Trial, Irrigation Management Technologies, Precision Agriculture Technologies and Strategies, and Management Technologies and Strategies as its primary priorities. Fourteen projects were awarded totaling more than $24.3 million.

In 2020, 22 States administered State CIG competitions, making 48 awards for over $4.4 million.

Program Improvements

Over the last two years, NRCS staff managing CIG programs have continued to pursue strategic program improvements. These include:

Improving Program Management and Oversight

In February 2017, USDA's Office of Inspector General initiated an audit of the CIG program. Released in September 2018, the audit analyzed program activities in fiscal years 2014–16. The audit called on NRCS to improve accountability and oversight of

CIG projects and agreements, develop policy for verifying expenditures of grantee matching funds, reduce payment processing time, and develop an agency conflict of interest policy. In response to those recommendations, NRCS formalized a variety of improvements in its new CIG program manual, published in early 2021. Publication of the revised manual represented the first updates since 2013.

The revised manual codifies, among many other items, NRCS's commitment to process all CIG partner invoices within 30 days of receipt and conduct annual audits of CIG partner matching fund expenditures. NRCS continues to closely monitor active awards to ensure timely submission of key deliverables such as performance and financial reports and is working to build more robust outcome metrics to inform future NRCS programs.

Technology Enhancements

The CIG team has pursued a number of technological enhancements to the program, with the aim of improving customer service, knowledge sharing, and data collection while streamlining the application process. These developments include:

1) Conservation Practice Database—Development of the Conservation Practice Database (CPD) was mandated by Section 2307 of the 2018 Farm Bill. The CPD will be a public-facing web-based software application and data store designed to provide greater transparency into the CIG Program and the incorporation of new and innovative technology into NRCS conservation practice standards and conservation activities. NRCS expects to have a first public release of CPD products in Fall 2021.

2) NRCS Programs Portal—In 2020, CIG national competitions began accepting applications through the NRCS Programs Portal. This platform simplifies the proposal process for applicants, gives CIG program staff direct access to proposals, minimizes data errors by automatically generating required forms from information entered by applicants, and provides a project management platform that is user-friendly for CIG awardees. CIG staff are working to integrate information collected in the Portal with the enhanced CPD-CIG search tool described above.

Historically Underserved Producer Benefits

CIG has traditionally reserved 10 percent of program funds for HU producers or community-based organizations comprised of or representing these entities. CIG staff have undertaken several initiatives to expand the program's impact on HU producers. Starting in 2020, NRCS began convening a separate group of reviewers to more closely evaluate proposals competing for the 10 percent reserved funding. These reviewers use criteria that highlight the degree to which proposed projects would directly benefit HU producers and communities. HU reviews provide supplementary information for the NRCS Chief to consider when making final award decisions.

In addition, CIG staff are participating in a NRCS working group focused on increasing outreach and grantsmanship training opportunities for HU producers and organizations serving HU communities. As of May 2021, the targeted outreach effort has reached 200+ organizations. In April 2021, a CIG grantsmanship webinar targeted to organizations working with HU producers attracted participants from over 40 organizations.

APPENDIX A: CIG Award Highlights

1. 2020 CIG Classic and On-Farm Trials Awards:

Below are short summaries of the national CIG Classic projects awarded in 2020:

Air Quality

Practical Farmers of Iowa
$1,131,213
Small Grains Unlock Potential to Keep Nitrogen in Crops and Out of Air and Water: Market-Based Innovations to Optimize Fertilizer and Manure Management in Extended Rotations
States: IA; MN; WI; NE; IL
Practical Farmers of Iowa proposes to increase the adoption of fertilizer and manure management practices that result in lower greenhouse gas emissions with small grains by piloting innovative cost-share and market-based mechanisms with grain and animal protein supply chain partners (including McDonalds, Oatly, PepsiCo and Starbucks).

Texas A&M AgriLife Research
$151,500
Demonstration of Management Practices and Technologies to Suppress Ammonia Emissions from Livestock Facilities Along Colorado's Front Range
States: TX; CO
Texas A&M proposes to validate and demonstrate targeted management practices for confined livestock operations to reduce particulate matter (PM) and ammonia (NH3) emissions in certain weather conditions along the front range of Colorado's Rocky Mountains.

University of Minnesota
$294,820
Demonstration of a microbial electrochemical system to mitigate hydrogen sulfide emission from dairy manure pits
States: MN
The University of Minnesota proposes to develop an economically feasible system that does not require pre- or post-treatment and will mitigate the highly toxic and odorous hydrogen sulfide gas released from pit manure storages.

Indian Land Tenure Foundation
$513,915
Tribal Lands Carbon and Co-Benefits Tool
States: CO; AZ; CO; KS; NE; NM; OK ;TX
Indian Land Tenure Foundation proposes to develop and pilot an operational web-based tool to assess and quantify the benefits of carbon sequestration produced through ecosystem conservation and restoration activities on tribal lands.

Energy Conservation

Ohio State University
$400,111
Validating Energy Conservation of Advanced Livestock Ventilation Systems with Real-Time Energy Data
States: OH; KY
Ohio State proposes to establish benchmark energy consumption for livestock confinement buildings by using high-efficiency direct drive motors and optimal control strategies and assessing the economic impact of implementing these practices in an 8-State area.

Rid-All Foundation, Inc.
$888,413
Equity-Based Regenerative Agriculture through Carbon Capture and Utilization Technology: The Community Carboneers Collaborative
States: OH; MI; NM
The Rid-All Foundation proposes to improve the resiliency of agricultural producers in historically underserved communities in urban and remote rural areas by increasing energy independence and developing soil conditioning byproducts to support cropping systems and aquaculture operations. The project will pilot bioenergy/biochar systems at four locations throughout the US by working with a consortium of organizations already engaged in community agricultural sustainability development.

American Council for an Energy Efficient Economy
$595,026
Data-Driven Market Transformation for Controlled Environment Agriculture
States: CO; IL; MA; OR; PA; WA
The American Council for an Energy Efficient Economy proposes to characterize key performance indicators, baseline data, and facility level benchmarking for controlled environmental agricultural facilities. The project will develop a comprehensive suite of data tools, coupled with a market intervention strategy to address barriers to energy conservation, adoption of energy-efficient technologies, access to energy use data, and best practices.

Water Quality

University of Illinois
$1,112,730
Innovating through barriers for bioreactors and saturated buffers
States: IL; IA; MN
The University of Illinois proposes to design and evaluate bioreactors and saturated buffers that address variable flow, increase the volume of water treated, look at how site factors may impact performance, and test innovative nitrogen monitoring methods that could lead to market-based water quality solutions.

Newtrient, LLC
$697,203
Environmental and Economic Benefits of Dairy Manure Treatment Technologies and Practices for Improving Water Quality
States: IL
Over the past two years, Newtrient has worked with partners to develop and test a specific protocol for evaluating dairy manure treatment technology performance. This project proposes to apply this protocol to evaluate fifteen technologies and practices for improving water quality, efficiently utilizing manure, and identifying new opportunities for marketable products in various regions.

Mississippi State University
$1,480,526
Combining Cover Crops with Irrigation Water Management Technologies to Economically Reduce Pollutant Loss from Farm Fields, Transport of Agrochemicals in Streams, and Aquifer Decline
States: AR; LA; MS; MO
Mississippi State University proposes to improve water quality and quantity by increasing the adoption of a novel production system based on scheduling and delivering water to cover crop production systems using state-of-the-art technologies.

First Nations Development Institute
$241,581
Increasing Native Producer and Community Access to Quality Water Resources
States: AZ; NM
First Nations Institute proposes to work with two Native American organizations, taking a community-focused approach to empower Native American agricultural producers both individually and collectively to create, implement, and sustain conservation strategies that will address water quality and watershed management issues. It will develop conservation planning training and build capacity to address watershed issues.

Arkansas Land and Community Development Corporation
$176,912
Innovative Conservation Approaches and Technologies for Alternative Crops
States: AR
Arkansas Land and Community Development Corporation proposes to introduce historically underserved vegetable growers in East Central Arkansas to using drones for pest control management. Training producers in using high resolution camera drones that can help with early stage detection of pest infestations will allow for targeted pesticide application leading to less chemical use.

Michigan State University
$614,347
Accelerating the adoption of saturated buffers using an educational decision-support tool
States: MI; IA
Michigan State University proposes to develop an educational decision-support tool for accelerating the adoption of saturated buffers by increasing knowledge of the value of this practice. This tool will inform farm-level siting and optimize the design of saturated buffers for efficient nitrate removal from subsurface drainage water.

Mississippi State University
$318,714
Demonstrating Phosphorus Adsorbance in a Slag/Biochar Bioreactor Design for the Treatment of Stormwater Runoff
States: MS
Mississippi State University proposes to use biochar for the purpose of mitigating agricultural nutrient runoff at the field-scale and combine the biochar technology with slag, a known phosphorus-grabber, to improve existing conservation practices and demonstrate their combined effectiveness to improve management of nutrients.

Texas A&M AgriLife Research
$735,239
Biocarbon-Enhanced Dairy Manure Management Demonstration for Enhanced Water Quality
States: TX
Texas A&M proposes to develop and demonstrate a biochar-assisted phytoremediation system for enhancing water quality during dairy manure application in three Texas counties. It will improve knowledge of field-applied calcium hydroxide-coated biochar and how, when used in conjunction with plants, it can help enhance water quality during dairy manure application.

North Carolina State University
$752,518
Using 3-D characterization and mapping of cover crops and weeds to fight herbicide resistant weeds and avoid reverting back to tillage-based weed control
States: IA; NC; TX
North Carolina State University proposes to apply a 3-D imaging system to increase the adoption of cover crops and provide site-specific weed control tactics to substantially reduce tillage. The 3-D imaging system will map and quantify cover crops and weeds and will inform site-specific management of weed escapes, protecting soil and water quality through improved management of herbicide-resistant weeds.

Water Reuse

White River Regional Irrigation Water Distribution District
$700,000
Using a Regional Ag Data Network to Accelerate Water Reuse and Water Quality Considerations in Irrigation Systems
States: AR
Use of advanced technology for irrigation scheduling has demonstrated reduced water use with proper scheduling. However, data that tracks the volume of runoff that can be captured and reused is limited. Whiteriver Regional Irrigation proposes to determine the volume of runoff that is captured in tail-water systems and irrigation storage reservoirs and the volume and quality of water reused for incorporation into Irrigation Water Management plans.

Louisiana State University Agricultural Center
$595,172
A comprehensive demonstration of using agricultural tailwater irrigation for southern crop production
States: LA
The proposed project focuses on the recycling of tailwater using agricultural return-flows. Louisiana State University will develop irrigation strategies that include constructed ponds and groundwater that decrease the salinity and suspended solids levels in tailwater for agricultural use.

Wildlife Habitat

Heart of the Rockies
$886,255
Landowner collaborative strategies for nonlethal predator control
States: AZ; CA; ID; MT; NM; OR; WA
Heart of the Rockies proposes to accelerate innovation by developing a community of practice to implement nonlethal predator control techniques across diverse social and ecological contexts. Through a diverse partnership, the project will evaluate the effectiveness of techniques across occupied grizzly bear and wolf habitat, examining potential for conservation practices and developing collaborative strategies and producer guidelines for nonlethal predator control.

Friends of the Teton River, Inc.
$468,388
Teton Basin Aquifer Recharge Demonstration: Expanding Innovative Irrigation Management
States: ID; WY
Friends of the Teton River proposes to demonstrate and evaluate a stakeholder-driven, science-based approach to water management in Southeastern Idaho that uses market forces to incentivize early season aquifer recharge. Intended benefits will be an extended local irrigation season, enhanced farm productivity, and improved habitat and water quality for critical fish and wildlife species.

Playa Lakes Joint Venture
$514,560
Tree-age: A decision support tool to target brush management and other wildlife practices to benefit rangeland management
States: CO; AZ; CO; KS; NE; NM; OK; TX
Playa Lakes Joint Venture proposes to build an online decision support tool to estimate effects of wildlife programs and practices on populations of grassland birds. The innovative, interactive tool will be spatially explicit, integrate across breeding and non-breeding seasons, potentially integrate across international borders, and build on years of conservation planning and delivery experience.

Texas A&M AgriLife Research
$694,167
Automated wildlife monitoring: Enabling producers to measure their conservation impacts
States: TX; CA; WA; AZ
Texas A&M proposes to use innovative integration of camera, image, and sensor technology to create a tool to monitor wildlife typically difficult to observe. Dramatic images, fine-scale data, ArcGIS compatibility, and an accessible web interface will empower producers and scientists to better monitor wildlife on agricultural land, creating a low-cost monitoring system with the potential to measure the positive effects of conservation measures.

Brigham Young University
$519,150
Helping Producers Improve Wildlife Habitat with Innovative Seed Coating Technologies
States: UT
Seeding degraded areas to restore wildlife habitat can often end in failure in dryland systems. Brigham Young University proposes to test seed coatings to protect seeds from fungus and herbicides to support delayed emergence for successful reseeding of native species on burned or herbicide-treated rangelands formerly degraded by invasive grasses. Specifically, the project will address the restoration of cheatgrass infested areas using seed coatings, herbicides and innovative planting techniques.

Texas Water Trade
$194,500
Protecting and Restoring Flow in the Pecos River Basin
States; TX; NM
Texas Water Trade proposes to test the marketability of various contract structures with agricultural producers in the Pecos River Basin to develop a replicable, effective, and voluntary legal mechanism to provide reliable flows in critical aquatic and riparian habitat. The proposal would test the feasibility of voluntary water savings while maintaining existing water rights through the contribution of unused water to the maintenance of stream flow and aquatic habitat.

Below are short summaries of the national CIG On-Farm Trials projects awarded in 2020:

Soil Health Demonstration Trials

Awardee: University of Texas Rio Grande Valley
Award: $1,899,545
State: TX
Project Description: A collaborative effort between the University of Texas Rio Grande Valley, Texas State University, the National Center for Appropriate Technology, and Texas producers, this project focuses on the long-term regional implementation and evaluation of cover crops and improved/reduced tillage practices in degraded, subtropical soils on arid, water-limited farms. Researchers will recruit historically underserved farmers across the region to receive technical and financial assistance to improve soil health.

Awardee: Vermont Land Trust, Inc.
Award: $2,015,167
State: VT
Project Description: Vermont Land Trust will work together with test farms to plan and implement a four-part Soil Health Management System for each site including: no-till seeding of forage and cover crops; nutrient management via application of compost and bioavailable soil amendments; non-invasive mechanical pasture improvement; and management-intensive rotational grazing of livestock. Outcomes will be evaluated against five control sites and used to produce a predictive pasture health model.

Awardee: North Carolina State University
Award: $2,003,778
States: VT, PA, MD, NH, OH, VA, TN, NC, SC, GA, FL, AL, MS, AR, WI, IN, SD, KS, NE, OK, TX, IA, MO
Project Description: This project adds new row crop farms to an existing network of producers in an online co-learning environment integrating technology, real-time data flow (aggregation, analytics, and visualization), and decision support tools to promote the use of soil health management principles including carbon storage, nitrogen cycling, and water infiltration and storage.

Awardee: American Farmland Trust, Inc.
Award: $2,627,531
States: CT, CA, NY, MA, KY, WA
Project Description: American Farmland Trust will stimulate the adoption of various soil health practices by involving farms in a coast-to-coast Soil Health Demonstration project demonstrating regionally appropriate soil health strategies across three regions covering 7 States and 6 cropping systems. Through soil sampling, in-field assessment, and crop management protocols AFT will track the short-term soil, economic, and social changes occurring as farms transition to full soil health management systems.

Awardee: Clemson University
Award: $499,959
States: SC, NC
Project Description: Clemson University will engage North and South Carolina cotton farmers, including historically underserved producers, to implement cover crops and conservation tillage. Participating producers will grow winter cover crops and use conservation tillage in cotton-based cropping systems to evaluate the impact on soil health in order to increase the adoption of these practices among cotton growers region-wide.

Awardee: University of Hawaii
Award: $1,983,479
State/Territories: Hawaii, Puerto Rico, American Samoa
Project Description: The University of Hawaii will establish a network of on-farm Soil Health Management Systems demonstrations that are individually tailored, regionally adapted, and managed by farmers, in collaboration with participating farms in Puerto Rico, American Samoa, and three Hawaiian islands. The project emphasizes engagement with historically underserved Native Hawaiian, Pacific Islander, and Hispanic farmers and restorative efforts on degraded or abandoned agricultural lands in rural communities.

Irrigation Management

Awardee: University of Florida
Award: $1,615,906
States: FL, GA
Project Description: The University of Florida will work with producers to institute a rapid, efficient, and near real-time method of estimating root zone soil moisture in vegetable farms with a long-term goal of helping agricultural producers and stakeholders achieve balance between water resource conservation and farming profitability through improved irrigation accuracy and planning.

Awardee: Michigan State University
Award: $426,209
States: MI, IN
Project Description: Michigan State University will work with producers to field-test a low-cost remote sensor monitoring system in corn, soybean, and small vegetable production plots. MSU will assess adoption through surveys conducted in collaboration with partners Michigan Farm Bureau and Michiana Irrigation Association.

Precision Agriculture

Awardee: University of Illinois
Award: $4,000,000
States: ID, IL, LA, MN, MT, NE, ND, SD, TX, WA
Project Description: University of Illinois, in collaboration with Washington State University's Extension Program and cotton, corn, soy, and wheat producers, plans to deploy a data-intensive crop management system based on on-farm precision experiments. Farmers will use these tools

to conduct site-specific, data-based evaluation of the yield costs of reducing nitrogen losses, enabling data-informed input management decisions.

Awardee: Regents of the University of Minnesota
Award: $786,965
States: MN, IN
Project Description: Researchers will implement on-farm corn precision nitrogen management (PNM) and monitoring trials on farms in Minnesota and Indiana to assess the agronomic, economic, and environmental benefits of PNM technology in comparison with farmers' current nitrogen management practices under diverse on-farm conditions.

Management Technologies and Strategies

Awardee: Ridge to Reefs, Inc.
Award: $995,991
Territory: Puerto Rico
Project Description: This project brings together a coalition of organizations representing academia, public, private, and non-governmental sectors in Puerto Rico to help farmers implement improved Regenerative Production Systems consisting of a suite of Enhanced Management Practices. Small- to medium-scale farms will implement practices focused on their specific resource concerns and production goals.

Awardee: Texas A&M AgriLife Research
Award: $ 2,231,261
States: IL, IA, DE, MD, VA, NC, LA, TX
Project Description: Texas A&M, in collaboration with commodity boards and grower networks, will work with soybean, corn, and cotton producers across 8 States to enhance on-farm adoption of integrated herbicide-resistant weed management practices through a focus on cover crops and harvest weed seed control.

Awardee: Michigan State University
Award: $2,571,064
States: MI, IA, IN, IL, NE, SD, KS, MS, TX, VA, MO
Project Description: In collaboration with corn, soybean, wheat, and cotton producers, MSU aims to reduce N fertilizer losses from agricultural fields by implementing two interconnected strategies: site-specific, data-driven, variable-rate N fertilizer application rates, and replacement of unprofitable and/or unresponsive areas with restored native vegetation.

Awardee: Candidus, Inc.
Award: $683,562
States: CA, MI, VA
Project Description: Candidus will implement and demonstrate an advanced greenhouse lighting control system coupled with site-specific lighting strategies, in cooperation with greenhouses in 3 States, with the goal of improving greenhouse energy efficiency and increasing profitability for growers.

2. Recent CIG Project Highlights:

Below are highlights of notable CIG projects not available in previous congressional reports.

- A report published in 2021 by the Conservation Finance Network and Gordian Knot Strategies highlighted the value of national CIG-funded conservation finance projects. The Enduring Arches: Building Conservation Finance Projects for Impact report, which was funded by the Walton Family Foundation, examined a cohort of 25 CIG-funded conservation finance projects, ranging from consumer-driven certification and labeling programs to urban green infrastructure to pay-for-success approaches for water quality improvements. The report found that 64% of projects achieved on-the-ground conservation outcomes; 32% successfully sourced and deployed private investment capital; and 68% led to follow-on projects, post-CIG award. "We hope that this report serves as something akin to a credit rating score for conservation projects," said Sean Penrith, CEO of Gordian Knot Strategies and lead author of the report. "Conservation finance dollars are too rare to waste, so finding a way to optimize their use is critical."
- A 2019 national CIG Award given to Mad Agriculture has helped the non-profit launch a loan program aimed specifically at landowners working to transition to organic agriculture. Known as the Perennial Fund, it gives landowners both the flexibility and stability necessary to make the transition to organic while still securing returns for investors. Since receiving a CIG of almost $800,000, Mad Agriculture has successfully raised $10 million from over 40 different investors. There are over 100 farmers in the pipeline, and Mad Agriculture is in the process of giving out their first loans. "Through the help of CIG, we are being taken seriously by the large bankers on Wall Street and multinational companies that trade in the commodities that farmers are growing," explained Brandon Welch, Director of Radical Capital for Mad Agriculture. "This is going to change the future of farm financing."
- New Hampshire awarded the Rockingham County Conservation District (RCCD) a State Conservation Innovation Grant in 2020 for $79,886. RCCD is partnering with the Cheshire County Conservation District, the Strafford County Conservation District, University of New Hampshire Cooperative Extension, and the Xerces Society to provide financial and technical assistance on Integrated Pest Management (IPM) techniques that are not yet widely utilized in New Hampshire. This project focuses on two main IPM cost share strategies: (1) Weather stations to increase the availability of localized weather information to help better farmers utilize models that will assist them in targeted pest management to reduce unnecessary or broad spectrum pesticide applications and; (2) Spotted wing drosophila exclusion netting to help famers reduce or eliminate pesticide use or allow no-spray farmers to utilize their growing season. Results from these demonstration projects will be shared widely to help other farmers implementing these practices.
- In 2019, the American Forest Foundation (AFF) and The Nature Conservancy received a national CIG award of nearly $1 million to develop the framework for the Family Forest Carbon Program (FFCP), which aims to increase participation of small, privately owned forest owners in carbon market opportunities. The FFCP reimagines carbon accounting, basing payments not on inventories of carbon (which require costly verification for landowners), but rather on specific forest management practices that have been

scientifically shown to increase the amount of carbon that gets removed from the atmosphere and stored in the trees and soil. The ultimate goal of the project is to facilitate landowner participation in carbon markets for nearly 300 million acres of family-owned American forests. According to the AFF, if 20% of family forest acres adopted practices to optimize carbon sequestration, about 3.5 gigatons of CO2e would be sequestered by the end of the century, making a significant contribution to the nation's climate mitigation strategy. The FFCP is still in its early stages, but thanks in large part to the CIG award, the AFF has been successful in piloting the program in the Central Appalachian Region. This proof of concept has led to more funding, with the tech giant Amazon gifting about $7.5 million to the project in April of 2020. The FFCP currently has about 50 contracts with landowners, representing over 60,000 acres of forested land.

- Vermont awarded the University of Vermont and State Agricultural College a State Conservation Innovation Grant in 2020 for $48,438. The project, titled "Integrating Solar Corridors in Corn Silage Production systems to Meet Agronomic and Conservation Goals," proposes a solar corridor cropping system in which the plants are spatially rearranged in an alternative design to increase the availability of light to all crop rows thereby maximizing photosynthetic capacity. The alternative arrangement also opens the canopy allowing for more light infiltration that could increase cover crop establishment success and productivity.
- The Winneshiek Energy District (WED) received a national CIG award in 2014 to build out a program aimed at helping farmers in northeast Iowa reduce their on-farm energy use. Now in 2021, the project has received a leadership award from the Midwest Energy Efficiency Alliance for its ongoing energy planning work. WED's CIG project retooled the existing framework that NRCS uses to assist farmers with traditional conservation planning to help farmers accelerate their transition to clean energy. "The core of the project was to say 'look, let's use the planning model that already exists and apply it to farmers and energy,'" explained Andy Johnson, executive director of the WED. "By collaborating with local NRCS offices we offered comprehensive energy planning to over 60 operations."
- A 2018 CIG award granted to the American Farmland Trust (AFT) allowed the organization to produce four case studies highlighting the economic benefits of implementing soil health management practices. The project, entitled "Accelerating Soil Health Adoption by Quantifying Economic and Environmental Outcomes & Overcoming Barriers on Rented Lands," employed several tools developed by USDA and NRCS to conduct the analysis. AFT partnered with the developers of USDA's Nutrient Tracking Tool to determine water quality benefits of the adopted soil health practices and NRCS' COMET-Farm tool to determine their greenhouse gas emissions reductions. These tools are both now available to the public.
- In 2020, a national CIG award allowed the Environmental Defense Fund and Climate and Forest Capital to produce a report highlighting the importance of early investments in conservation finance projects. The report, entitled *Catalytic Capital and Agriculture: Opportunities to Invest in Healthy Soils, Resilient Farms and a Stable Climate*, lays out a strategy for how early funding can catalyze impact-driven investment that would not have happened without the intervention of this "catalytic" capital. Much like a rocket ship that needs a boost of jet fuel to liftoff, catalytic capital can help conservation finance projects get off the ground. The report emphasizes that while America's farmers and ranchers are

successfully feeding the world, the U.S. agricultural sector can also help solve some of our Nation's most challenging environmental problems.

- In 2017, Sustainable Conservation was granted a national CIG award to deliver liquid manure—an abundant fertilizer source found on dairies—in a more efficient and effective way. The project involved an innovative method of delivering manure nutrients through subsurface drip irrigation (SDI). With SDI, drip tape is buried underground close to the roots allowing dairy producers to deliver water and fertilizer to a crop's rootzone more precisely, which increases irrigation efficiency and conserves water. By modifying a SDI system to apply liquid manure, the hypothesis was that this "manure SDI" system would save water, protect groundwater quality through precision nutrient application and reduce irrigation-related greenhouse gas emissions. Thanks to the CIG award, Sustainable Conservation was able to show that manure SDI fields had increased crop yields, improved water and nutrient use efficiency and no additional salinity build-up. With these positive results, the manure SDI system was certified by California NRCS as an acceptable technology under the micro-irrigation conservation practice standard (CPS 441).
- A 2017 national CIG project lead by the Xerces Society established a new labeling program for farm products, certifying the product as pollinator friendly. The idea behind *the Bee Better* standard is that consumers will be willing to pay a premium for products they know to be environmentally friendly. This encourages participating farmers, like the 10,000-acre Villicus Farms in northern Montana, to adopt practices that benefit pollinators, including habitat creation and pesticide mitigation. The Bee Better standard has been adopted on almost 20,000 farm acres and is being used by major retailers including Häagen-Dazs. The Xerces Society is still expanding the program, with plans to enter new countries (such as Canada and South America) and crop verticals (such as blueberries and wine grapes).
- Funded by a 2017 national CIG award, the Liquid Assets project allowed Trout Unlimited and its partners to explore a number of potential water conservation projects in the West that could be viable for injection of private capital. One major project aimed to help reduce water pressure for farmers in Central Arizona, one of the most water stressed regions in the West. The pilot project explored whether providing technical advice and financial support could help farmers switch to less water-intensive crops. While still in the piloting phase, the project may increase financial returns for these farmers while also increasing environmental benefits to the region by avoiding groundwater overdraft and subsidence, and improving soil health and riparian habitat.
- In 2016, Iroquois Valley Farms received a national CIG award to explore how private capital might be harnessed to help farmers transition to organic agriculture. The idea manifested in the creation of Soil Restoration Notes (SRN). Impact investors can purchase SRNs, allowing Iroquois Valley to create a pool of funds that farmers and ranchers then draw on to help secure viable farmland and receive subsidized loans to make the transition to certified organic. Iroquois Valley received an initial grant of just under $1 million from the CIG to fund the development of the SRNs. Since then about $8.5 million has been raised from over 120 investors, with 25 farmers working 5,000 acres receiving funding to facilitate the transition to organic agriculture.
- A 2017 national CIG award allowed South Dakota conservation districts, private partners, and the City of Sioux Falls to launch a model payment-for-ecosystem-services

project that will generate significant water quality improvements in the Big Sioux Watershed. Dubbed the Seasonal Riparian Area Management program, producers are paid rental rates to erect fencing or provide alternative water sources for their livestock to keep them out of riparian areas during six crucial months between spring and fall. These payments can be as high as $75 per acre depending on where producers' operations are located within the watershed.

- A 2017 national CIG project led by The Nature Conservancy and the Fox Canyon Groundwater Management Agency used advanced metering infrastructure to facilitate water trading to meet new groundwater regulations. The project led to a successful year-long groundwater market pilot in 2020, with more than 100 agricultural wells opting to participate and the first trades completed in March 2020.
- With the help of a 2015 national CIG award, a consortium of partners including the Colorado Cattlemen's Association and the States of Nevada and Utah developed a pay-for-success investment instrument for wildlife habitat and water quality conservation. The State of Nevada piloted the instrument as part of its efforts to conserve greater sage-grouse habitat. The project resulted in the design and implementation of a seed-funding loan approach for credit-generating projects that was used in the first transaction of Nevada's Conservation Credit System (CCS) in December 2017. The goal of the Nevada CCS, which is still in place, is to protect greater sage-grouse habitat by ensuring that impacts to sage-grouse habitat in the State are offset with commensurate habitat conservation actions.

3. CIG Prior Year Summary:

The following project success stories were included in the 2019 congressional report and are reproduced here for informational purposes:

- Funded by a 2015 CIG award, Farmland LP, a farmland fund manager, developed a method for estimating the social and environmental impacts of a specific conservation-based farming method which they used on their own holdings. Released in September 2018, the announcement of the CIG final report was picked up by over 700 media outlets. The report noted that Farmland LP's first fund (which raised approximately $85 million) generated a financial return of 67 percent, but also $21.4 million in ecosystem service value, which accrues to the surrounding communities and environment. Farmland LP estimated that under conventional management practices, the same farms would have caused a negative $8.5 million in ecosystem harm over the same period. The report provides hard numbers and rigorous methodology for the thesis that conservation-based or regenerative farming can have a positive impact on the environment and an operation's bottom line.

- Another 2015 CIG project, led by the Oregon Climate Trust, supported the establishment of a Working Lands Carbon Fund. The funding was used to develop a transparent legal and financial framework for the fund which could serve as a model for any organization looking to catalyze climate mitigation investments. The framework allowed for the development of Climate Trust Capital's Fund I, a $5.5 million carbon offset investment fund which provides upfront capital for the development of carbon credits on working lands. Fund I was launched in October 2016, supported by an investment from the David and Lucile Packard Foundation. Fund I invests in forestry, grassland conservation, and livestock digester carbon projects in return for partial ownership of the resulting carbon credits. Models like the Working Lands Carbon Fund hold significant potential for investors interested in conservation impacts while providing a new source of income and capital for stewardship-minded landowners.

- A 2017 CIG project led by Sustainable Conservation is developing an innovative subsurface drip irrigation/manure technology that dairy farmers can use to water and fertilize (using manure nutrients) their fields. An initial pilot had shown promising results, leading to a 38 percent increase in water-use efficiency, a 52 percent increase in nitrogen use efficiency and a 15 percent increase in corn yield on a 40-acre field. The CIG funding allowed Sustainable Conservation to scale up the effort to three different farms, each operating in California counties with widespread nitrate contamination in ground water. Should the scaled-up pilot produce similar results as the initial farm tests, this new technology could be integrated into NRCS financial assistance programs.

- A 2017 State CIG project led by Virginia Tech is exploring the use of a bucket grinder to remove bones from large animal mortality compost on 100 farms in Virginia. There is currently no commercial equipment available for bone screening, and leaving bones in compost is problematic for spreading the material on fields. The project aims both to

demonstrate to agribusiness that a commercial solution is economically feasible, and to show farmers that screening bones from compost piles makes the practice more likely to be successful.

- With a 2016 Conservation Innovation Grant (CIG) award to Greenprint Partners, a vacant lot in downtown Peoria, Illinois has been transformed into Well Farm, an urban forest and working farm that also serves as green infrastructure. The site covers 1.5 acres and is engineered and contoured to optimize stormwater management, capturing water and redirecting it to vegetable beds and a plot of fast-growing hybrid poplars. Greenprint Partners engaged with the local community from the project's inception and hopes that the project can serve as a green infrastructure and urban agriculture model for cities throughout the country.

- In 2014, the City of Griswold, Iowa was faced with high nitrate levels in their drinking water, forcing them to make changes to their drinking water system. Finding a cost-effective solution was imperative for this small town of only 1,000 people. The town engaged local farmers and together they developed a plan to increase the adoption rate of cover crops in the draw zones of their municipal well field. A 2014 State CIG award provided for the planning and financial assistance. Monitoring before and during the project confirmed significant nitrate reductions in the city's raw water supply. This project serves as a successful case study for how small communities can use cover crop management to reduce nitrates in municipal wells. Today, several years after the completion of that project, farmers are still planting cover crops on 75 percent of the well capture zone for Griswold. The Statewide average cover crop adoption rate is 3 percent.

- The New Jersey Invasive Species Strike Team received a 2013 New Jersey State CIG award to facilitate an Early Detection/Rapid Response strategy to stop the spread of emerging invasive species in New Jersey's natural and agricultural systems. The CIG funding was used to develop an app called "NJ Invasives" and a web program called "IPC Connect New Jersey," which empower small-scale producers and forest owners to easily and inexpensively report invasive species they come across during their everyday work. The system allows for a rapid response to newly discovered and localized populations of invasive species which is critical to slow their spread. The app and web-based program were successfully deployed and are used by producers with thousands of records already added to the database.

- A 2014 Conservation Innovation Grant (CIG) project led by Hood River County for the Columbia Gorge Fruit Growers focused on improving air quality by increasing the use of burn boxes when discarding pruned orchard wood. By 2015, Oregon fruit growers in the Hood River Valley stopped burning their orchard pruning wood in open piles and began safely and cleanly burning the wood in an innovative air curtain burner or burn box. The burn box produces almost no smoke and significantly reduces the amount of airborne particulates. Data gathered during the project showed discernible improvements to air quality. In 2015 alone, Hood River fruit growers eliminated about 1.35 tons of particulate matter by using burn boxes instead of open-pile burning. Because of the successful

demonstration, financial assistance for burn box technology is now available to producers through EQIP's Air Quality Initiative.

- A recently completed CIG project by the National Association of Conservation Districts (NACD) provides detailed information on the economic impact of using cover crops and no-till farming to help ensure soil surfaces are covered year-round. Adoption of no-till practices and cover crops by farmers can sometimes hinge on how these practices impact a farm operation's bottom line. NACD partnered with Datu Research LLC on the project, documenting case studies. Over 3 years, 4 corn and soybean farmers tested cover crops or no-till practices and calculated annual changes between their farming costs relative to a pre-adoption baseline. Net farm income increased up to $110 per acre with adoption, with the costs of implementing the practices offset by reductions in input costs, erosion repair costs, and increases in yields. While the project was only a snapshot of farm operations, it adds to a growing body of evidence that the adoption of soil health systems and practices can result in more money in a farmer's pocket. The case studies are available on the NACD website.

- In 2014, with the support of a CIG award, the First Nations Development Institute developed a conservation planning process that was piloted on 14 acres of land newly opened for development. This project, driven by Navajo Nation producers, provided an opportunity to generate a shared vision of land management strategies that promote wise stewardship of natural resources and serve as an affirmation of Navajo culture and traditional farming practices. Navajo Nation members were trained on conservation strategies and completed their own conservation plans. The process was documented and templates were developed to encourage replication by other Tribal producers. To date, using the process developed under the CIG grant, 4 Tribal producers have been awarded EQIP contracts to help finance conservation improvements on Navajo Nation lands. In addition, the "Conservation Planning Guide for Native Ranchers" was published and is currently used by NRCS, the Federal Bureau of Indian Affairs, and the Navajo Nation. The guide is available as a free resource on the First Nations Development Institute website.

- A recent CIG project led by the National Center for Appropriate Technology (NCAT) ensures NRCS field staff are better prepared to work with organic producers, a growing segment of farmers. Through this study, NCAT worked with ten other sustainable and organic agricultural organizations to review conservation practices for possible unintentional barriers that could limit the participation of or accessibility to organic producers. The team developed recommendations for changes to 15 Conservation Stewardship Program (CSP) conservation enhancements and the addition of one new CSP enhancement. The team also trained farmers and NRSC field staff through 10 webinars, 5 in-person trainings, and a published guidebook for NRCS field staff working with organic and transitioning-to-organic farmers and ranchers. This CIG project improves the accessibility and relevance of NRCS programs for organic producers, helping NRCS address the unique needs of organic systems.

  Two consecutive CIG projects, starting in 2011, developed the Agricultural Conservation Planning Framework (ACPF), a versatile tool enabling communities across the United

States to improve the health of their waterways. The Environmental Defense Fund collaborating with the USDA Agricultural Research Service integrated precision conservation and watershed planning with GIS and simulation modeling software to allow for conservation planning that can be scaled up from a single farm to a full watershed. The customizable framework allows multiple conservation scenarios to be modeled, allowing multiple views on how practices would affect nutrient movement and thus their potential to minimize impact to waterbodies. Currently, the ACPF is being used in hundreds of watersheds. ACPF data is available for Illinois, Iowa, Minnesota, and Wisconsin and parts of Indiana, Kansas, Missouri, Nebraska, North Dakota, and South Dakota. A pilot project in the western Lake Erie basin is underway to expand the ACPF into the eastern Corn Belt. To learn more about the ACPF please visit their website.

- A 2017 CIG award to California chapter of The Nature Conservancy is developing the State's first ground water market under the new California Sustainable Groundwater Management Act. The market will allow farmers that reduce their ground water consumption to sell the saved water to other users willing to pay more than crop sales would generate. The small pilot program, if successful, can serve as a model for the rest of the State and provide a new income stream for California farmers.

- A 2013 State CIG award to Penn State University explored the dangers of using recycled gypsum as bedding for dairy cows. The gypsum, when loaded into manure storage facilities as soiled bedding and then agitated, can off-gas deadly hydrogen sulfide. Several human and cattle deaths were blamed on sulfate poisoning, which led Penn State to apply for a grant to understand the chemical processes and devise a potential solution. The project resulted in identification of several chemicals that when added to the manure slurry could reduce or even eliminate the dangerous hydrogen sulfide gas.