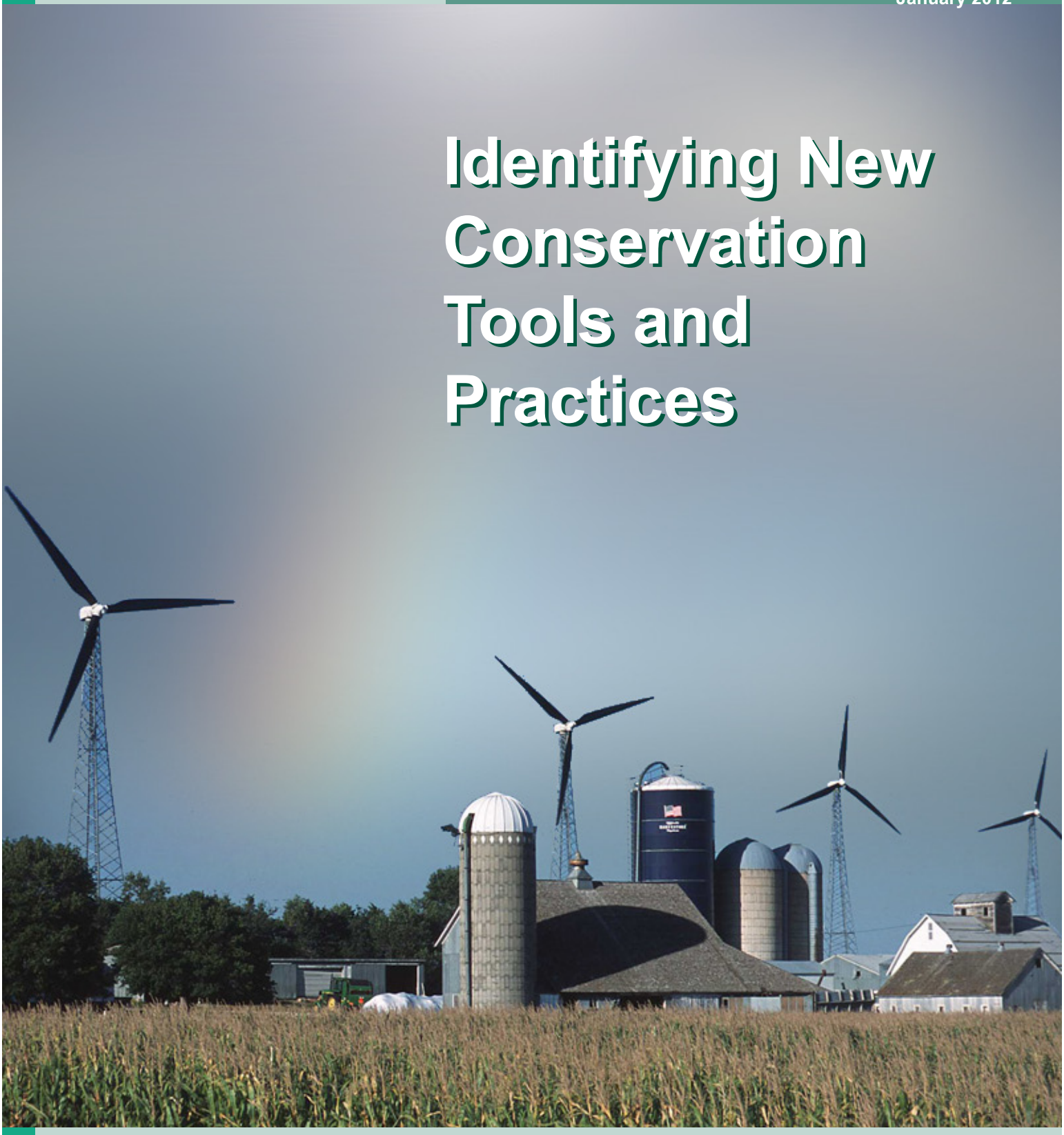
USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Conservation Innovation Grants

January 2012

Identifying New Conservation Tools and Practices



Helping People Help the Land

Conservation Innovation Grants is a competitive grant program to encourage the development and demonstration of new technologies and conservation practices that the USDA Natural Resources Conservation Service (NRCS) can use to help America's landowners in conserving and improving natural resources on private working lands.

For more information, visit *http://www.nrcs.usda.gov/technical/cig/index.html)* or contact Gregorio Cruz, Program Manager (202-720-8071) or *gregorio.cruz@wdc.usda.gov).*

NRCS - A Legacy of Over 75 Years

Contents

NRCS has a long history of providing science-based, technically sound and proven conservation practices, advice, and alternatives to America's farmers and ranchers. Traditionally, NRCS has worked with the USDA Agricultural Research Service, universities, and other nongovernmental organizations to identify and refine new cutting-edge technology through on-farm trials and research. Using this approach, NRCS continually reviews and revises conservation practices based on new research or changes in technology.

Through Conservation Innovation Grants (CIG), NRCS involves additional entities in identifying and demonstrating new approaches for possible NRCS adoption. Funded through the NRCS Environmental Quality Incentives Program (EQIP), CIG is a voluntary program where agricultural producers participate because they want to do something on behalf of conservation. CIG's purpose is to stimulate the adoption of innovative conservation approaches and technologies in agricultural production and leverage additional investments in conservation. The goals are to:

- identify new conservation technologies and practices;
- conduct demonstrations and field tests; and
- integrate widely applicable technologies and practices into NRCS' toolkit of practices (the Field Office Technical Guide).

Grants are awarded through a national program as well as through individual State programs. Since the program's beginning in fiscal year 2004 through fiscal year 2010, CIG has disbursed $145.3 million to more than 700 projects (Appendix A). The national program awarded $125.9 million to 373 projects, while State-level competitions awarded the remainder to 370 projects testing innovative concepts on a smaller scale.

This report examines CIG's experience to date, looking at where and how grants were awarded, project results, and the process NRCS is putting in place to evaluate, replicate, and potentially adopt the technologies and practices for widespread use.

Finding Innovations that Work: The CIG National Program

CIG's goal is to stimulate the adoption of conservation approaches or technologies that have already been studied sufficiently by universities, the USDA Agricultural Research Service, or other organizations to indicate a likelihood of success. CIG is not a research program; rather, it supports innovative, on-the-ground conservation projects such as pilot activities and field demonstrations.

Using EQIP funds, CIG provides grants through a nationwide competitive process to eligible individuals, nongovernmental organizations, private businesses, tribes, and State and local governments. Technologies and approaches already commonly used in the geographic area or already eligible for EQIP funding are not eligible for funding through CIG. Projects are expected to have benefits that can be applied to a larger geographic area, whether watershed, regional, multi-State, or nationwide in scope. They may be single- or multi-year projects, but have a three-year maximum.

How CIG Works

Special CIG funds are set aside each year to provide assistance to underserved, beginning or limited resource producers, and Indian tribes.

CIG funding availability is announced each year through an announcement for program funding (APF) issued through *www.grants.gov*. The APF identifies the natural resource concerns eligible for CIG funding in that year, along with the application details.

Eligibility. Applicants may be State or local units of government, federally recognized tribes, nongovernmental organizations, or individuals. Applications are accepted from all 50 States, the Caribbean Area, and the Pacific Islands Area. Proposed projects must involve farmers or ranchers eligible to participate in the EQIP Program, and funds are subject to EQIP payment limitations. In order to encourage the participation of historically underserved producers, including beginning and limited resource farmers and ranchers, as well as Indian tribes, up to 10 percent of national CIG funds each year are set aside for applicants who qualify in those categories.

Matching Contributions. Grantees must provide non-federal matching funding equivalent to at least 50 percent of the project. These funds may be provided through a combination of cash and in-kind contributions. For historically underserved producers, up to three fourths of the matching funds may be in the form of in-kind contributions. For all other applicants, at most half of the matching funds may be in the form of in-kind contributions. Grantees must also provide the technical assistance to complete the project successfully.

CIG gramts can be specifically directed at providing benefits for the historically underserved or beginning farmers or ranchers.

NRCS Oversight. NRCS provides administrative and technical oversight of each project and, after project completion, evaluates whether the demonstrated practices should be offered on an ongoing basis in the Field Office Technical Guide. The technical oversight is done primarily by NRCS specialists at the regional and state level and often come from one of the three NRCS National Technology Support Centers. The technical contacts specialize in fields relevant to the grant activity, provide support for issues and concerns, and celebrate milestones with grantees.

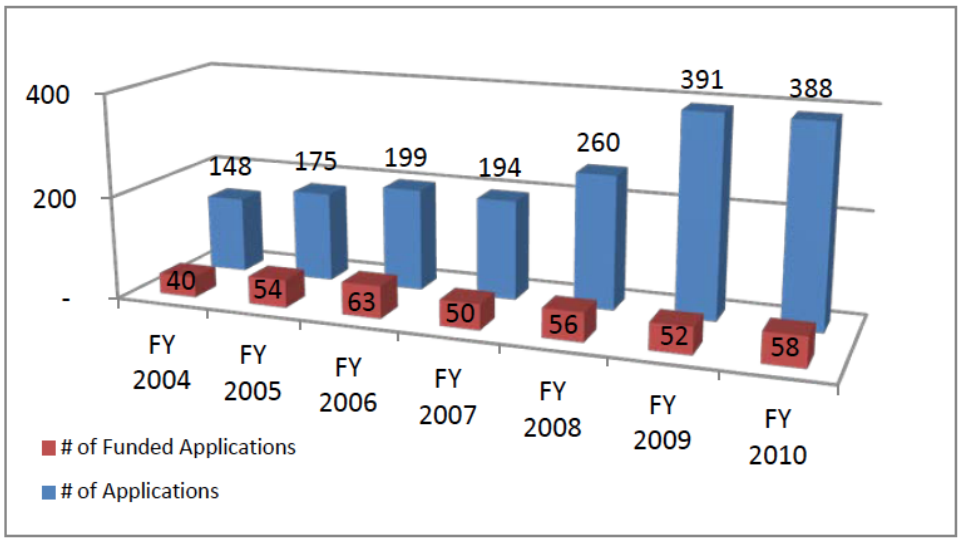
The number of applications has more than doubled since CIG's initial years, but the amount awarded each year has remained fairly constant at just under $20 million per year (Table 1 and Figure 1). After the initial year, the number of projects funded per year has averaged 55 (Figure 2).

Table 1. CIG National Program: Aplications and Awards, FY 2004 - FY 2010

Fiscal Year	Applications		Grants		Total Project Cost (including matching funds)
	number requested	$ millions	number	$ millions awarded	$ millions
2004	148	$55.0	40	$13.8	$27.5
2005	175	$70.7	54	$19.1	$38.3
2006	199	$75.4	63	$19.3	$38.6
2007	194	$121.3	50	$19.0	$38.0
2008*	260	$90.7	56	$18.9	$37.8
2009	391	$170.2	52	$18.0	$36.0
2010	388	$221.8	58	$17.7	$35.4
Total	1,755	$805.1	373	$125.9	$251.7

**FY 2008 agreements are managed by the National Fish and Wildlife Foundation.*

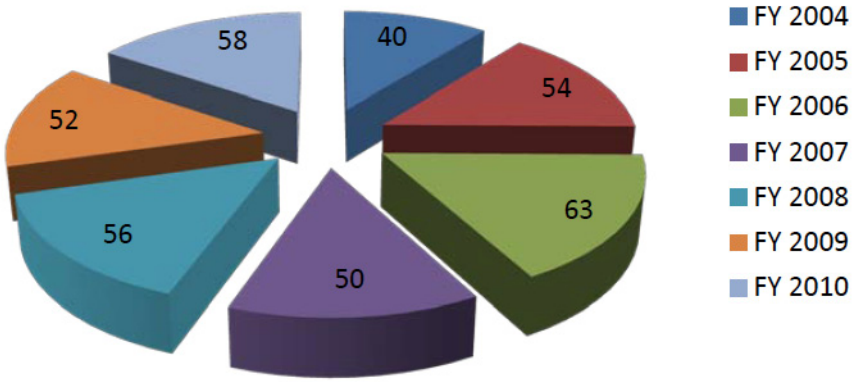
Figure 1. Applications and Funded CIG Projects, by Year, FY 2004 – FY 2010



The number of applications has risen rapidly since the beginning of the CIG program, but the number of grants awarded has been relatively stable.

The CIG Showcase provides grantees with a forum to present their findings to NRCS and other conservationists. Posters are also presented for viewing and discussion during networking session.

Figure 2. Number of Projects Funded by Year, FY 2004 – FY 2010



The number of projects funded has averaged 55 PR year after the first year.

To be considered for CIG funding, projects must address one or more natural resource issues identified by NRCS as priority concerns. Of the 373 projects funded through fiscal year 2010, 136 (42 percent) addressed water quality issues as their primary natural resource concern, followed by soil (43 projects), energy (39 projects), and grazing (37 projects). Table 2 and Figure 3 show the range and distribution of primary natural resource concerns addressed by projects funded during the first seven years.

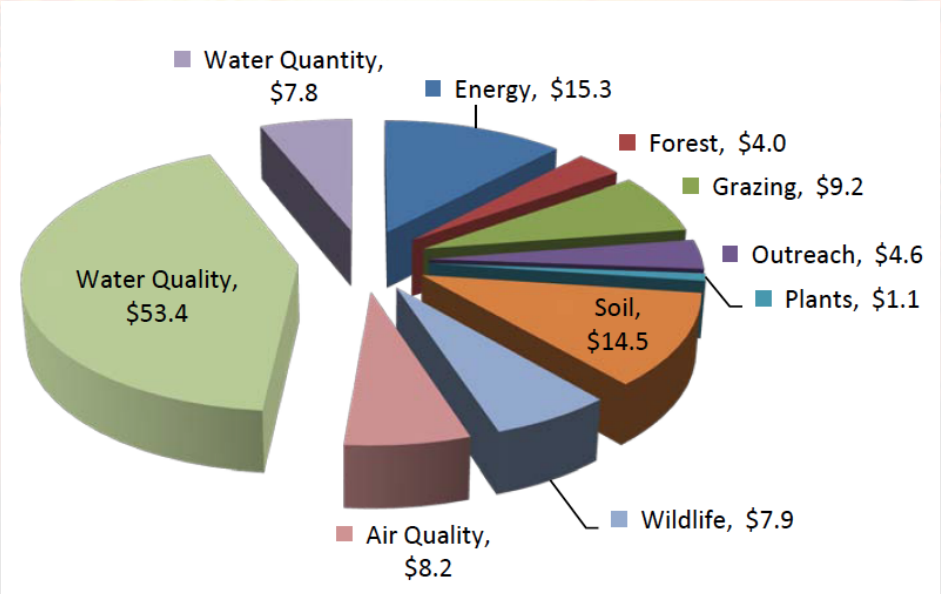
This project studied the differences in waste product nutrients when changes were made to the nutrients in feed.

Feedlots and other operations with large numbers of livestock in a limited amount of space have specific needs for dealing with animal waste.

Table 2. Primary Natural Resouce Concerns Addressed by CIG Projects

Natural Resource Concern	Funded Projects	
	no.	*$ millions*
Water Quality	136	$53.4
Soil	43	$14.5
Energy	39	$15.3
Grazing	37	$9.2
Water Quantity	29	$7.8
Wildlife	25	$7.9
Air Quality	23	$8.2
Outreach	21	$4.6
Forest	12	$4.0
Plants	8	$1.1
Total	**373**	**$125.9**

Figure 3. Distribution of CIG Funds by Primary Natural Resource Conserns, FY 2004 – FY 2010



States across the United States benefited from the CIG program awards. Of the 373 grants, 304 were single-State awards, and 69 supported multi-State projects. Table 3 shows the distribution of national program funds across States.

Table 3. CIG National Program Awards by State, FY 2004 – FY 2010

	Funded Projects	
	number	*dollars*
Alabama	5	$941,070
Alaska	2	$350,960
Arizona	5	$1,131,017
Arkansas	11	$3,398,605
California	30	$10,706,440
Colorado	8	$2,557,620
Delaware	3	$547,512
Florida	1	$999,923
Georgia	11	$2,683,991
Guam	1	$267,050
Hawaii	3	$1,008,250
Idaho	1	$77,575
Illinois	6	$2,042,258
Indiana	6	$1,652,628

"CIG grants are a great opportunity for individual farmers, partners, universities, tribes or groups of these folks to demonstrate their ideas and expand on practices that may have worked in only one location. We're proud to be able to work together with them through this Program."

Fertilizer Nitrogen BMPs to Limit Losses that Contribute to Global Warming

By C.S. Snyder

THE CONCEPT of fertilizer best management practices (BMPs) is not new...it was first introduced almost 20 years ago (Roberts, 2007). Fertilizer BMPs are more important today than ever before and need to be based on a simple concept of matching the nutrient supply with crop requirements, while minimizing nutrient losses from fields. All fertilizer consumers should apply the correct nutrient in the amount needed, timed and placed to meet crop demand – **"right product, right rate, right time, and right place."** Fertilizer BMPs must be adaptable to all farming systems, since one size does not fit all (Roberts, 2007).

Properly balanced plant nutrition with fertilizer BMPs will maximize capture of carbon dioxide (CO_2) through crop photosynthesis and carbon (C) sequestration; crop productivity per unit of land area will be optimized, while also achieving farmer profitability and sustainability goals. Any fertilizer BMP that increases crop yields, nutrient uptake, and recovery of applied nutrients is likely to minimize or limit the potential for undesirable nutrient losses to water and air resources.

Science and experience show that the impact of a fertilizer BMP on crop yield, crop quality, profitability, and nutrient loss to water or air is greatly influenced by other agronomic practices such as plant population, cultivar, tillage, and pest management, as well as conservation practices such as terracing, strip cropping, residue management, riparian buffers, shelter belts, and others (Fixen, 2007). Practices that are defined enough to be useful in making on-farm fertilizer use decisions often are "best" practices only when used in conjunction with other appropriate agronomic and conservation BMPs. A best fertilizer practice can be totally ineffective if the cropping system in which it is used has other serious inadequacies (Fixen, 2007).

The discussion and guides that follow are oriented toward the central U.S. Corn Belt, but are relevant to other cropping systems with similar crop geographies. They are provided to assist in fertilizer nitrogen (N) management decisions that will help lessen the impact of fertilizer N use on greenhouse gas (GHG) emissions and help mitigate the global warming potential (GWP) – expressed as CO_2 equivalent. The three GHGs of interest to agriculture are: nitrous oxide (N_2O), methane (CH_4), and CO_2. The GWP of CH_4 is 23 times greater and the GWP of N_2O is 296 times greater than that of CO_2. Because fertilizer N use may be associated with N_2O emissions, and because the GWP of N_2O is so much greater than CO_2, fertilizer N BMPs to reduce N_2O emissions are emphasized in this practical guide. For example, fertilizer N BMPs which help minimize excess nitrate (NO_3^-) in the soil during warm, wet, or waterlogged conditions can result in lowered risks for N_2O emission. (Snyder et al., 2007).

Fertilizer BMPs —

Best Management for Fertilizers on Northeastern Dairy Farms

By Tom W. Bruulsema and Quirine Ketterings

In the past 10 years, many dairy farms in the humid temperate zone of northeastern North America have implemented best management practices (BMPs) for manure and fertilizer to address concerns about nutrient buildup in soils and nutrient losses that can impact water and air quality. This Introductory Guide focuses on fertilizer BMPs: applying the right source at the right rate, at the right time, and in the right place.

On dairy farms, large amounts of nutrients can be removed from the field in the harvest of forages. Nutrients are returned with manure and/or fertilizer applications, and for legumes, also through N fixation. If the amount of nutrients applied exceeds crop nutrient removal, the difference will either be lost to the environment or accumulate in the soil. In the humid temperate zone of northeastern North America, carryover of inorganic N from one year to the next ranges from small to sporadic and risk of harm to the environment increases when surplus inorganic N remains in the soil at the end of the growing season. Surplus P and K most often contribute to an increase in soil test levels.

Large amounts of nutrients cycle on dairy farms.

While dairy farming is associated with increases in soil test P levels over time, not all farm fields test above the agronomic optimum. The proportion of soils deficient in P in northeastern North America ranges from 10 to 20% in Delaware and Pennsylvania to about 50% in Quebec, New York, and Virginia (Ketterings et al., 2005a; PPI, 2006). Soil testing allows a farmer to determine if nutrient additions are needed and is therefore among the most important BMPs for fertilizer management.

Losses of N entail risks to groundwater quality and may also contribute to water quality issues in estuaries where fresh water meets salt water. Losses of P may result in eutrophication of fresh waters, leading to algal blooms and impaired water quality in local water sources.

Fertilizer management influences greenhouse gas emissions as well. Nitrogen fertilizer manufacture emits carbon dioxide, and adding N to soils can increase emissions of nitrous oxide. On the other hand, appropriate N fertilizer use boosts crop absorption of carbon dioxide, and influences soil carbon storage. Applying the right source of nutrient with the right rate, timing and placement is currently the best that can be done to assure the minimum net emission per unit of crop production (Snyder et al., 2007).

For reliable fertilizer management recommendations, extensive research needs to be conducted for multiple years, on local soils, under local management, and under local weather conditions. This type of research is usually done at universities and research institutions. For state-specific fertilizer application rates, we refer to the local land grant university. However, common principles apply for dairy farms across northeastern North America. In the following pages we describe general BMPs that ensure the right source is applied at the right rate, at the right time and in the right place. "Right" is defined as contributing to the cropping system's productivity, profitability, and sustainability while minimizing any harmful impact on the surrounding environment (IPNI, 2008).

Abbreviations and notes for this article: N = nitrogen; P = phosphorus; K = potassium; C = carbon.

This publication is one of a series prepared by cooperators with the staff of the International Plant Nutrition Institute (IPNI). It is part of a project in cooperation with the Foundation for Agronomic Research (FAR) toward fulfilling the goals of a 3-year Conservation Innovation Grant (CIG 68-3A75-5-166) from the USDA-Natural Resources Conservation Service to identify fertilizer best management practices (BMPs). The intent of this publication is to help develop the BMP definition process in such a way that environmental objectives are met without sacrificing current or future production or profit potential and in full consideration of the newer technologies relevant to fertilizer use. The concept of applying the right fertilizer at the "right rate, right time, and right place" is a guiding theme in this series. For additional information, visit the websites: www.fameresearch.com/CIG and www.ipni.net.

Item # 30-3220

Fertilizer Best Management Practices

Fertilizer BMPs —

Fertilizer Management Practices for Potato Production in the Pacific Northwest

By Robert Mikkelsen and Bryan Hopkins

Potatoes are grown in almost every state and province in North America. Some potatoes are grown for fresh consumption, while others are used for processing into fries, chips, or frozen products. Whatever the end use, the objective of every potato grower is to provide high quality potatoes that meet the market objectives at a price that is economically profitable and environmentally sustainable.

Potatoes are an important part of our diet. In North America, a typical consumer uses over 130 lb of potatoes each year (fresh and processed). Global consumption of potatoes continues to increase…with the largest consumers in Eastern Europe and with China now the world's largest potato producer.

Fertilizer BMPs for potatoes are based on applying the right source of nutrients at the right rate, right time, and right place.

Of the 40 billion pounds (400 million hundred weight) of potatoes grown in the USA in 2007, over 60% of the fall production occurs in the Pacific Northwest. A unique combination of soil, environment, and management practices has led to the success of the potato industry in this area. Production occurs primarily in the Snake River Valley of southern Idaho, the Columbia River Basin between Oregon and Washington, and smaller regions of eastern, central, and southern Oregon. Yield potential varies considerably between these regions, with the Columbia River Basin commonly measuring yields 50% greater than in the Snake River Valley of Idaho, due to a longer growing season.

Although Russet Burbank potatoes are the most commonly grown potato in the region, other varieties are also important. The major varieties grown include various Russets (Burbank, Norkotah, Ranger) and Shepody. The specific management of nutrients for potato varieties differs with factors such as their growth habit (determinate and indeterminate varieties), yield potential, irrigation practices, root patterns, and especially the length of growing season.

Advances in crop management and improved varieties have resulted in steadily increasing yields. Successful potato production requires careful attention to water, disease, pests, and plant nutrition. To maintain these high levels of intensive potato production, considerable research has been done to properly manage the crop and nutrients. Most of the information here relates to Idaho potato production. Many principles of potato nutrient management practices apply throughout the Pacific Northwest. However, local expertise is needed to fine-tune the general management practices outlined here for specific conditions and goals. For specific recommendations, it is generally best to consult with your local university or a Certified Crop Adviser (CCA).

This publication describes general fertilizer best management practices (BMPs) to help assure that the **Right Source** of nutrient is applied at the **Right Rate**, at the **Right Time**, and in the **Right Place**. The term "right" is defined as contributing to the productivity, profitability, and sustainability of the potato production system – all while minimizing any undesirable impact on the environment.

An understanding of the nutrient demand of high-yielding potatoes through the growing season is crucial to correct management. Knowing the total seasonal demand and the daily nutrient requirement provides a guide for fertilization and

Abbreviations and notes for this article: N = nitrogen; P = phosphorus; K = potassium; GS = growth stage; NO_3 = nitrate.

This publication is one of a series prepared by cooperators with the staff of the International Plant Nutrition Institute (IPNI). It is part of a project in cooperation with the Foundation for Agronomic Research (FAR) toward fulfilling the goals of a 3-year Conservation Innovation Grant (CIG 68-3A75-5-166) from the USDA-Natural Resources Conservation Service to identify fertilizer best management practices (BMPs). The intent of this publication is to help develop the BMP definition process in such a way that environmental objectives are met without sacrificing current or future production or profit potential and in full consideration of the newer technologies relevant to fertilizer use. The concept of applying the right fertilizer at the "right rate, right time, and right place" is a guiding theme in this series. For additional information, visit the websites: www.fameresearch.com/CIG and www.ipni.net.

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Fertilizer Best Management Practices

Iowa	7	$3,930,100
Kansas	3	$759,800
Kentucky	3	$948,695
Louisiana	2	$511,954
Maine	2	$211,230
Maryland	13	$5,039,307
Massachusetts	3	$520,277
Michigan	12	$3,278,127
Minnesota	11	$3,351,812
Mississippi	8	$1,985,576
Missouri	6	$1,957,701
Montana	6	$988,616
Nebraska	5	$1,140,738
New Mexico	3	$134,769
New York	7	$2,832,315
North Carolina	11	$3,884,429
Ohio	4	$1,591,789
Oklahoma	7	$1,875,931
Oregon	18	$4,604,815
Pennsylvania	17	$5,477,119
Puerto Rico	3	$433,150
Rhode Island	1	$595,639
South Carolina	1	$2,000,000
South Dakota	6	$2,659,263
Tennessee	1	$665,361
Texas	5	$1,618,965
Utah	2	$567,500
Vermont	8	$1,096,255
Virginia	4	$1,981,879
Washington	13	$5,281,157
West Virginia	7	$2,190,745
Wisconsin	9	$2,129,662
Wyoming	3	$707,300
Multi-State	69	$30,537,883
Total	**373**	**$125,854,756**

States Offer Grants to Innovate on Smaller Scales

This small acreage landowner has forested areas on part of his land.

In addition to the national grants competition, some NRCS State offices have their own State-level competitions. State-funded CIG projects may be farm-based, multi-county, small watershed, or statewide in scope. They are administered with the same guidelines as the national program, but focus on resource concerns identified within the particular State.

This component of CIG enables NRCS State leadership to make funding available to individuals and organizations with promising innovations that might be too small to compete well in national-level competition. Each State Conservationist or Director determines whether to offer CIG funding and at what level, but a grant may not exceed $75,000.

State-level competitions were first offered in 2005. During fiscal years 2005 through 2010, 34 states and territories collectively awarded $19.4 million dollars to 370 projects (Table 4). As with the national program, the largest number of projects (89) addressed water quality issues, followed by soil, energy, water quality, and grazing (Table 5). Some States have begun to adopt innovations demonstrated by the projects to be successful in addressing a particular resource concern. See Appendix for listing of awards by state.

Table 4. CIG Projects Awarded through State-Level Competition, FY 2005 – FY 2010

Fiscal Year	Funded Projects		Total Project Cost (incl. matching funds)
	no.	*$ millions*	*$ millions*
2005	32	$1.77	$3.5
2006	56	$3.33	$6.7
2007	70	$3.41	$6.8
2008	58	$2.77	$5.5
2009	85	$4.72	$9.4
2010	69	$3.41	$6.8
Total	**370**	**$19.4**	**$38.8**

Note: 31 states plus Guam, Puerto Rico, and Saipan held State-level competitions for one or more years. See Appendix for listing by state.

Table 5. State-level Awards by Natural Resource Concern, FY 2005 – FY 2010

Natural Resource Concern	Funded Projects	
	no.	*$ millions*
Water Quality	89	$5.22
Soil	68	$3.06
Energy	66	$3.28
Water Quantity	36	$1.95
Grazing	27	$1.56
Plants	21	$1.25
Forest	19	$0.90
Outreach	16	$0.88
Wildlife	16	$0.75
Total	**370**	**$19.4**

Innovation Grants at Work: A Sample of Projects

CIG awards have varied widely in their focus and approach. Early issues addressed included managing manure and improving water quality through terrace layouts and feed management, composting manure to provide heat for livestock, paying producers a type of “insurance” payment to reduce fertilizer use, using solar systems to assist in grazing management, and reducing soil loss and improving air quality by incorporating manure into the soil rather than spreading it on the soil surface.

As a result of the continuing assessment of individual projects and overall program goals, proposal announcements and the projects funded continue to focus on addressing needs identified by NRCS technical experts. A sampling of project results is provided here. Lists of projects funded are available on the CIG Web site by year *(http://www.nrcs.usda.gov/technical/cig/index.html)*, and a compendium of final reports submitted by grantees upon project completion will be available late 2011.

Irrigator Pro Software Offers New Irrigation Water Management Tool

To reduce the use of irrigation water in growing corn, cotton, and peanuts, the Georgia Soil and Water Conservation Commission tested the use of Irrigation Pro software with support from a Conservation Innovation Grant. Researchers tested the software, which incorporates a computerized irrigation scheduling system with center pivot irrigation, on 53,000 acres in order to obtain scientific data to help farmers make better decisions about irrigation water management and water conservation. Among the findings: every inch of water saved on 53,000 acres is a savings of more than 1.4 billion gallons of water; if half is pumped with electricity and half with diesel, the energy cost savings per inch of water saved is approximately $290,000.

Farmers who used Irrigator Pro recognized the technology's potential for both water and energy savings. Most continued to use it after the project, and additional growers continue to adopt it since the project ended in 2008. As a result of the project, NRCS Georgia now suggests the use of Irrigator Pro as a water management tool for use in conjunction with retrofitting or up-grading existing center pivot irrigation systems to efficiently use water.

Prescribed Fires May Help Restore Texas Rangeland Ecosystems

A three-year study of the effects of using prescribed fires on Texas rangelands suggests that such burns may have ecological, economic, and social benefits. With support from the NRCS Conservation Innovation Grant program, the Texas Agricultural Experiment Station conducted the study in four contiguous counties in each of three eco-regions in Texas. The station set up three demonstration sites, conducted focus groups, and mailed a survey to 1,200 landowners in the twelve counties to determine whether prescribed fire, particularly extreme fire applied during the growing season, is an effective tool to restore ecosystems in the southern plains. Among the findings:

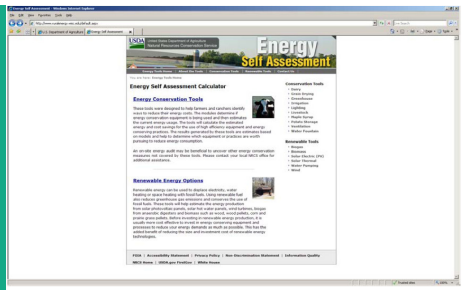
- Extreme fire—i.e., fire exceeding NRCS's guidelines for prescribed fire with respect to temperature, humidity, wind speed, and fuel moisture content—reduces the density of invasive woody plants without destroying the herbaceous understory.
- The behavior of fire fueled by live plants is determined more by the amount of moisture in the plants than by the fire's temperature.
- Extreme fire applied as an initial woody plant treatment followed by cool-season maintenance burns was better economically than other common treatments of invasive plants.
- Landowners generally have favorable views of prescribed fire, including extreme fire, as a management tool. Members of prescribed burning associations are significantly more favorable than non-members.

The three-year study has increased understanding of the impacts of extreme fire, particularly from the landowner perspective.

Air and Water Quality Guidelines and Practices Advance Winegrowing Sustainability

The California Sustainable Winegrowers Alliance was established in 2003 to advance environmental stewardship among the state's growers and vintners, and soon created a Code of Sustainable Winegrowing Practices, including a workbook of best management practices to help vineyard and winery operations assess and improve their sustainability. With support from an NRCS Conservation Innovation Grant, the Alliance developed numerous air and water quality innovations, including an air quality chapter and assessment tool for the workbook and air quality and water quality demonstration sites to showcase innovative technologies and practices.

Two subsequent Conservation Innovation Grants (including one still in progress) focus on developing and implementing tools and metrics for evaluating environmental sustainability, training growers in using the tools to correctly plan and implement conservation practices, developing incentive programs to reduce energy and water use, and improving the tools and programs in ways that make them transferable to other commodities. Elements of the Winegrower Alliance program have been adapted for similar sustainability initiatives in specialty crops, including almonds, hazelnuts, raisin and table grapes, pears, cut flowers, and others. Because the Alliance program trains growers in conservation practices that reduce energy use, maintain soil fertility, and increase water use efficiency (essential in a drought-prone state), NRCS uses it in developing conservation plans with growers, thereby saving time and cost.



Self-Assessment Tools Help Farmers Evaluate Energy Use and Renewable Energy Potential

With a Conservation Innovation Grant, the University of Wisconsin worked with NRCS information technology staff to develop a series of Web-based energy self-assessment tools that farmers in the upper Midwest can use to evaluate their baseline energy use and the potential cost-effectiveness of various energy conservation measures. In addition, the project developed several renewable energy tools to help farmers assess renewable energy potential on their farms.

The assessment tools provide more sophisticated energy self-evaluation tools than previously available. Ten energy efficiency tools include assessments of energy use related to dairy farming, grain drying, greenhouses, irrigation, lighting, livestock production, maple syrup production, potato storage, ventilation, and water fountain use.
The tools for evaluating renewable energy potential include assessments of biogas, biomass, solar photovoltaics, solar water heating, water pumping, and wind. The tools are currently maintained by the *University of Wisconsin* on an external Web site and will be transferred to a USDA server in 2013

Internet Access and Real Time Data May Improve Irrigation Effectiveness

In a test to determine whether real-time soil moisture data can help producers improve irrigation scheduling and water usage, the Flint River Soil and Water Conservation District (SWCD) of Georgia installed a remote soil moisture monitoring (RSMM) telemetry network with support from an NRCS Conservation Innovation Grant. The network gathered soil moisture data at the field level, along with irrigation activity, and transferred it via the Internet to nine participating farmers.

The network consisted of five primary components and provided service to 17 center pivot irrigation systems on 2,467 irrigated acres, resulting in an estimated 15 percent water savings due to improved irrigation scheduling. This is equivalent to reducing annual use by more than 7.5 million gallons of water. The project demonstrated that such technology is a viable option for farm operators if funding is available to assist with installation and monitoring. Nevertheless, the limits of the existing technology at the time of the project inhibited the information from being transferred consistently in “real” time.

Now such barriers in technology have been overcome and producers have the option of using RSMM equipment that connects the field to the Internet via wireless broadband, satellite, or cell-based radios. More than 80 new RSMM deployments throughout the 27-county area of the Lower Flint River Basin have been funded by federal and private resources. As the value of Internet connectivity in the farm setting is demonstrated, it is contributing to the growth of rural wireless broadband in the region, which in turn encourages the development of even more conservation-based technologies.

High-Impact Targeting Can Reduce Sediment and Nutrient Erosion

With a Conservation Innovation Grant, the Michigan Department of Agriculture teamed up with Michigan State University Institute of Water Research (IWR) and several local conservation districts to develop a geographic information system (GIS) tool to address erosion in high-risk areas in the Great Lakes Basin. The resulting High-Impact Targeting (HIT) system uses GIS data and computer modeling to identify precisely, down to the field level, which areas have the greatest erosion and pollution problems. Such precision allows scarce conservation resources to be used for greatest impact.

HIT is simple, fast, and cost-effective way to identify high-priority areas most likely to contribute to sedimentation. The online tool allows users to view sediment and erosion data for certain watersheds and their sub-basins, simulate best-management-practices scenarios at watershed scales, prioritize watersheds, and map high-risk areas. HIT can calculate the sediment and phosphorus loadings to surface waters from upland agriculture as well as potential reductions in pollutant load from implementing best management practices on a portion of the polluting area.

IWR continues to work with NRCS and other partners to improve and extend HIT. The Michigan Department of Environmental Quality encourages the use of HIT in developing watershed management plans. NRCS; state, local, and regional governments; soil conservation districts; farmers; watershed organizations; and conservation organizations can use it to target places where intervention is most needed.

Variable Rate Irrigation Offers Potential to Reduce Water Usage

With the support of an NRCS Conservation Innovation Grant, researchers at the University of Georgia Research Foundation, Inc., demonstrated and tested the impact in actual farm situations of adding Variable-Rate Irrigation (VRI) technology to traditional spray-type center pivot irrigation systems. They found that VRI has the potential to reduce water usage by 12 to 20 percent.

Center pivot irrigation, a reliable tool that has ensured good yields in many settings, distributes water uniformly in non-uniform fields. Most fields vary in soil type, topography, drainage, and number of crops planted, among other factors, making uniform water application relatively ineffective. In contrast, VRI systems use computer technology and Global Positioning System (GPS) technology to apply only the amount of water needed to differing sections of the same field. In the CIG-funded project, researchers installed VRI systems on 19 center pivot systems, and then tested their benefits, effectiveness, and practicality by collecting flow volumes, field moisture values, and uniformity data.

Since the CIG project ended in 2006, VRI has become an accepted NRCS practice in several states and eligible for financial assistance. In addition, NRCS partners have promoted more adoption of VRI for water conservation reasons. More recently, VRI controls are being installed with CIG financial assistance on center pivot irrigation systems on dairy farms to help farmers keep effluent out of environmentally sensitive areas. In addition, mainline irrigation system manufacturers now offer their own versions of “variable-rate irrigation,” giving farmers additional options in this emerging technology area.

NRCS Massachusetts awarded grants to conduct 100 on-farm energy audits to assess best management practices related to on-farm energy use and to implement 50 percent of the recommended actions to help NRCS evaluate the impact and benefits of such conservation practices. The grants demonstrated significant energy savings as well as reductions in carbon emissions, resulting in annual savings per efficiency project of $12,317 and annual savings per renewable energy project of $4,821.

In New Hampshire, a $10,534 NRCS Conservation Innovation Grant enabled an award-winning maple producer to purchase and install a clean-burning wood-fired evaporator. The Maples Guys matched the grant equally. In purchasing the first evaporator of its kind in the state, they were able to simultaneously decrease the environmental impact of their maple sugaring operation and increase safety. They now hold workshops encouraging other producers to use local, sustainable fuel sources, in part to counteract the negative impact of global warming on maple trees.

Learning through Innovation

The focus of the Conservation Innovation Grant program is to identify, test, and demonstrate new practices and technologies, or new applications of existing technologies. Therefore, technology transfer (sharing ideas and experiences during and after the life of the grant) and technology integration (incorporating the findings and lessons into NRCS and other conservation activities) are important aspects for both the grantee and the program.

Transferring the Technology

Since 2007, shortly after the first round of three-year grants was completed, NRCS has collaborated with the Soil and Water Conservation Society (SWCS) to provide an annual opportunity for grantees to network with other researchers and share their project information through the annual CIG Showcase. The Showcase is a track within the SWCS annual meeting; it offers a multi-discipline, nationwide audience for grantees to give oral and poster presentations, get feedback on their projects, and network with NRCS staff and other grantees who may be working toward the same or similar goals. The Showcase continues to be an important annual event at which grantees share their findings.

After the second Showcase in 2008, a group of NRCS State CIG program managers, technical specialists, Headquarters program staff, and others met to evaluate the first group of completed grants on their usefulness to the agency, the evaluation and reporting process, and other aspects of the Program as well as to provide NRCS leadership and program managers with input on potential improvements.

Based on the 2008 meeting and feedback from the implementation process, NRCS continually seeks to improve the grant selection process and the likelihood of generating applications and projects that yield promising results that can ultimately be adopted by the agency as recommended conservation practice. Ongoing program changes include measures to:

- attract high-quality applications that address agency priority resource concerns and technical issues,
- train technical contacts to provide similar kinds of support to grant recipients,
- require consistent end-of-project information,
- require projects have the ability to be replicated, and
- identify and integrate promising technologies into NRCS programs.

Integrating Findings into NRCS Programs and Conservation Activities

NRCS evaluates the findings from CIG projects to determine whether the results suggest that new practices should be added to the NRCS standard practices offered, previous practices should be modified or eliminated, or additional study and pilot projects are needed.
The integration process includes the following elements:

- identifying and training technical contacts at the national and/or State level;
- reviewing project progress and final reports;
- conducting project evaluations;
- distributing findings and recommendations for use by national and state technical specialists; and
- incorporating innovative technologies and approaches into NRCS.

CIG agreements are administered according to the NRCS Federal Grants and Cooperative Agreements Handbook. Through the Deputy Chief for Science and Technology and the Deputy Chief for Soil Survey and Resource Assessment, NRCS designates various staff members to serve as national technical contacts for the CIG projects. These technical contacts are trained to conduct status reviews to assess progress in implementation and to ensure that CIG projects achieve their objectives and are in compliance with the deliverables listed in the grant agreement. They provide technical feedback on any proposed amendments to the projects. The status review process is a key internal control to ensure conservation activities are properly applied and meet the goals of both the participant and USDA.

Informally, many project findings are already being replicated by the peers of grantees as they observe successes. NRCS continually refines a formal technology integration process to incorporate innovative technologies and approaches into NRCS technical and program manuals, guides, activities, and references, and to transfer these innovations to the private sector and others in the public sector as CIG agreements are completed.

Just as Hugh Hammond Bennett (right) helped farmers with the formation of the Soil Erosion Service over 75 years ago, NRCS continues to work with partners to support agriculture for America's future.

Emerging Opportunities

The program continues to refine the areas in which it is seeking innovation. In fiscal year 2010, a pool of funds was established specifically to identify technologies and approaches to address the nutrient management and other agricultural issues affecting the health of the Mississippi River Basin. In fiscal year 2011, another important change was made to the program when a separate pool of funds was set aside to support large-scale demonstration projects that can accelerate the adoption of new and innovative approaches to reduce greenhouse gas (GHG) emissions and promote carbon sequestration on private lands.

Appendix: CIG Awards by State, FY 2004 – FY 2010 (Total, National, and State-Level Competition)

	Total CIG Awards*		National Competition		State-Level Competition**	
	no.	*dollars*	*no.*	*dollars*	*no.*	*dollars*
Alabama	12	$1,264,513	5	$941,070	7	$323,443
Alaska	7	$590,604	2	$350,960	5	$239,644
Arizona	5	$1,131,017	5	$1,131,017	–	–
Arkansas	11	$3,398,605	11	$3,398,605	–	–
California	30	$10,706,440	30	$10,706,440	–	–
Colorado	72	$6,244,423	8	$2,557,620	64	$3,686,803
Delaware	3	$547,512	3	$547,512	–	–
Florida	6	$1,276,542	1	$999,923	5	$276,619
Georgia	12	$ 2,723,991	11	$2,683,991	1	$40,000
Guam	7	$634,642	1	$267,050	6	$367,592
Hawaii	21	$2,082,288	3	$1,008,250	18	$1,074,038
Idaho	23	$1,129,324	1	$77,575	22	$1,051,749
Illinois	6	$2,042,258	6	$2,042,258	–	–
Indiana	6	$1,652,628	6	$1,652,628	–	–
Iowa	10	$4,154,375	7	$3,930,100	3	$224,275
Kansas	7	$950,950	3	$759,800	4	$191,150
Kentucky	3	$948,695	3	$948,695	–	–
Louisiana	3	$586,954	2	$511,954	1	$75,000
Maine	14	$537,095	2	$211,230	12	$325,865
Maryland	17	$5,313,406	13	$5,039,307	4	$274,099
Massachusetts	5	$670,277	3	$520,277	2	$150,000
Michigan	16	$3,501,410	12	$3,278,127	4	$223,283
Minnesota	11	$3,351,812	11	$3,351,812	–	–
Mississippi	21	$2,636,060	8	$1,985,576	13	$650,484
Missouri	21	$2,779,316	6	$1,957,701	15	$821,615
Montana	20	$1,806,045	6	$988,616	14	$817,429
Nebraska	15	$1,636,657	5	$1,140,738	10	$495,919
New Hampshire	18	$654,291	–	–	18	$654,291
New Jersey	15	$932,240	–	–	15	$932,240
New Mexico	17	$754,493	3	$134,769	14	$619,724

New York	16	$3,245,473	7	$2,832,315	9	$413,158
North Carolina	11	$3,884,429	11	$3,884,429	–	–
North Dakota	19	$1,072,464	–	–	19	$1,072,464
Ohio	20	$2,368,002	4	$1,591,789	16	$776,213
Oklahoma	7	$1,875,931	7	$1,875,931	–	–
Oregon	28	$5,200,882	18	$4,604,815	10	$596,067
Pennsylvania	26	$6,127,119	17	$5,477,119	9	$650,000
Puerto Rico	7	$561,924	3	$433,150	4	$128,774
Rhode Island	1	$595,639	1	$595,639	–	–
Saipan	2	$97,719		–	2	$97,719
South Carolina	1	$2,000,000	1	$2,000,000	–	–
South Dakota	13	$3,067,820	6	$2,659,263	7	$408,557
Tennessee	1	$665,361	1	$665,361	–	–
Texas	5	$1,618,965	5	$1,618,965	–	–
Utah	14	$1,182,961	2	$567,500	12	$615,461
Vermont	17	$1,483,005	8	$1,096,255	9	$386,750
Virginia	6	$2,124,933	4	$1,981,879	2	$143,054
Washington	27	$5,889,328	13	$5,281,157	14	$608,171
West Virginia	7	$2,190,745	7	$2,190,745	–	–
Wisconsin	9	$2,129,662	9	$2,129,662	–	–
Wyoming	3	$707,300	3	$707,300	–	–
Multi-State	69	$30,537,883	69	$30,537,883	–	–
Total	**743**	**$145,266,407**	**373**	**$125,854,756**	**370**	**$19,411,651**

Includes national and state-level competition.
****NRCS state offices make the decision each year whether to offer a state-level compition.***

CIG Authorization

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 Conservation Innovation Grants (CIG) program with funding from the Environmental Quality Incentives Program (EQIP). Section 2509 of the Food, Conservation, and Energy Act of 2008 (Public Law 110-246) reauthorized CIG. The Secretary of Agriculture has delegated the authority for EQIP to the Chief of the Natural Resources Conservation Service (NRCS), who is a vice president of the Commodity Credit Corporation (CCC).