



NFWF – NRCS

CIG 2008 Projects

Preliminary

Final Report

''''''''''''''''''''National Agreement

An Overview of Projects funded through the Natural Resources Conservation Service (NRCS) Conservation Innovation Grants (CIG) 2008 Program in partnership with the National Fish and Wildlife Foundation (NFWF)

NFWF – NRCS Conservation Innovation Grants 2008 Projects *Preliminary Final Report*

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NFWF Contact Information

Overview of NFWF – NRCS CIG 2008 Projects



NFWF

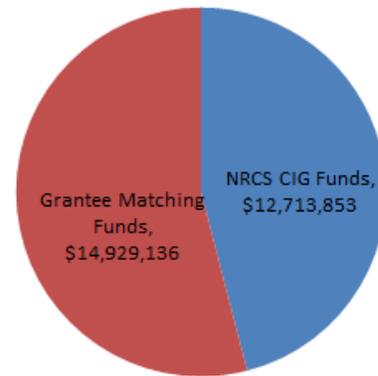
Overview of NFWF-NRCS Conservation Innovation Grants 2008 Projects

NRCS Partnership with NFWF for CIG 2008 Projects

The Natural Resources Conservation Service (NRCS) partnered with the National Fish and Wildlife Foundation (NFWF) to manage the 2008 round of Conservation Innovation Grants projects. This included 45 National projects. Project solicitation and selection was managed by NRCS and NFWF served only as the grants administrator. NFWF donated its services and did not charging for management costs associated with administering these grants or creating reports. This represents an in-kind donation of services valued at \$750,000.

National – \$14 million

- Of the 45 projects approved, fourteen projects are closed, twenty-eight projects have completed all programmatic activities and are in the closure process, and three projects were terminated.
- All \$12.7 million in project funds awarded has been disbursed to sub-recipients.
- Of the \$14 million originally awarded, approximately \$1.2 million was de-obligated from projects with the consent of NRCS. This is due to three cancelled projects and fourteen projects closing under budget.
- NFWF leveraged over \$12.7 million in NRCS CIG funds into over \$27.6 million in total project funds.



NFWF consistently submitted performance reports to NRCS on a semi-annual basis for the agreement. Copies of sub-recipient (grantee) reports received during each reporting period were provided.

This report provides an update on the status of all projects as of January 2013 in addition to detailed summaries of project progress or final reports. All grantee reports are being provided electronically in conjunction with this report.



About This Report

This report provides an in-depth overview of each of the projects funded through the NRCS CIG 2008 National agreement. At the time these grants were awarded, NFWF was in the early stages of upgrading its grants management database to streamline all project information electronically. Through that upgrade process, NFWF did away with the “Phase Reports” provided by grantees, and replaced them with a single “Interim Programmatic Report” to provide a status on project activities. The ultimate goal of streamlining the grantee reporting process electronically is to achieve consistency in the information provided in the project final reports so project information can be shared with funding Agency partners. Each of the projects in this report either have a “Final Report Summary” or “Progress Report Summary” with information extracted from the grantee reports provided for the project. Where possible, photos or project materials are provided.

Explanation of Project Statuses listed in this Report:

- In Closure – Project is programmatically closed with all activities completed.
- Closed – Project is programmatically and financially closed.
- Cancelled – Project cancelled.

The following is an example of what Agency partners could be provided for Final Reporting measures on projects in the future:

Project Title	Agency Funds:	\$1,000,000
Grantee Organization	Other NFWF Federal Funds:	\$1,000,000
Project #:	NFWF Non-Federal Funds:	\$1,000,000
	<u>Grantee Matching Funds:</u>	<u>\$2,000,000</u>
	Total Project Funds:	\$5,000,000

Project Description: Brief two-line description of project.

Project Location: Brief description of project location.

Project Status: Active or Closed

Project Abstract: An in-depth description of the project purpose, objectives, and activities.

Projected Long-term Outcomes: Description of the expected outcomes for each of the projects activities.

Summary of Accomplishments: An overview of the project accomplishments and results.

Lessons Learned: Provides insight and feedback on the project’s successes or setbacks.

NFWF is continuing to review its collection of project metrics to provide funding Agency partners with consistency in reporting project outputs and results.

NFWF – NRCS CIG 2008
National Projects

Grassland Restoration and Bison Management*InterTribal Bison Cooperative*

Project #: 2008-0116-001

NRCS CIG Funds: \$425,787

Grantee Matching Funds: \$552,001

Total Project Funds: \$977,788

Project Description: Centralize bison management activities on tribal lands. Project will inventory bison and their range ecosystems and provide data on long-term ecological trends.

Project Location: Central and Western United States

Project Status: In Closure

Final Report Summary:

Tribes produce buffalo for sale, subsistence and cultural use with little or no collaboration between tribes or outside agencies. Each agency has differing opinions on guidelines and policies for bison/range management and each agency has a different role from reservation to reservation due to differing land jurisdictions. This results in inconsistent guidelines, protocols, and policies within reservations, states, regions, and nationally. The InterTribal Bison Cooperative (ITBC) conducted an innovative project that is uniquely Native America for NRCS to better serve the needs of tribes on specific range management issues.

The project accomplished a review of Tribal bison/range management protocols, guidelines and assessments of the 57 member Tribes in the InterTribal Bison Cooperative (ITBC). Upon completion training were held which established potential collaborative efforts between the Tribes and other entities. Projects were developed through these collaborations and implemented at five Tribal sites and these projects were presented at the annual ITBC Membership meeting, ITBC Regional trainings and other regional and national conferences.

The following is a brief overview of project results (details can be found in the Final Programmatic Report):

1. Initial bison/range management protocol, guidelines, and policies assessments; and initial range unit assessment.
 - ITBC data from 57 Member Tribes showed that 49 Tribes had bison herds.
 - All Tribes with herds had a bison management plan in place.
 - 22 Tribes had a range assessment that had been done by either the NRCS or BIA.
 - Based on assessments and guidance from the ITBC Membership, five Tribes were selected for the pilot restoration projects, two of which were replaced during the grant period due to lack of responsiveness.
2. Successful completion of the five regional pilot restoration projects.
 - Throughout the grant period the five Tribes and replacements were implementing restoration projects developed with input from ITBC and local NRCS and BIA offices. These projects are done on a year to year basis and have been completed.
3. Implementation of new bison/range management plans by each Member Tribe; including those not involved in pilot projects.
 - It was determined that of the 49 Tribes with bison management plans in place that approximately 20 of them needed updating and we have developed a schedule of 5 Tribes per year to work on the new plans.
4. Foster a working relationship between Tribes and other organizations via restoration projects.

- As part of the project, ITBC brought together USDA, BIA, and Tribal staff during trainings held in the five regions. ITBC has also had USDA staff present at the 2010 Annual Membership meeting.
5. Evaluation of restoration efforts will be done with criteria developed from regional meetings and forums.
 6. Dissemination of project results via regional and National Native American Fish and Wildlife Society Conferences, the U.S. Fish and Wildlife Society Regional Conferences and the ITBC Annual Membership meeting.
 - ITBC has presented the projects results and panel discussions at NAFWS regional meetings: (1) Great Plains Region: 2009, 2010; (2) Pacific Region: 2010.
 - ITBC presented project results at the ITBC Annual Meeting in: 2009, 2010, 2011, and 2012.
 - ITBC resented the project results at the ITBC Regional Trainings (4) in: 2009, 2010, and 2011.

Lessons Learned – We have learned that the Tribes want to develop new management plans but they must include ecological, biological, economic and cultural best management practices in order to be accepted and approved. As a response to this ITBC submitted and received approval for a grant from the USDA Small Socially-Disadvantaged Producer Grant (SSDPG) program to develop a Tribal Buffalo Management Handbook. The first draft is completed and we are now going through final circulation at this time and this will serve as a basis for our new management plans.



Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, deliverables, results, and lessons learned.

Gopher Tortoise Habitat Credit Bank (GA, AL)*American Forest Foundation*

Project #: 2008-0116-002

NRCS CIG Funds: \$194,350

Grantee Matching Funds: \$194,350

Total Project Funds: \$388,700

Project Description: Develop and implement a gopher tortoise habitat credit bank on family forestlands in portions of Georgia and Alabama. Project will provide recommendations for expanding the program to include more areas of the gopher tortoise range and other species.

Project Location: Georgia and Alabama

Project Status: In Closure

Final Report Summary:

This project requested to modify the scope of the project by adding a deliverable in October 2011 (Please refer to Scope Amendment Letter available with the grantee documents provided). The original purpose of this project is: “to develop and implement a habitat credit bank for the gopher tortoise on family forestlands in portions of Georgia and Alabama. The habitat credit bank framework will help to preclude the need to federally list the eastern population of the gopher tortoise. Lessons learned may be transferable to developing market-based management systems for other conservation-reliant species.”

Overall, 60 percent of all plants and animals that the Endangered Species Act classifies as “at risk” of decline or extinction on the mainland 48 states need private forest land — that’s more than 4,600 native animal and plant species. In some areas, 95 percent of forest-associated, at-risk species occur only in private forests. This project, designed to work with private landowners, was successful in working with partners and a broad community of experts to develop an innovative and credible habitat evaluation model to calculate credits for the quality of a site as habitat for the gopher tortoise (*Gopherus polyphemus*) in Georgia and Alabama. The model was also tested from an economic perspective to determine the costs of credit determination, tracking, monitoring, and assurance. It is ready for pilot testing in the Sandhill habitat area, and the concept of proactive conservation to preclude species listing under the Endangered Species Act is gaining more attention. Although no market for voluntary credits of this nature currently exists, project partners are part of a coalition working with the US Fish and Wildlife Service to figure out how they can provide the regulatory predictability that will enable proactive conservation strategies such as this to become effective tools for long term species viability and habitat protection.

There were three main activities associated with this grant: (1) Develop an innovative, market-based framework which will help preclude the need to federally list the eastern population of the gopher tortoise; (2) Produce and disseminate a handbook: “Pine Ecosystem Management for the Gopher Tortoise” tailored to Alabama, Florida and Georgia; and (3) Initiate work to strengthen landowner outreach in the Piney Woods region of southeast Mississippi.

Please refer to the project’s Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.



Gopher Tortoise



Scoping Burrows



Gopher Tortoise Burrow Closeup



Site Evaluation

Credit Trading System for Restoring Habitat*Sagebrush Initiative, Inc.*

Project #: 2008-0116-003

NRCS CIG Funds: \$1,000,000

Grantee Matching Funds: \$1,268,145

Total Project Funds: \$2,268,145

Project Description: Conduct mitigation and restoration treatments at project sites using the credit metric system. Project will demonstrate how Ecological Site Descriptions can provide the basis for generating equal ecosystem services.

Project Location: California, Colorado, Idaho, Wyoming

Project Status: Closed

Final Report Summary:

This project developed and tested a metric system for monitoring off-site mitigation in sagebrush ecosystems, and evaluated the use of this system in potential trading of mitigation credits. The metric system was evaluated by monitoring various sagebrush improvement treatments applied to seven different sites located in Wyoming, Idaho, Utah, and California. The system determined site level improvements by monitoring changes to plant communities and evaluated these based on comparisons to reference conditions developed for specific ecological sites. It also determined landscape level improvements measured through use of wildlife habitat models. Over 6,000 acres of sagebrush were included in the treatment areas that involved seven producers.

Recent management planning designed to address impacts to sagebrush ecosystems from developments such as oil and gas have considered the use of off-site mitigation to compensate for impacts that cannot be mitigated on-site. A challenge in the use of off-site mitigation is to ensure that benefits produced from treatments at the off-site location are equal and equivalent to the impacts produced at the development site. The Cooperative Sagebrush Initiative (CSI) was interested in developing and testing a metric system that could be used to evaluate off-site mitigation and determine its effectiveness in compensating for on-site impacts at both site and landscape scales. CSI teamed with the Ecosystem Management Research Institute to test a metric system at seven different locations within the sagebrush biome.

A metric system that compared pre and post-treatment plant communities to reference communities developed from NRCS ecological site descriptions was used to evaluate site level benefits produced by mitigation treatments. Landscape level analysis of benefits were determined by using habitat models for seven different sagebrush associated wildlife species and comparing habitat quality for these species pre-treatment to post-treatment. Pretreatment sampling of vegetation conditions was conducted prior to the treatments, and then monitored for 1-3 years post-treatment depending on the timing of the treatment during the 3-year duration of the project. The metric system and its results were presented to a series of meetings during the final 6 months of the project involving diverse agencies and stakeholders to obtain their perspectives on the metric system and its potential application to a credit trading system.

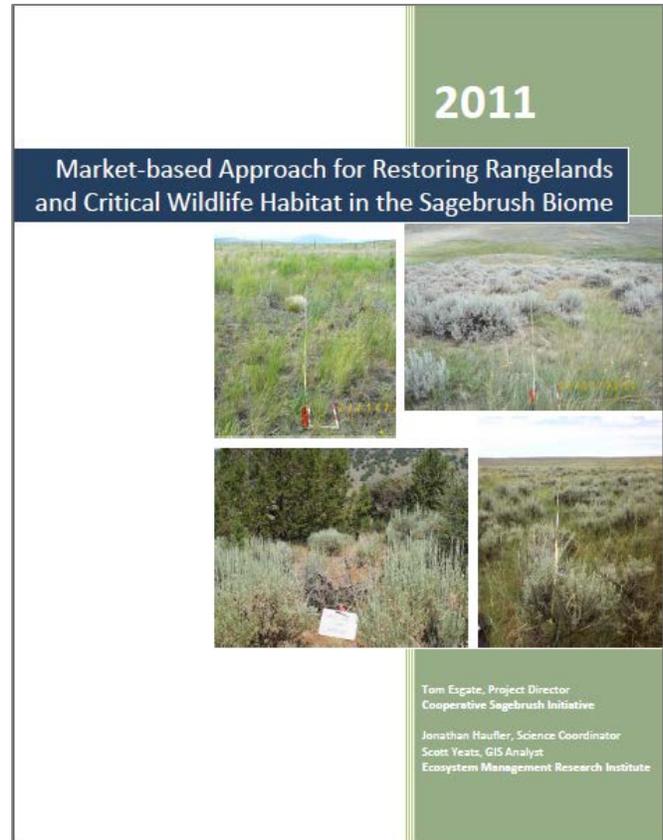
Results – The metric system worked well for quantifying changes to sagebrush plant communities at the site level and evaluating changes in species habitat conditions at the landscape level. There was strong support for the use of ecological sites as the underlying framework for site level development of reference conditions. Mitigation “credits” were documented to be created at several of the sites. At other sites, the short time response following some of the treatments precluded the site from showing measureable generation of credits. Landscape level analyses worked to demonstrate how species would respond to mitigation treatments. The models worked effectively, although the scales used for some species such as sage-grouse revealed the challenges of producing measureable changes in habitat quality at larger scales.

Stakeholders supported the metric system and offered various suggestions for application to actual credit trading. Various types of tradeoffs between specific impacts and generated mitigation benefits were discussed and recommendations noted.

Various treatments were shown to produce good responses by sagebrush communities including removal of junipers, control of cheatgrass and other invasive species, and seeding of desirable species. The metric system developed to document these benefits worked well and was generally supported by a diverse group of stakeholders. These findings have been presented to various small groups as well as to several meetings of the Soil and Water Conservation Society annual meeting. The project report will be available on the web, and additional publications on the application of the metric system are anticipated.



Locations of 7 project sites where mitigation treatments were conducted and monitored using the mitigation metric system.



Please refer to the extended project report “*Market Based Approach for Restoration*” for detailed information and data for this project.

Please refer to the project’s Final Programmatic Report and extended report “*Market Based Approach for Restoration*”, available with the provided grantee documents, for detailed project activities and results.

Roost Conservation for Southwestern Bats*Bat Conservation International, Inc.*

Project #: 2008-0116-004

NRCS CIG Funds: \$82,473

Grantee Matching Funds: \$82,892

Total Project Funds: \$165,365

Project Description: Implement long-term conservation initiative for multiple bat species in the southwestern United States. Project will use a partnership-based model to implement priority conservation actions.

Project Location: Southwestern United States

Project Status: Closed

Final Report Summary:

During the three phases of this grant, Bat Conservation International (BCI) was able to survey 269 mine and cave features in accordance with the goals of the NRCS CIG program. BCI was able to survey and assess more mine openings than expected (50-75 was the goal in the phase reporting) – largely because the assigned staff worked well and fast with partners and volunteers. Furthermore, the volume of abandoned mines exceeded expectations within focused regions, so travel wasn't necessary to reach higher volume, and our output increased.

The surveying of these features has led to the discovery of many new bat colonies and the implementation of protective measures to keep their subterranean roosts from being sealed or destroyed. Our target for protection actions at these sites was 10-15, and we exceeded this with protection actions at 20 sites. Many of these roosting sites are adjacent to private lands where agricultural producers rely on the pest fighting and pollinating skills of the bats whose foraging range covers a broad swatch of the landscape.

The information gathered during these surveys is leading to a better ecological and biological understanding of the target insectivorous and nectivorous (pollinating) species, helping federal and state resource managers more effectively preserve, protect, and manage bats and their roosts – thus ensuring the continuance of their invaluable ecosystem and pest management services, greatly benefiting agricultural producers.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.

Transitioning to No-Till Cover Crops (IN, OH)*Conservation Technology Information Center*

Project #: 2008-0116-005

NRCS CIG Funds: \$255,014

Grantee Matching Funds: \$255,014

Total Project Funds: \$510,028

Project Description: Demonstrate the use of cover crops to ease the transition to continuous no-till systems. Project will promote the environmental and economic benefits of no-till systems and cover crops.

Project Location: Indiana and Ohio

Project Status: In-Closure

Final Report Summary:

In 2008, the Conservation Technology Information Center (CTIC) began a three-year project, “Using Cover Crops to Facilitate the Transition to Continuous No-Till,” to provide technical and social support to producers in Indiana and Ohio wanting to expand their use of cover crops and continuous no-till, two proven conservation practices. With consultant services, workshops and opportunities to learn from peers, this project provided the assistance needed to get conservation on the ground.

Project participants – four producers in Indiana and two producers in Ohio – have transitioned field(s) within their operation to continuous no-till, while incorporating cover crops into the rotation. Crop consultants provided producers with technical and social support as they made the transition. Consultants met regularly with their partner-farmers, assisting with equipment, planting time, seed selection and other decisions as they relate to cover crops and no-till planting.

CTIC and the Midwest Cover Crops Council developed a unique Cover Crop Selection Tool for Indiana, Ohio, Michigan, Minnesota and Wisconsin which is available online at <http://mcccdev.anr.msu.edu/>. Producers enter details about their location, operation and desired outcomes, and the tool responds by showing cover crops that will work well in their operation.

CTIC created a cover crop sub-site, <http://ctic.org/Cover Crops/> on the organization's main website. We added more than 100 cover crop references to a searchable database in this site. The site contains information about our project, including soil tests, profiles, and details about what the farmers did each year. CTIC interviewed participating farmers by phone for feedback about their participation and the project. Interview summaries can be accessed on the cover crop site.

Overview of Project

Using a continuous no-till (CNT) system, producers build healthy soil, grow productive crops and efficiently manage nutrients. Without disturbing the fragile sub-layers of soil, CNT allows surface organisms to thrive and encourages increased nutrient cycling and availability while improving soil structure and infiltration and increasing organic matter. Residue-covered ground is highly resistant to extreme weather conditions, such as drought, and holds the soil in place, ensuring that nutrients and sediment remain on the land and not in nearby water ways. With reduced fuel use, reduced nutrient inputs and yields comparable to conventional systems, CNT greatly increases profit margins.

Despite the proven economic and environmental benefits of CNT, some farmers remain hesitant to fully adopt the system. In 2004, the National Crop Residue Management survey indicated that only

22.6 percent of farmers were no-tilling. This does not indicate the number of CNT farmers; that number is likely much less. One of the major reasons farmers resist switching to CNT is that the transition years pose many challenges. Attempting CNT without proper technical knowledge may cause a disastrous first year and taint opinions toward the practice. Potential economic risks and yield losses during the first five years also can cause farmers to resist CNT. However, if farmers can maintain a CNT system for three consecutive years, the risks begin to fade. The farmers' confidence increases and benefits from the lack of tillage start to take effect on the land and in the wallet.

Incorporating cover crops into a CNT rotation can multiply the environmental and economic benefits. In fact, by keeping something growing on a field for as many days as possible, soil erosion becomes almost nonexistent, even during a six -inch rain. These are the same benefits of a CNT system, but by pairing the two practices, the benefits are seen more quickly and the transition years are more productive and less stressful for the transitioning farmer. CTIC proposed addressing the challenges that farmers face during the transition to CNT by educating them about the environmental and economic advantages of pairing no-till and cover crop systems.

Objectives of this project include:

- Eight farmers in Indiana and Ohio transition to CNT with the personalized technical support provided by a Crop Consultant.
- Eight participating farmers integrate cover crops into their CNT system.
- At least 20 farmers in both Indiana and Ohio form social support networks for CNT.
- A Cover Crop Matrix (CCM) for the Midwest aids farmers in choosing the correct cover crop for their location and operation.
- Soil quality tests showing the benefits of cover crops paired with no-till.

Additional information about this CIG project is available on the grantee's website [here](#).

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.

Quail-Friendly Rangelands Management*Texas AgriLife Extension Service*

Project #: 2008-0116-006

NRCS CIG Funds: \$132,834

Grantee Matching Funds: \$164,979

Total Project Funds: \$297,813

Project Description: Implement an innovative approach to managing livestock grazing and prescribed fire to achieve desirable patches of vegetation for quail while reducing the need for chemical control of prickly pear.

Project Location: Rotan, Texas

Project Status: In Closure

Final Report Summary:

Patch-burn grazing was investigated as a technique to enhance cactus-infested rangeland for northern bobwhites. We successfully demonstrated the use of patch-burning to enhance quail habitat based on several habitat parameters including: (a) promoting early successional forbs like sunflower and western ragweed; (b) increasing bare ground; and (c) sustain desirable densities of warm-season bunchgrasses. However, despite such improvements in habitat, bobwhite abundance decreased by greater than 50%. Exceptional drought (a historical record for this area) prevailed from Sept 2010 through Sept 2011) coupled with record heat precluded us from measuring some attributes (e.g., soil stability), hindered burning efforts (in 2011), and surely impacted (decreased) several response variables (e.g., quail, arthropods). We demonstrated that cattle grazing can be manipulated effectively with patch-burning and that such patch disturbance regimes can be used to manage quail habitat. While patch-burn grazing accomplished several habitat objectives, we did not demonstrate any positive influence on quail abundance. Bobwhite abundance in study pastures decreased more than other parts of the study area.

We were unable to assess soil/site stability due to exceptional drought conditions. Collar failure (3 of 4 GPS collars failed in 2010) precluded a comparison of grazing use during a near average year (2010) and an exceptional drought year (2011).

We predicted that patch-burn grazing would enhance various habitat attributes for bobwhites (and it did), but quail abundance failed to respond accordingly. In fact, despite “habitat improvement” the 2 treatment pastures had lower quail abundance than the remainder of the Ranch at the completion of the study.

The exceptional drought surely impacted herbage availability and may have affected plant species’ responses to the patch disturbances applied. The doctoral candidate hired to conduct this study withdrew in April 2011 and his absence/abilities delayed completion of this report and the depth of some data analyses. Bobwhite populations across the Rolling Plains has reached record lows each year since 2009; the RPQRR is presently engaged in a multiyear disease study to assess disease-parasites as possible contributing agents to the decline of quail.

Field days were conducted in 2008 (170 attendees), 2009 (152 attendees), 2010 (120 attendees), and 2011 (64 attendees). Two presentations were made at the annual meetings of the Texas Chapter of The Wildlife Society in 2010 and 2011; one presentation was made to the Wildlife Committee of the Texas & Southwestern Cattle Raisers Association.

Please refer to the project’s Final Programmatic Report, available with the provided grantee documents, for detailed project activities, deliverables, data, results, and lessons learned.



Aerial view of “Ellie” pasture showing preferential grazing by cattle for recently burned polygon. Rolling Plains Quail Research Ranch, Fisher County, TX.



Prickly pear cactus provides important nesting and escape cover for bobwhites. Rolling Plains Quail Research Ranch, Fisher County, TX.



Prescribed burns were conducted in Feb-Mar as part of a batch-burn grazing regime. Rolling Plains Quail Research Ranch, Fisher County, TX.



This cow fitted with a GPS collar grazes on burned prickly pear in April 2010. The GPS collars collected a waypoint every 30 minutes allowing us to monitor grazing use of various polygons.



Dale Rollins discusses patch-burn grazing as an effort to stimulate key forbs for bobwhites at the 2008 field day. Rolling Plains Quail Research Ranch, Fisher County, TX.



Quail abundance was assessed by direct and indirect methods (e.g., call counts). Here a helicopter is used to obtain flush counts; Rolling Plains Quail Research Ranch, Fisher County, TX.



Webisodes produced for YouTube provide summaries of various aspects of the patch-burn-grazing project, Rolling Plains Quail Research Range, Fisher County, TX. A total of 4 webisodes were produced to support this project.



Quail biologists from throughout the U.S. tour the patch-burn grazing project in August 2012 on the Rolling Plains Quail Research Ranch, Fisher County, TX.

Vegetation Management and Pasture Health (AL)*Tuskegee University*

Project #: 2008-0116-007

NRCS CIG Funds: \$231,615

Grantee Matching Funds: \$128,675

Total Project Funds: \$360,290

Project Description: Use goats to improve soil quality, plant health, and land productivity on five farms in rural Alabama. Project will perform nutrient analyses, develop marketing strategies to ensure the viability of small producers, and produce an educational video.

Project Location: Alabama

Project Status: In Closure

Progress Report Summary:

Goats have been a successful use for the biological control of abandoned farmland, and pastures invaded by herbaceous weeds, vines, multiflora rose bushes and hardwood saplings. Therefore, managed defoliation with goats can result in a substantial increase in vegetative cover by favorable grass species while reducing or eliminating unwanted shrub species and weed in time. For this project we used a few farms that our research scientists at Tuskegee University are currently conducting research and we introduced goats to control weeds and brush. The results of these experiments indicated that goats could successfully eliminate weeds from pastureland and enhance growth of summer grasses. Goats could also reduce brush and restore pastureland. Some guidelines for use of goats regarding their number per acre are discussed. Using timberland for winter grazing goats as silvo-pasture setting has been explored in objective 4 and has shown promise to improve farm output and profitability.

Objectives to be addressed through this project:

1. Assessing the system nutrient balance on farms for possible nutrient overload or deficiency
2. Improving pastureland using goats co-grazing with cattle
3. 3-Control brush and invasive plants (kudzu) and fuel load reduction using goats
4. Managing goats in silvo-pasture systems to improve total land output
5. To collect baseline information and develop a marketing strategy to ensure profitability for small and minority producers

Please refer to the project's Progress Report for 2011, available with the provided grantee documents, for detailed project accomplishments and activities.

Awaiting submission of Final Programmatic Report by the Grantee.

Pumping Plant Energy Audit & Reporting System (AR)	NRCS CIG Funds:	\$531,833
<i>White River Irrigation District</i>	Grantee Matching Funds:	\$865,226
Project #: 2008-0116-008	Total Project Funds:	\$1,397,059

Project Description: Develop, install, and demonstrate technology that will perform irrigation plant evaluations and provide continuous plant performance data via the Internet. Project will reduce farm energy costs by raising pumping efficiencies.

Project Location: Arkansas

Project Status: In Closure

Final Report Summary:

Summary of Accomplishments:

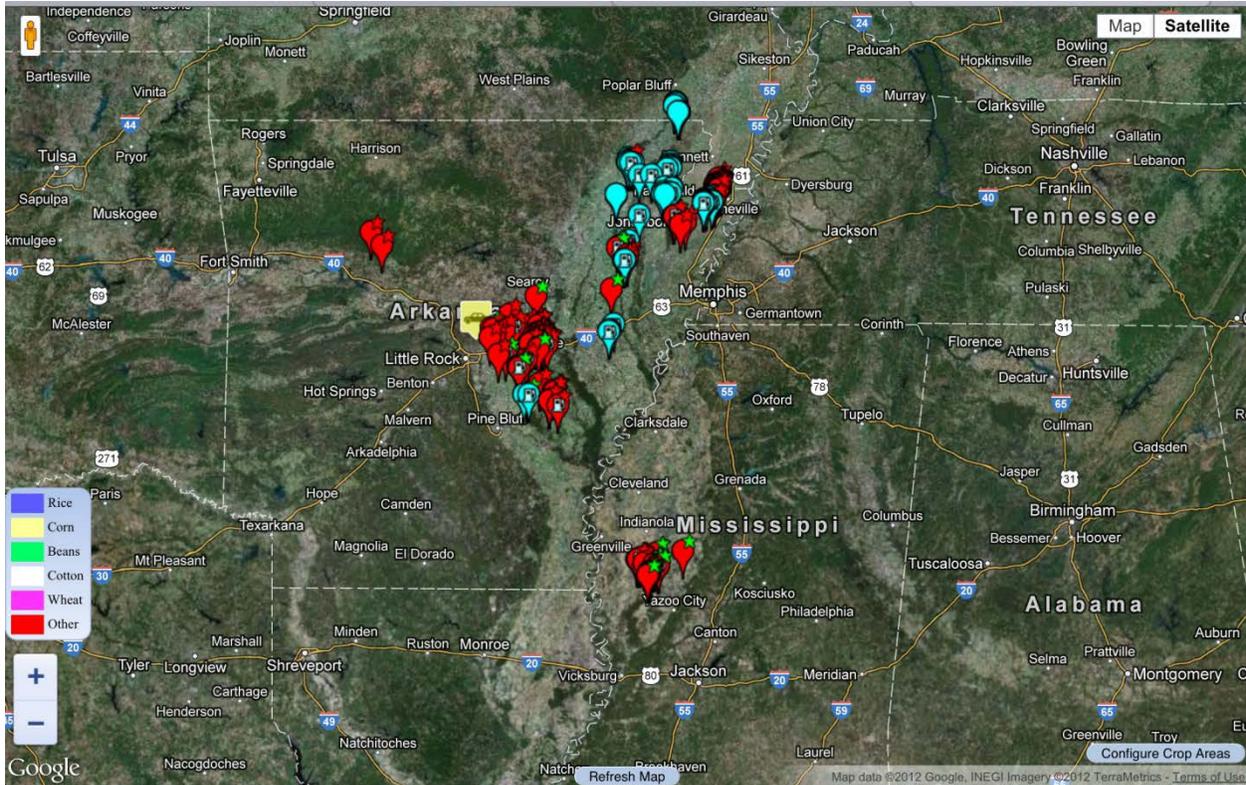
1. Technology has been developed that provides a method for irrigators to remotely control (turn on and off) and monitor the operation of electric motors and diesel engines used for irrigation.
2. Sensors monitored and reported near real-time include temperature, rainfall, amount of water pumped, water flow rate, power used, fuel flow rate, water pumping depth, time of pumping, and engine performance characteristics such as RPM, engine temperature, oil pressure, soil moisture, electricity used, and photographs when requested by the operator.
3. A software system has been developed that collects, records, analyzes, and reports the sensor data back to the operator for operational decisions. The operator can set predetermined limits to turn the pumps on off depending on preset conditions. This is unique to surface operation systems.
4. Technology has been developed and implemented that displays when pumping is occurring at various locations region wide. This is an important component for irrigation system managers where status of pumping is important as well as agencies interested in knowing the status of irrigation pumping across the region.
5. Several sensors have been evaluated and limitations identified that are important to consider when selecting components to monitor and report water use. Some sensors work and some don't under the given situations found in the field.
6. More than 150 installations have been installed, upgraded, and maintained during the grant period. We continue to grow the technology well beyond the actual grant conclusion.

Major Technology Change: In April of 2009 we stopped installations utilizing previously identified technology, identified our technology needs, and in cooperation with our local partners, we identified a different technical service provider that had the necessary expertise in hardware (electric and diesel), software development capability, communication network expertise and a willingness to partner with us. We started the development process in May of 2009 for new procedures, different sensors, and different communications boards for in-field installations as well as converting to cell phone technology as the basic method for moving the needed volume and rate of data to and from the in-field locations. This effort cost us a serious amount of time investment and exploded our budget. WRID and our partner utilized our funds to complete this effort. We did have to reduce the number of actual installations goaled for completion with this grant because of this particular issue. It was clearly the proper decision although the increased local expenditure of funds has certainly been a challenge.

The largest outcome has been the adoption and utilization of this technology by others to improve and grow the technology. Installed systems are being utilized by the University of Arkansas CES to monitor and evaluate pumping volumes, pumping rates, pumping costs, and detailed evaluation of irrigation component cost. Arkansas State University and USDA Agricultural Research Service is building a

significant part of their program around the availability of this technology and installed systems to monitor water applied, runoff volumes, water quality, wetting fronts, and as the system to install and evaluate various soil moisture units, flow meters and other sensors to test the performance. This is a very large platform to monitor and evaluate water quantity and water quality as well as testing sensors. This effort is underway with a team composed of engineers, irrigation specialists, agronomists, and economists from the states of Arkansas, Mississippi and Missouri. This effort will continue long term.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, results, and lessons learned.



Region wide installations in Arkansas and Mississippi

Conservation of Winery Biomass Residues (CA)

Community Power Corporation

Project #: 2008-0116-009

NRCS CIG Funds: \$0

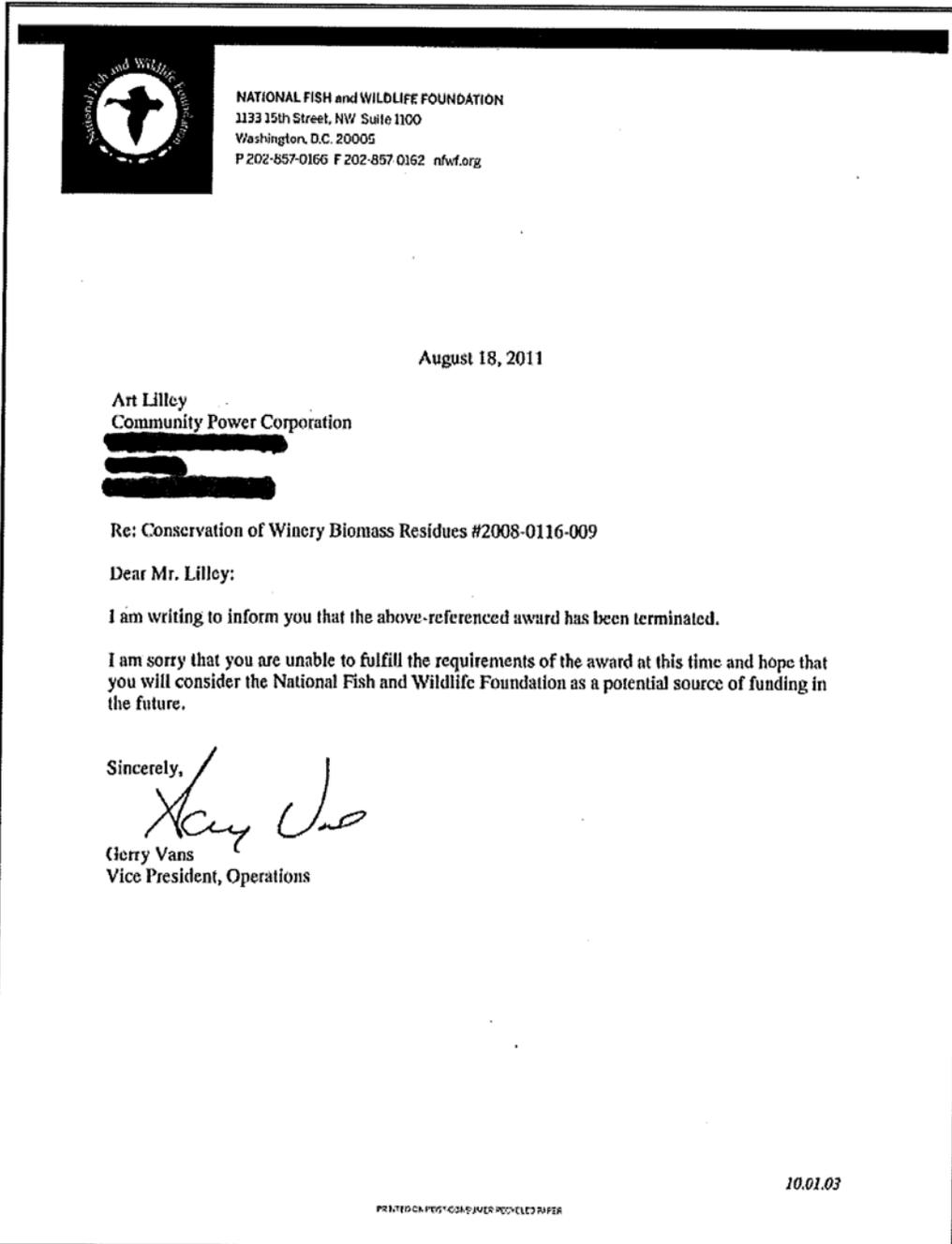
Grantee Matching Funds: \$0

Total Project Funds: \$0

Project Description: Demonstrate a sustainable, cost-effective approach for wineries to convert viticulture and enology biomass residues to electricity and heat.

Project Location: California

Project Status: Cancelled



Dairy Waste Discharge Requirements (CA)*California Dairy Campaign*

Project #: 2008-0116-010

NRCS CIG Funds: \$776,146

Grantee Matching Funds: \$1,899,702

Total Project Funds: \$2,675,848

Project Description: Implement and evaluate the effectiveness of Nutrient Management Plans and Waste Management Plans at dairies within the San Joaquin Valley. Project involves extensive wastewater, soil, and plant tissue analysis and nutrient mass loading estimates.

Project Location: San Joaquin Valley, California

Project Status: Closed

Final Report Summary:

The California Regional Water Quality Control Board, through regulations, required dairies in the San Joaquin Valley of California to gather information on the following: (a) facility information due no later than 12/31/2007; (b) complete and existing conditions report due no later than 12/31/2007; (c) prepare preliminary dairy facility assessment due no later than 12/31/2007; (d) complete annual dairy facility assessment due no later than July 1 annually; (e) prepare Nutrient Management Plan due no later than 7/1/2008; (f) complete Waste Management Plan due no later than 7/1/2009 [extended one year to 7/2010]; and (g) an annual report due no later than December 31 of each year. As a result, the California Dairy Campaign (CDC) and partners submitted this grant to assist in the overall effort.

A “one-stop-shop” was the innovative concept for this project and was initiated when this grant was received. CDC solicited and selected 81 participants from over 110 dairymen who initially expressed interest in this project. During the grant period, four dairies went out of business due to severe economic conditions, leaving 77 dairies that completed the grant. Once dairymen were selected, agreements were signed between the dairymen and CDC before any project work began. CDC then coordinated and assisted in providing technical and cost share assistance through its partners to prepare and implement Nutrient Management Plans (NMP’s) on 81 dairies; scheduled sampling of soil, water, and plant tissue testing was a part of management. Once the NMP’s were prepared, preparation and implementation of Waste Management Plans (WMP’s) began. Two workshops which focused on Nutrient and Waste Management were designed and presented by CDC and its partners; the workshops were taped for training and technology transfer.

Please refer to the project’s Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.

Sonoma County Salmon Coalition (CA)
Sotoyome Resource Conservation District
Project #: 2008-0116-011

NRCS CIG Funds:	\$270,000
Grantee Matching Funds:	\$270,226
Total Project Funds:	\$540,226

Project Description: Develop Best Management Practices and conservation projects that protect the Russian River watershed while retaining the economic viability of agricultural producers. Project will include outreach, data collection, and partnership development.

Project Location: Mendocino and Sonoma counties, California

Project Status: In-Closure

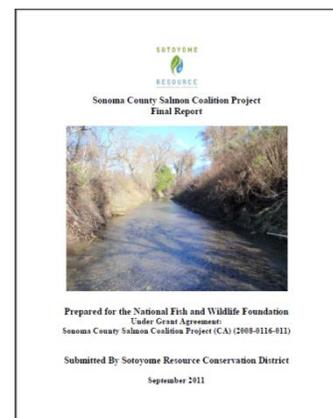
Final Report Summary:

One key accomplishment of this project was strengthening the relationship and coordination between the Russian River Property Owners Association (RRPOA) and the Sotoyome Resource Conservation District (RCD), resulting in the development of additional habitat restoration and flow monitoring projects that the two organizations will work on together beyond the term of this agreement. RCD staff coordinated with the RRPOA and Salmonid Forum (formerly Salmonid Coalition), including attending general meetings, providing newsletter updates, and scheduling special working group meeting to plan for flow monitoring and habitat enhancement.

The Center for Ecosystem Management and Restoration (CEMAR) took the lead on the hydrologic aspects of this project, which included two main elements. The first element was a water needs analysis developed for Alexander, Dry Creek and Knights Valleys by compiling water need data, stream flow data, and biological habitat criteria, and the incorporation of this information into a Geographic Information System (GIS) model. The second hydrologic element of this project was developed in response to heightened concerns on the part of the State Water Resources Control Board (SWRCB) and the National Marine Fisheries Service (NMFS) over the use of water for frost protection and potential impacts to threatened and endangered fisheries. As a result, the instream flow monitoring element of this project was expanded. This was made possible through the work of RRPOA volunteers as well as matching funds contributed by the RRPOA and through some of the RCD's other funding sources. Because of these additional outside contributions, the expansion of this project element was possible without otherwise modifying other elements of the scope of work.

During the term of this agreement, the RRPOA and RCD also worked together to identify, plan, and implement a project that will enhance habitat and aid in upstream migration of steelhead trout in Gird Creek. Another key accomplishment was the development of information to aid landowners in their water management decisions and to inform regulatory processes currently underway, including flow monitoring in Alexander Valley and water needs analysis for Dry Creek, Alexander, and Knights Valley's. Lastly, this funding supported the continued exploration of the 4(d) and other regulatory processes as they relate to farming activities in the Russian River watershed and informed local landowners of these processes and their options.

Please refer to the project's Final Programmatic Report and extended Final Report (pictured to the right), available with the provided grantee documents, for detailed project activities and results.





Looking west along Gird Creek and the edge of the vineyard road where a thick area of invasive plant Arundo donax was established prior to mowing and hand removal that was completed in the summer of 2010. This location is one of the photo monitoring points.



Looking from the same photo monitoring point as the first picture, the Arundo has been mowed and removed by hand and treated with herbicide. In select locations, native riparian trees and shrubs have been planted to suppress other invasive plants and to establish a native plant riparian corridor.



Looking east at a stretch of Gird Creek mostly within Reach 2. This section of the creek will be enhanced with the installation of willows and native plants that will provide refuge for steelhead, slow stream velocity and create more channel complexity.

Advisory Service for Irrigation Scheduling (CA)*The Regent of the University of California*

Project #: 2008-0116-012

NRCS CIG Funds: \$226,578

Grantee Matching Funds: \$233,258

Total Project Funds: \$459,836

Project Description: Establish an irrigation advisory service. Project will assist individual farmers with improving water use and efficiency and maximizing net economic returns.

Project Location: Sacramento and San Joaquin Valleys, California

Project Status: Closed

Final Report Summary:

During this project, we refined the software in the Irrigation Management On-line (IMO) Scheduling program for use in California. Specifically, the ability to automatically upload reference evapotranspiration (ET_o) for short canopies from the California Irrigation Management Information System (CIMIS) was added to the IMO. The On-line Scheduling program can be accessed at the url: <<http://oiso.bioe.orst.edu/RealtimeIrrigationSchedule/index.aspx>>. In addition, the crop coefficient data base was expanded to include all known crop coefficients from California, and the software was modified to include high frequency irrigation systems (i.e. drip and micro-sprinkler) for scheduling. Based on feedback from grower-cooperators in 2010, we developed new, simpler software at the request of growers participating in the project.

Blake Sanden (Kern County), Allan Fulton (Tehama County), and Dan Munk developed active field research projects to validate the IMO program, and they developed excellent cooperation with growers to test the program. Until the IMO program was introduced into California production systems during the past two years, the program focused primarily on furrow, flood, center pivot, and hand-line and wheel-line sprinkler systems in agronomic and vegetable crops. Therefore, the UCCE farm advisors worked closely with OSU personnel to design and expand the software to apply to high frequency irrigation systems and orchard crops. They served as intermediaries between the grower-cooperators and the OSU program developers to provide feedback on how to improve the scheduling model. The farm advisors conducted several meetings with growers to train them on how to use the IMO and to gain feedback on the growers' perception about how to improve the model.

At UC Davis, we accumulated a data base of crop coefficients for expansion of the IMO into California. Using Excel software, we developed an irrigation scheduling model that accounts for water and salinity stress and during the first year of the experiment, but we were unable to find data to test the model from any source including the USDA Salinity Lab. Because of the lack of field data to test the model, we did not modify the IMO software to use the water and salinity stress model. We looked for sources of field data on interactions between salinity and water stress, but to our knowledge, none is available. However, we were able to enlist the support of the Biosaline Research Center in Dubai. Because of water and salinity stress problems in the Middle East, they have agreed to set up experimentation to validate the model. This year, they initiated field research to begin the verification process, and we will refine the experiments to validate the model in following years.

Irrigation scheduling of orchard crops is considerably more difficult than field crops because the water requirements are less well known and they often produce better in the long-term when moderate water stress is applied at certain times of the season. We chose to use almond, walnut, and prune orchards as our study crops in this project. Almond is a major water using crop throughout the Central Valley of California, and the University of California has a strong research program related to quantifying water

stress in almonds. Walnut and prune are also major crops in the northern Sacramento Valley (Tehama County) that have been supported with field research quantifying the effects of deficit irrigation. The UCCE Farm Advisors worked on field studies that related midday stem water potential readings and soil moisture monitoring for use in the Bayesian decision model used in IMO. We monitored evapotranspiration, soil moisture, and plant-based stress in each county in addition to working with growers.

There was been excellent cooperation between the Oregon State and UC Davis personnel. We emphasized irrigation scheduling of almond, walnut, and prune orchards with micro-sprinkler and drip irrigation systems because it comprises a growing part of California that differs from earlier work done in Oregon. The revised software and what we learned was a good first effort to expand IMO into California. In future years, our research group will move on to other crops to continue refining crop coefficients and water management.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, accomplishments and results.

Environmental Services from Florida Ranchlands*World Wildlife Fund, Inc.*

Project #: 2008-0116-013

NRCS CIG Funds: \$950,481

Grantee Matching Funds: \$950,481

Total Project Funds: \$1,900,962

Project Description: Develop and implement an operational pay for services program for working agricultural lands in the Northern Everglades region. Project will reduce nutrient loads to Lake Okeechobee and mitigate adverse changes in coastal estuaries.

Project Location: Florida

Project Status: In Closure

Progress Report Summary:

The overarching goal of this grant was achieved with the launch in November 2011 of the new program, Northern Everglades and Estuaries – Payment for Environmental Service (NE-PES) by the South Florida Water Management District (SFWMD). During this reporting period the first solicitation under the NE-PES program was conducted (Jan-May 2011) and as a result of a competitive process the SFWMD awarded 8 contracts with ranchers for the provision of water retention services. Broad support by the USDA Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (FWS), the Florida Department of Agriculture and Consumer Services (FDACS), the Florida Department of Environmental Protection (FDEP), other environmental groups, and the agricultural community for the concept of a (PES) program on ranchlands is a direct result of the success of the Florida Ranchlands Environmental Services Project (FRESP) demonstration projects and comprehensive program design developed through a stakeholder process that was funded by this grant.

The 8 projects will provide annually on average an estimated 4,800 acre feet of water retention. Contracts in the first solicitation represent a \$7 million investment by the SFWMD over the life of the 10 year contract for securing on-ranch water retention services. The Governing Board of the SFWMD has expressed support for future solicitations under this program and SFWMD and FRESP staffs are in the process of preparing for the next solicitation to be released sometime in early 2012.

Please refer to the project's FY11 Progress Report, available with the provided grantee documents, for detailed project accomplishments and activities.

Awaiting submission of Final Programmatic Report by the Grantee.

Broiler Energy Conservation Planning (GA)	NRCS CIG Funds:	\$264,365
<i>Georgia Resource Conservation and Development Council</i>	Grantee Matching Funds:	\$280,000
Project #: 2008-0116-014	Total Project Funds:	\$544,365

Project Description: Develop techniques for energy conservation on broiler operations in Georgia. Project will demonstrate the planning and installation of conservation practices and produce educational materials for distribution to agricultural professionals.

Project Location: Georgia

Project Status: In Closure

Final Report Summary:

Six poultry production farms participated in the project. Three were in Northwest Georgia (Rolling Hills RC&D,) and three were in Southeast Georgia (Seven Rivers RC&D). Each farm was visited and an energy audit was performed recommending changes to improve energy efficiency. Additionally, a prediction of expected savings if these changes were implemented was generated. Energy records were obtained for each farm for one year before and after the changes. A no-cost extension to the original time table was requested and received so that more data were available for review.

Initially, as called for in the grant, energy audits and resulting improvements were implemented on six poultry operations in the two participating RC&D areas. Subsequently, energy audits have been completed on 138 additional poultry operations statewide. Partnerships between UGA, RC&D and the Natural Resources Conservation Service (NRCS) were strengthened as the audit process became more standardized. A new partnership was developed with USDA/Rural Development as landowners took advantage of the REAP (Rural Energy for America Program) to assist with the cost of improvements recommended by their energy audit results.

One of the best indicators of the success of this demonstration project is the number of poultry farms that are adapting the demonstrated technologies. The University of Georgia and the GA RC&D Councils have performed audits on 86 farms from July, 2010 through June, 2011. These farms represent 475 poultry houses which have implemented or plan to implement various energy efficiency upgrades. If fully implemented, these measures are expected to save over 630,000 gallons of LP gas and over 1.4 million kWh of electrical energy per year on these farms. The farms will invest \$7.1 million with an expected return of \$1.4 million in annual savings.

The intent of this project was to provide NRCS with an “energy conservation” mindset, providing more of an awareness/understanding training than an expectation that NRCS would apply the principles and techniques. The documents produced and the lessons learned are being shared with NRCS personnel on an ongoing basis. The NRCS personnel are then taking this knowledge into the field for practical application statewide, as demonstrated by the vast number of energy audits currently being performed.

A number of publications have been developed by UGA to address energy savings on poultry operations. These publications have been made available to owners, integrators and NRCS, as well as any other interested parties. This project produced a brochure for NRCS Conservation Practice Standard for “Attic Inlets for Broiler Houses” – available with the provided grantee documents.

Please refer to the project’s Final Programmatic Report, available with the provided grantee documents, for detailed project activities, data, results, and lessons learned.

NATURAL RESOURCES
CONSERVATION SERVICE
CONSERVATION PRACTICE
STANDARD

ATTIC INLETS FOR BROILER
HOUSES

DEFINITION

Installation of inlets that bring air from attic space of broiler houses

PURPOSE

To use the natural solar heating of the attic space to preheat incoming air during minimum ventilation conditions. Preheating the air reduces the heating required and also dries the air, thus helping keep litter drier resulting in reduced ammonia levels and healthier birds.

CONDITIONS WHERE PRACTICE APPLIES

Any broiler house that is tightly constructed enough to give control over where air enters the house. If house has many cracks in its walls, air will come in through those cracks rather than the attic inlets rendering them ineffective. The houses should be able to develop a minimum of 0.13" in static pressure test. (All doors and inlets closed and enough fans turned on to move 0.1 cfm/sq. ft of floor area. For a 40x500 ft house, one 48" fan would be turned on.)

DESIGN CRITERIA

Enough inlets should be installed to supply the minimum ventilation requirements for the house, so the number of inlets needed depends on (1) the capacity of the inlet and (2) the minimum ventilation rate for the house. Although the numbers can vary, a typical 40 x 500 ft house would need 12 to 14 inlets and a 50 x 500 ft house would need 16 to 18.

A variety of inlets are available with outlets on one side, two sides, or four sides. Some are operated by gravity, and some by a power winch system. Any of these systems will provide the desired results, although some may require more management.

SPECIFICATIONS

Inlets should close tightly when ventilation fans are not operating. An open inlet will allow air laden with ammonia and moisture into the attic where it will condense and cause deterioration of the structural members of the house.

Houses should achieve a minimum of 0.13" static pressure on a pressure test (see Conditions where Practice Applies section.)

Maintenance. Inlets should be checked periodically to assure they are opening and closing as they are supposed to. A buildup of dust may inhibit proper operation.

Economics. Expected savings of heating fuel depend on a number of factors including house tightness, types of brooders, other equipment installed in the house, and weather, but typical expected savings range from 10 to 30% of annual gas usage.

REFERENCES

Attic Inlets-A First Look
Poultry Housing Tips, Volume 19 No. 2
UGA Cooperative Extension
www.poultryventilation.com

Basic Attic Inlet Operational Guidelines
Poultry Housing Tips, Volume 19 No. 13
UGA Cooperative Extension
www.poultryventilation.com

Frequently Asked Questions About Counter-Weighted Attic Inlets
Poultry Housing Tips, Volume 19 No. 9
UGA Cooperative Extension
www.poultryventilation.com

New Four Way Attic Inlet-A First Look
Poultry Housing Tips, Volume 22 No. 5
UGA Cooperative Extension
www.poultryventilation.com

Cooperative Conservation for Watershed Health (IA)*Iowa Soybean Association*

Project #: 2008-0116-015

NRCS CIG Funds: \$800,000

Grantee Matching Funds: \$800,000

Total Project Funds: \$1,600,000

Project Description: Improve watershed health in Iowa. Project will develop, field test, and implement a cooperative conservation system for improving health in 4 watersheds that will focus on water quality, linkages to soil, atmosphere, and energy.

Project Location: Iowa

Project Status: In Closure

Final Report Summary:

Iowa Soybean Association's (ISA) multi-year Cooperative Conservation Project in five Boone and Raccoon River sub-watersheds brings USDA NRCS Conservation Innovation Grant (CIG) funding, leveraged by soybean checkoff and Agriculture's Clean Water Alliance (ACWA) funding, to help local farmers optimize and document the results of voluntary conservation efforts, using management tools that can also improve profitability.

As part of this project, Iowa Soybean Association provided technical assistance, paid for by project funding, to watershed organizations and individual farmers in the following watersheds: Buck Creek, Lyons Creek, and Lower Eagle (all in the Boone River Watershed); and Fannys Branch and Willow Creek (both in the Raccoon River Watershed)

This project strove to improve watershed health in Iowa by developing, testing, and implementing a cooperative conservation system focused on water quality with linkages to soil, atmosphere, and energy. To achieve this goal, five HUC12 watersheds were chosen in the Boone and Raccoon River basins in which to focus efforts. Within each watershed, a watershed management plan was developed which then guided the development of resource management systems for participating farmers. A number of supporting activities were completed during this process including water monitoring, RASCAL assessments of the streams, a sociological survey, soil loss and phosphorus risk analysis, in field performance evaluation, agronomist training, and attribute analysis. The combination of planning and assessment at the field, farm, and watershed scale successfully demonstrated a framework for watershed improvement.

The 5 watershed management plans and all project information can be found online at <http://www.iasoybeans.com/environment/programs-initiatives/ccfw>.

Watershed Management Plans:

[Buck Creek Watershed](#)

[Fannys Branch Watershed](#)

[Lower Eagle Creek Watershed](#)

[Lyons Creek Watershed](#)

[Willow Creek Watershed](#)

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, results, and lessons learned.



End of season stalk sampling in Boone River



Corn harvest in the Boone River Watershed



Fannys Branch Creek, Raccoon River Watershed

Watershed Program



to meet agronomic and environmental objectives

Delivering innovative programs providing farmers with service and support

BOONE AND RACCOON RIVER COOPERATIVE CONSERVATION PROJECT

Integrated Technical Assistance for Producers, Crop Consultants and Watersheds

Iowa Soybean Association's (ISA) 3-year Cooperative Conservation Project is designed to help local farmers optimize and document the results of voluntary conservation efforts using management tools that also improve profitability. This project is being implemented in five Boone and Raccoon River sub-watersheds using USDA NRCS Conservation Innovation Grant (CIG) funding, leveraged with soybean checkoff and Agriculture's Clean Water Alliance (ACWA) funding.

This project is a pro-active effort to use the science, technology, and experience of local farmers, ISA, and collaborating public and private experts to advance local watershed health and demonstrate how effective a voluntary effort to address water quality with local stakeholders can be.

As part of this project, Iowa Soybean Association is providing technical assistance, free of charge, to watershed organizations and individual farmers in the following watersheds: Buck Creek, Lower Eagle, and Lyons Creek (all in the Boone River Watershed); and Fannys Branch and Willow Creek (both in the Raccoon River Watershed).

Those services include:

- Helping 15-25 producers in each sub-watershed develop CEMSA (enhanced Resource Management) Plans, with applied evaluation of soil, nutrient, pest, and energy management and assistance in using data collected on the farm to improve efficiency and profitability.

- Assisting local Agronomists and CCA's to provide these services to their clients.
- Developing watershed plans for each of the five sub-watersheds.
- Linking the efforts of farmers in developing their plans with those at the watershed level to maximize conservation outcomes, achieve watershed goals, and strengthen farmer leadership in the watershed.
- Conducting water and soil monitoring to learn more about which practices are most effective in local watersheds.

Based on the experience of farmers participating in ISA's Watershed and CEMSA projects in the past, most farmers signing up to participate in the project for the next 2-3 years:

- Are likely to experience improved profitability as a result of data gathered to inform their management decisions (70% of participating producers responding to surveys reported this outcome).
- Will be able to use their documentation to apply for federal cost share programs, such as the Conservation Stewardship Program (CSP), Environmental Quality Incentives Program (EQIP), and others – with improved chance of success.
- Will come out with a unified system for documenting their management and its effectiveness in terms of yield, profitability, and environmental performance.
- Can elect to use the plans developed with their consultants or not, as they see fit.
- Will have a system in place that can help prepare them for new opportunities that may arise with conservation programs or ecosystem service markets.



ENVIRONMENTAL PROGRAMS

1255 S.W. Prairie Trail Parkway
Ankeny, IA 50023
800.383.1423

www.iasoybeans.com/environment/
www.isafarmnet.com/lep

Partially funded by the soybean checkoff. Partially funded by cooperative agreement with USDA NRCS.



Implementing Carbon Conservation Practices (ID)

Coeur d'Alene Tribe

Project #: 2008-0116-016

NRCS CIG Funds:

\$0

Grantee Matching Funds:

\$0

Total Project Funds:

\$0

Project Description: Inform landowners of the developing market in carbon credits, develop carbon credit trading expertise, and improve water quality, wildlife habitat and ecological resiliency of forest lands on the Coeur d'Alene Reservation.

Project Location: Idaho

Project Status: Cancelled



NATIONAL FISH and WILDLIFE FOUNDATION
1133 15th Street, NW Suite 1100
Washington, D.C. 20005
P 202-857-0166 F 202-857-0162 nfwf.org

August 30, 2010

Tiffany Allgood
Coeur d'Alene Tribe



Re: Implementing Carbon Conservation Practices (ID) #2008-0116-016 / 7269

Dear Ms. Allgood:

In response to your letter dated August 1, 2010, I am writing to inform you that the above-referenced award has been terminated, per your request.

I am sorry that you are unable to fulfill the requirements of the award at this time and hope that you will consider the National Fish and Wildlife Foundation as a potential source of funding in the future.

Sincerely,

A handwritten signature in black ink, appearing to read "Gerry Vans".

Gerry Vans
Chief Operating Officer

10.01.03

Wastewater Treatment and Disposal System (IL)

Thompsons Pearl Valley Eggs, Inc.

Project #: 2008-0116-017

NRCS CIG Funds: \$443,000

Grantee Matching Funds: \$458,000

Total Project Funds: \$901,000

Project Description: Reduce odors caused by an existing egg wash water treatment system. Project will demonstrate and share innovative technology that is environmentally safe, economical, and technically feasible to install and operate for other egg producers.

Project Location: Illinois

Project Status: In Closure

Final Report Summary:

Waste Water Treatment Plant (WWTP) and solids disposal system built and operated by Pearl Valley Eggs, Inc. demonstrated that Egg wash water (with high PH and BOD) could be treated in an environmentally safe manner without offensive odor and without building a treatment lagoon which have often been the source of offensive odors for miles downwind of the lagoon. The new WWTP has proven to be effective in the reduction of BOD, nitrogen, total suspended solids, and phosphorus from the waste water created here at the farm. The entire process is user-friendly, earth-friendly, and requires a small amount of labor to operate efficiently. By using the activated sludge system, odors are also greatly reduced. The wastewater plant is economical to run; requiring minimal supplies and labor.

Project objectives were all met. Currently the treatment system is working, the solids disposal system is functioning, and there is no odor problem (chief objective). The overall design works fine. The only discrepancies in activities agreed to conduct during the grant and those agreed to were quarterly reports to NRCS. It was an oversight on Pearl Valley Eggs' part to do this. All other parts of the grant were completed.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, results, and lessons learned.



Dave Thompson of Pearl Valley Eggs explains each step of the farm's innovative wastewater treatment system, which utilizes aerobic bacteria and a reed bed to recycle nutrients from the egg wash water. Watch the video [here](#).

Reducing Agricultural Sediment Transport (KS)

Kansas State University

Project #: 2008-0116-018

NRCS CIG Funds: \$450,000

Grantee Matching Funds: \$450,000

Total Project Funds: \$900,000

Project Description: Develop and implement an innovative, market-based pilot conservation program that targets the most vulnerable sites in south-central Kansas watersheds. Project will improve water quality, reduce soil erosion, and maintain agricultural productivity.

Project Location: Kansas

Project Status: In Closure

Final Report Summary:

The overall goal of this project was to develop and implement an innovative, targeted, market-based pilot conservation program in Black Kettle Creek Watershed in Harvey and McPherson Counties (Kansas) that targeted the most vulnerable sites in a watershed leading to improved water quality, reduced soil erosion, while maintaining agricultural productivity. Fields were ranked from most to least vulnerable for potential soil erosion and sediment delivery. A menu of market-based incentives was developed and finalized. Twenty-two landowners developed plans for BMP implementation and signed contracts for 141 fields (5,078 acres/25.4% of total acres in watershed). ***Implementation of this program resulted in a 60% reduction in annual sediment delivery to streams in the watershed, from 13,000 tons/year to 5,138 tons/year (60% reduction).***

The specific objectives of this project were to: (1) assess all crop fields within the three watersheds for potential soil erosion and sediment delivery and rank fields within the watersheds from most to least vulnerable for soil erosion and sediment delivery; (2) design a menu of market-based incentives for BMPs that would result in BMPs being implemented on the top 10% most vulnerable fields for sediment transfer to surface water; (3) employ innovative strategies for BMP implementation, including targeting priority locations and strategies to encourage producer participation, such as in-field sign-up and market-based incentives based on a menu of BMPs weighted by degree of impact on sediment abatement; and (4) utilize the current surface water monitoring program, which utilizes a calibrated paired watershed approach to monitor outcomes, report project results, and design methods to translate successful strategies to other watersheds throughout the country.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities and accomplishments, lessons learned, photos, and project presentations.



A field showing erosion prior to implementation of practices.



Following a heavy rainfall, a terrace and waterway system implemented with no tillage to reduce erosion and sediment losses.

Cranberry Production Strategies Evaluation (MA)*Cape Cod Cranberry Growers Association*

Project #: 2008-0116-019

NRCS CIG Funds: \$33,416

Grantee Matching Funds: \$85,673

Total Project Funds: \$119,089

Project Description: Evaluate subsurface drainage and irrigation systems and related technology to decrease water usage. Project will develop a best management practice for use in cranberry bogs.

Project Location: Massachusetts

Project Status: Closed

Final Report Summary:

The overall object of this project was to better understand how to install and manage subsurface drainage systems in Massachusetts cranberry production, with the hopes of establishing a Best Management Practice (BMP). This project demonstrated that there is still a fair amount of variability involved with installing the drainage systems and more research and experience is required before a definitive BMP can be created. Most likely, any future BMP will need to be tailored to the specific soil conditions of the project site, including hydrological considerations. The biggest factor in determining the best installation method was whether the bog has mineral or peat-based soils. Another predominant factor was the depth of sand for new plantings. Lastly, the general hydrologic conditions in the bog were an important consideration. Factors such as amount of groundwater, uniform beds, and irrigation setup all played a role in determining the install protocol for drainage. Even though the industry may not be ready for the creation of a BMP guide, until more drainage can be evaluated under the various conditions, some basic principles have been established.

There were several major accomplishments that were discovered through the intensive research conducted during the grant project. The first was the discovery of the proper spacing of drainage for most types of cranberry bogs. The spacing takes into effect yield, berry sugar and anthocyanin (the pigment that gives cranberries their red color) content and the economics of installing the drain pipe. Second, valuable installation techniques were established through the study sites and the participants in the grant project. Finally, participating growers were able to keep the moisture levels uniform in their cranberry bogs, helping to establish vine cover quicker than conventional new plantings. The uniform moisture levels also helped the edges near ditches from drying out, a common occurrence in traditional bog systems.

The most valuable take-away message is that subsurface drainage can positively influence cranberry production. Establishing uniform vine growth on a newly-planted bog can be attained much faster and efficiently through the use of a drainage pipe. Subsurface drainage systems reduce surface water faster, eliminated puddles and wet spots, which can decrease vine growth and yield and increase pest pressure.

The data collected through this project suggested that a spacing of 30 feet is the most ideal in terms of the number of fruiting uprights and yield in barrels. Further analysis based on the contrast shows that there is no added advantage in reducing tile spacing from 30 feet to either 30 or 15 feet. However, additional evaluations may be necessary during the spring growing season to ascertain if spring frost protection using sprinkler irrigation will influence drainage patterns at different tile spacing.

A section of the Cape Cod Cranberry Growers' Association website has been dedicated to this grant project. Information containing research reports, grower input and photographs can be found at http://www.cranberries.org/growers/program_subsurface_overview.html.



Renovated cranberry bog with uniform vine growth, subsurface drainage installed.



1-year old renovated bog in spring (vines dormant) with subsurface drainage system in use.



Drainage pipe draining water from a newly planted cranberry bog; PVC shield helps to prevent sediment buildup and provides rigidity to the end of the pipe.



Drainage pipe without PVC shield can be prone to sediment buildup, especially on new plantings.

Water Quality Trading (MD)

Tarleton State University

Project #: 2008-0116-020

NRCS CIG Funds: \$57,801

Grantee Matching Funds: \$57,810

Total Project Funds: \$115,611

Project Description: Create an augmented Nitrogen Trading Tool that can predict phosphorus and sediment losses and crop yields. Project will demonstrate the tool's applicability to the USDA/EPA Water Quality Trading project in Cecil County, Maryland and produce a user manual.

Project Location: Maryland

Project Status: Closed

Final Report Summary:

In this CIG-funded project, USDA's Nitrogen Trading Tool was augmented by the Texas Institute for Applied Environmental Research (TIAER) at Tarleton State University in order to estimate phosphorus and sediment losses and crop yield changes in addition to nitrogen losses. To accomplish the augmentations required, the core simulation model in the tool was changed from Nitrate Leaching and Economic Analysis Package (NLEAP) to Agricultural Policy Environmental eXtender (APEX). The tool is now called the Nutrient Trading Tool (NTT) since it provides other nutrient indicators in addition to nitrogen. TIAER researchers also augmented the trading tool with additional programming that enables linkage with RUSLE2 management files and other national databases. As part of this project, USDA staff and other collaborators in Maryland tested the augmented tool (NTT) using farm data and other information from Carroll County, Maryland. Please refer to the project's Final Programmatic Report for detailed information on project activities.

The results produced from the NTT tool will require some level of calibration in order to reasonably reflect the nutrient and sediment losses that would be measured in a given application. This calibration requirement is not a drawback of NTT, as it is required in any application that predicts nutrient and sediment losses from field-scale practices. After calibration parameters have been established through scientific research efforts, further calibration requirements would be minimized or eliminated altogether.

A fact sheet for the Nutrient Tracking Tool, developed through this project, is available with provided grantee documents or online at <http://tiaer.tarleton.edu/nttfactsheet.pdf>.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, results, and lessons learned.



The NUTRIENT TRACKING TOOL (NTT)

Overview

The Nutrient Tracking Tool (NTT)¹ (<http://nn.tarleton.edu/nttwebars/>) is an enhanced version of Nitrogen Trading Tool, a user-friendly web-based computer program originally developed by the United States Department of Agriculture (USDA). NTT was developed by TIAER staff in collaboration with USDA-NRCS. The tool estimates nutrient (nitrogen and phosphorus) and sediment losses from fields managed under a variety of cropping patterns and management practices through its user-friendly linkage to the Agricultural Policy Environmental eXtender (APEX) (Williams et al, 2008). NTT provides farmers, government officials, and other users with a fast and efficient method of estimating nitrogen and phosphorus credits for water quality trading, as well as other water quality, water quantity, and farm production impacts associated with conservation practices. The information obtained from the tool can help farmers to determine the most cost-effective conservation practice alternatives for their individual operations and provide them with more advantageous options in a water quality credit trading program. NTT can also be used in evaluating conservation practice effectiveness outside of a water quality trading environment.

How does NTT work?

NTT uses a widely recognized farm-scale environmental model, APEX, to determine nutrient

and sediment losses and runoff from agricultural fields. APEX is an environmental model that uses mathematical processes to simulate the transport of water, sediment and nutrients through land. NTT is a web-based program which requires no software installation. The required data for this program for major portions of US are provided through GIS data layers and pre-existing databases.

Who can use NTT?

APEX is a very sophisticated model. However, NTT uses a very user-friendly web-based interface program to make the benefits of APEX directly accessible to farmers, crop consultants, government officials and the general public. Anyone with internet access can use NTT, but the tool was designed with specific attention to the needs of the typical farmer.

Scope of NTT

NTT is used to estimate the impacts of alternative conservation practices on nutrient and sediment losses and flow from agricultural fields, as well as crop yields on those fields. NTT output on the impacts of alternative conservation practices can be used in integration with other watershed models to calculate the nutrient credits that would be associated with these practices in a water quality trading program.

Farm-scale simulation:

NTT is a farm-scale simulator. The tool is designed to provide reliable estimates of nutrient and

sediment losses and flow when measured at the edge of the farm. To estimate watershed loadings, NTT output can be linked to a watershed model.

Conservation Practices:

NTT can simulate a wide variety of conservation practices. The following are among the many practices that are commonly simulated using the web-based program.

Nutrient management: alternative fertilizer and manure applications.

Contour buffer strips: Buffer strips positioned along field contour.

Filter strips: Managed strip of vegetation to reduce sediment and nutrient runoff.

Riparian forest buffer: Multi-plant buffer zones around water bodies.

Alternative tillage systems: a variety of tillage systems (e.g., no-till, conventional tillage, minimum till).

Tile drainage: Subsurface drainage management

Strip cropping: Alternating strips of different crops.

Cover cropping: Vegetative cover crops (e.g., Rye) planted after harvesting the main crop.

Data Sources

The major data provided in NTT are as follows. Weather data are from the USDA-NRCS High Resolution Climate Extractor (HCE), soil and geometry data are from the USDA-NRCS Web Soil Survey, and predefined management data were obtained by modifying RUSLE2 management data files.

Where NTT has been applied to date

NTT has been verified and used in three states and is currently being verified in over half dozen additional states (see map below). In all other

states the required data have been assembled for general application of the tool.



Contacts:

Additional information on NTT can be obtained by contacting any of the following:

- Dr. Ali Saleh, Texas Institute for Applied Environmental Research (TIAER), Tarleton State University.
254-968-9799
saleh@tiaer.tarleton.edu
- Shaun P. McKinney, Natural Resources Conservation Service
Shaun McKinney, USDA-ARS
503 273 2413
shaun.mckinney@por.usda.gov

Funded by: Conservation Innovation Grant (USDA-NRCS)

Reference:

Saleh, A., O. Gallego, E. Osei, H. Lal, C. Gross, S. McKinney, and H. Cover. "Nutrient Tracking Tool – a user-friendly tool for calculating nutrient reductions for water quality trading". *Journal of Soil and Water Conservation* 2011 66(6):400-410; doi:10.2489/jswc.66.6.400

Williams, J.R., R.C. Izaurralde, and E.M. Steglich. 2008. "Agricultural Policy/Environmental eXtender Model" BRC Report No. 8.

¹ Formerly referred to as the Nutrient Trading Tool (NTT).

Wild Link (MI)
Conservation Resource Alliance
Project #: 2008-0116-021

NRCS CIG Funds:	\$500,000
Grantee Matching Funds:	\$505,000
Total Project Funds:	\$1,005,000

Project Description: Demonstrate an improved system of conservation practices to benefit tribes and natural resources in the Upper Great Lakes. Project will connect 100,000 acres of habitat, improve 50 miles of stream, and improve 2,500 acres of critical corridor lands.

Project Location: Michigan

Project Status: In Closure

Final Report Summary:

The overall goal of this project was to demonstrate a unique, efficient delivery system for conservation of natural resources of importance to northern Michigan tribes and communities, including water, fisheries, wildlife, and forests. The approach uses comprehensive resource plans to drive voluntary projects undertaken by landowners in the most critical corridor areas of northern Michigan. This delivery system, titled “Wild Link” was proven to concentrate benefits in the most ecologically valuable areas for maximum impact. Practices and habitats of importance to tribes were integrated into the program. Landowners and local communities were very responsive, being unconcerned with which federal or state program might provide assistance with various projects, because the technical staff of CRA and its regional partners were able to provide planning, coordinating, and fund-directing assistance.

The following is a summary of accomplishments:

Properties/Landowners Assisted	173
Rural Communities/Counties Involved	17
Critical Corridor Lands (acres)	17,808
On-the-Ground Projects Completed	123
Stream Habitat Improved (miles)	347
Reduction in Sediment Loading to Streams (tons per year)	1,360
Permanently Protected Conservation Lands (acres)	5,540

This project produced a brochure, available with the provided grantee documents, that details all of the project information and results. Excerpts of this brochure are provided in this report.

Please refer to the project’s Final Programmatic Report, available with the provided grantee documents, for detailed project activities, results, and lessons learned.

Northern Michigan **Wild Link:
a new approach for conservation**

**Conservation Innovation
Grant Project**



Results

Project activities took place in a 4 million acre region of Michigan that boasts 6 national Wild & Scenic rivers and some of the best wildlife habitat in North America.

- **Wildlife habitat improvement** • **Stream restoration**
- **Permanent land protection** • **New survey protocols**
- **Field guide for plants important to tribes**



The project was carried out in two phases over 7 years, and proved to be a highly effective demonstration of delivering real conservation results.

Properties / Landowners Assisted	173
Rural Communities / Counties Involved	17
Critical Corridor Lands	17,800 acres
On-the-Ground Projects Completed	123
Stream Habitat Improved	347 miles
Reduction in Sediment Loading to Streams	1,360 tons per year
Permanently Protected Conservation Lands	5,540 acres
Conservation Innovation Grant Funding	\$1,000,000
Non-Federal Funds Leveraged	\$1,800,000
Other Federal Funds Leveraged	\$2,540,000

Healthy rivers and habitat corridors

are necessary to preserve the ecological and economic value of premier trout and salmon streams in northwest Michigan.

Of Special Concern

- Lake sturgeon
- Michigan monkey flower
- Grey wolf
- Wood turtle
- Brook trout
- Eastern massasauga
- Red-shouldered hawk
- American woodcock
- Hungerford's crawling water beetle



Wildlife Habitat Projects

- Food plots • Nest boxes
- Quality timber management
- Shrub and tree plantings
- Wetland restoration
- Stream habitat improvements
- Siting of roads, driveways, buildings
- Conservation easements



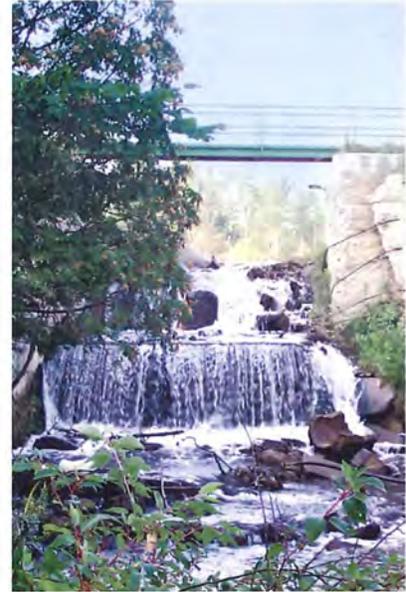
Streambank Stabilization

Eroding streambanks make the river channel wider and diminish overhead tree cover that shades the stream. Erosion sites contribute sediment to streams, covering gravel beds that are critical to fish spawning and aquatic insect habitat. CRA uses a combination of fieldstone, plantings, whole-tree revetments, and log terracing to stabilize and revegetate eroding banks.



Dam Removals & Barriers

CRA helps facilitate dam removals when needed to provide fish passage, reduce water temperature problems, and prevent structural failures that will release sediment downstream.



Road Stream Crossings

Outdated road stream crossings contribute sediment, oil and grease to a stream due to erosion, structural deterioration, and poor design. CRA works with road commissions to replace culverts and bridges, and install runoff control mechanisms at problem crossings.



Woody Debris

Trees that have fallen into a river provide fish cover, resting spots for wildlife, and attachment spots for aquatic insects. CRA works to place whole trees in rivers to simulate naturally occurring logjams.



Incentives for Hayland and Pasture Management (MI) <i>Michigan Department of Natural Resources</i> Project #: 2008-0116-022	NRCS CIG Funds:	\$358,661
	Grantee Matching Funds:	\$402,500
	Total Project Funds:	\$761,161

Project Description: Increase and enhance promising conservation practices on haylands and pasturelands that will benefit grassland birds, including the Henslow's Sparrow and Grasshopper Sparrow. Project will form Grassland Bird Partnership with three focus areas in Michigan.

Project Location: Michigan

Project Status: In Closure

Final Report Summary:

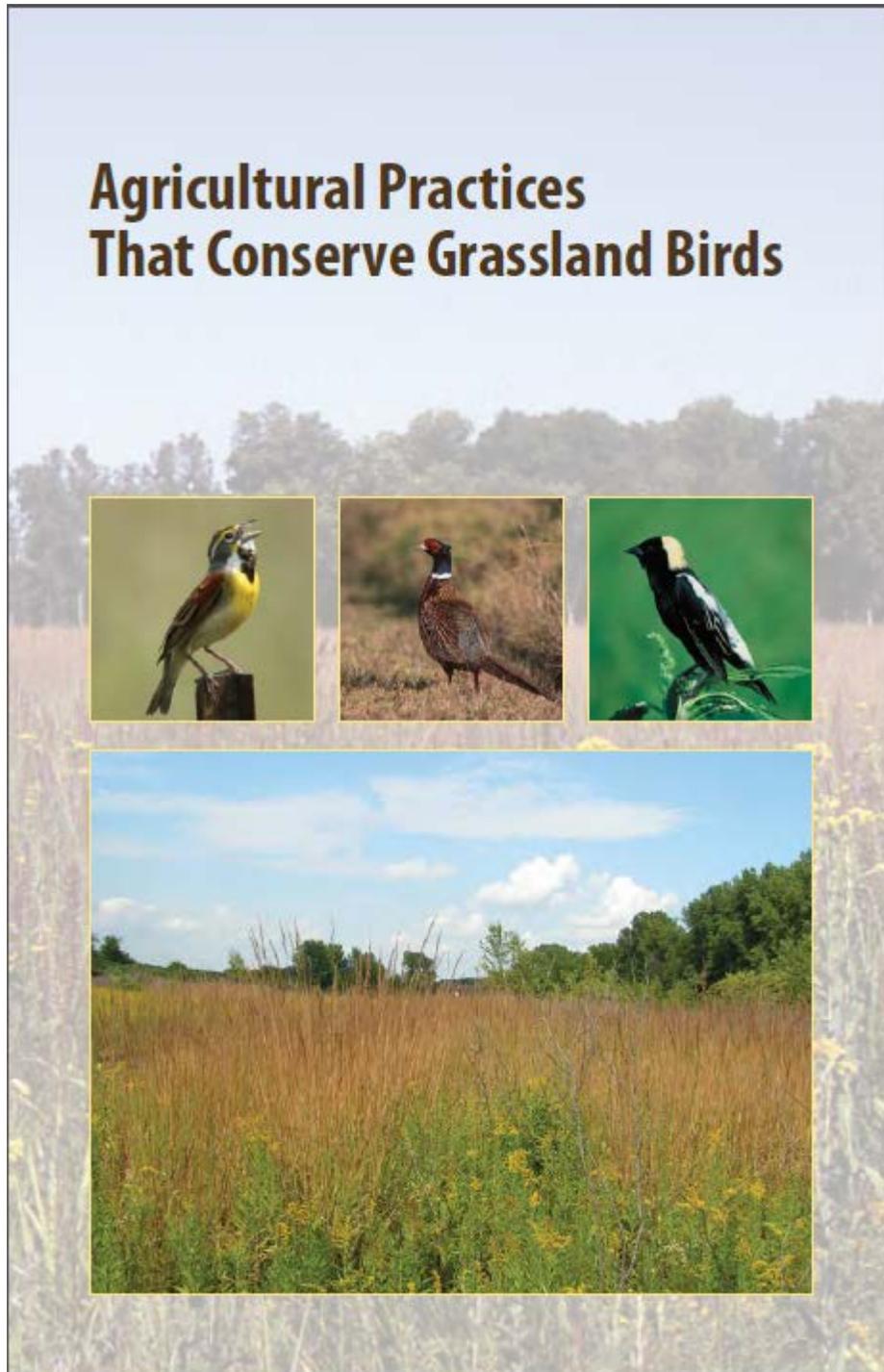
The purpose of this project is to increase and enhance promising conservation practices on haylands and pasturelands that will benefit grassland birds. This will be accomplished through a Grassland Bird Partnership. This partnership will provide an opportunity for agencies and organizations to work together to improve habitat for birds in agricultural grasslands. Partners include Pheasants Forever, Michigan Audubon Society, Michigan Natural Features Inventory, Michigan State University Extension, Conservation Districts, Natural Resources Conservation Service, U.S. Fish and Wildlife Service, Michigan Department of Agriculture, and Michigan Department of Natural Resources.

The goal of this project is to identify management practices that maintain or enhance habitat for grassland birds, while sustaining agricultural productivity. We identified several conservation practices that would benefit grassland birds: prescribed mowing, planting warm season grasses, flushing bars, establishing short-term refuges, invasive species control and prescribed burning. These conservation practices were implemented on 54 farms, improving 2,018 acres of habitat for grassland birds. These practices were monitored for positive impacts to habitat and bird activity. A technical guidance document, a producer opinion survey and several presentations were made at various meetings, workshops and conferences to promote the project and disseminate the results.

This project had 7 primary objectives:

1. Form Grassland Bird Partnership and host 12 quarterly Steering Committee meetings with project collaborators of partner organizations.
2. Create three or more grassland bird focus areas based on sound science using partner input and analysis of data such as abundance and diversity of grassland species, proximity to larger complexes of suitable habitat and higher concentrations of agricultural grasslands.
3. Review information on current practices and incentives for hayfield/pasture management.
4. Establish a suite of existing and new practices or incentive payments that will be piloted and supported through the Grassland Bird Partnership.
5. Demonstrate at least three of these practices for hayland and pastureland in three regions of Michigan.
6. Monitor results of practices and incentives through field surveys of demonstration sites and a producer opinion survey.
7. Distribute results of project through three workshops, printed technical materials, and four presentations to agency and producer groups.

We incorporated information distilled from research and publications as well as experiences of Michigan farmers into a 24 page technical guide entitled: “Agricultural Practices That Conserve Grassland Birds”.
<http://mnfi.anr.msu.edu/education/ag-bird-booklet.pdf>



Please refer to the project’s Final Programmatic Report and Technical Guide, available with the provided grantee documents, for detailed project activities and results.

Ecosystem Services in the Upper Mississippi (MN)*Minnesota River Basin Joint Powers Board*

Project #: 2008-0116-023

NRCS CIG Funds: \$914,797

Grantee Matching Funds: \$999,994

Total Project Funds: \$1,914,791

Project Description: Establish and operate incentive programs for various ecosystem services in three watershed areas of the Upper Mississippi River Basin. Project will create local infrastructure and support systems to facilitate participation in Water Quality Credit Trading.

Project Location: Minnesota

Project Status: In Closure

Final Report Summary:

Conservation Marketplace Midwest (CMM), initially known as Conservation Marketplace of Minnesota, was successful in raising the awareness of ecosystem markets and demonstrating the program's flexibility to many different stakeholders, including state agency officials, local units of government, private sector professionals, industries, crop producers, and environmental organizations. This project also demonstrated protocol development that established flexible and transferable processes (e.g., water quality trading calculator, pollinator protocols, and wellhead protection protocols) that led to the implementation of some voluntary practices. A robust administrative framework was established that eventually led to the launch of CMM, a 501(c)(3) non-profit organization that continues to promote and facilitate ecosystem service markets.

Below is a summation of the deliverables indicated in the original grant agreement. The results, however, can be found in the extended report (available with the grantee documents provided). Chapters 1-5 provide descriptions and quantifications of the CMM team's primary activities; however, when compared to the grant deliverables listed below, a number of discrepancies are present; however, the team developed a strong adaptive management capacity, and shifts in work activities are explained in detail. As activities are described in Chapters 1-4, progress towards achieving project deliverables (listed below) and the reasons that a number of shifts in focus had to be made, is summarized. Within these chapters, discrepancies are explained and a wide range of unexpected outcomes did occur.

Project Deliverables:

- Enlist at least 60 farmers to implement credit generating best management practices (BMPs) including, but not limited to, reduced fertilizer application and/or reduced tillage that are linked to American Farmland Trust's (AFT) BMP Challenge.
- Assist 15 new producers to participate in the Chicago Climate Exchange (CCX) or a local Minnesota greenhouse gas program.
- Secure 15 producer contracts for biomass production on up to 10,000 acres.
- Develop CMM structure, roles and responsibilities responsive to watershed needs.
- Devise credit estimation processes approvable by the State and consistent with other operating market programs in a clear and simple framework.
- Facilitate aggregation of multiple credit generation sites into grouped blocks for sale to credit buyers and approval regulators.
- Develop educational and explanatory materials for credit generators, credit certifiers, credit buyers, regulators and citizens.
- Devise templates for legally binding agreements, permit tracking and watershed based program reporting.
- Develop and test marketing tools for the services provided to potential buyers/sellers.

- Create framework to address complaints, comments, citizen concerns and noncompliance.
- Develop, test and implement tracking registry and methods for public, buyer, seller and regulatory access to program data and information displayed via the Internet.
- Establish adaptive management methods for marketing programs and watershed plans.
- Produce electronically available program manuals for broad dissemination.
- Management, oversight, project advisory meetings, and reporting.

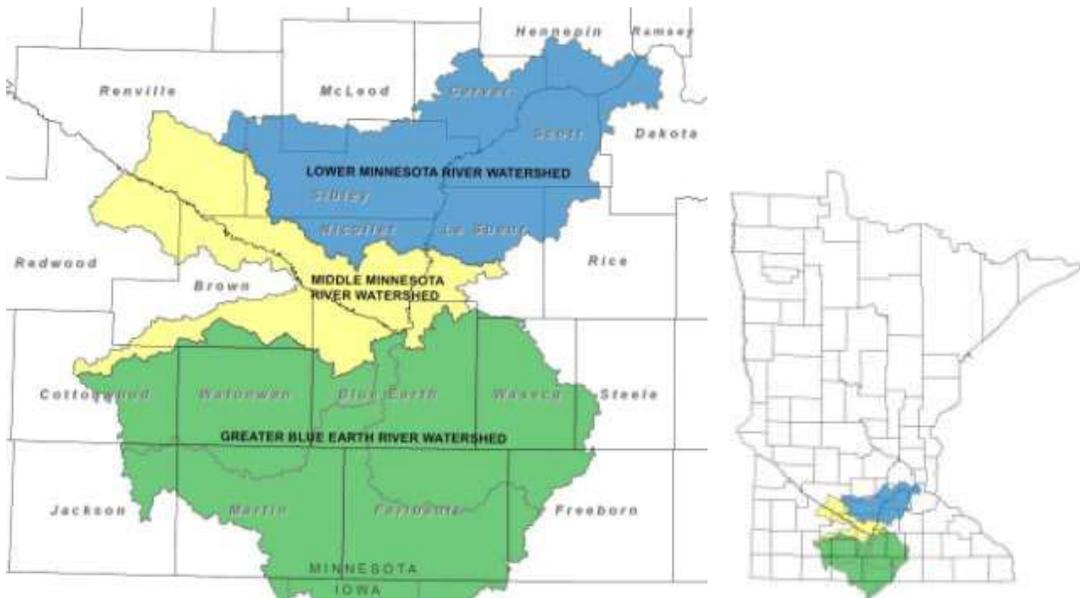
About the Extended Report (available with the grantee documents provided)

This report provides a list of ecosystem market success stories and related products developed under the Natural Resource Conservation Service (NRCS) Conservation Innovation Grant (CIG) process. In the following chapters, we provide details and experiences that limited the project team participation in some of the original markets selected. These challenges provided important lessons that were assessed and used to improve our approach to market mechanisms. In the end, it was the lessons taught by the school of hard knocks that most benefited the team and project.

The document is organized into seven chapters in an effort to share our results in a meaningful way. The sequence of chapters begins with our project activities and results, presented in a chronological format (*Chapters 1 through 5*) that supports the “Project Activities and Results” section, with *Chapter 5* focusing on the project shifts the team needed to make and the resulting unexpected outcomes. *Chapter 6* is our summary of lessons learned and includes information on dissemination. *Chapter 7* presents our overall conclusions and a few next steps.

Please visit the project’s website for additional information: <http://www.conservationmarketsofmn.org/>. The website also includes a Draft Business Plan available on the website [here](#).

Please refer to the project’s Final Programmatic Report and Extended Report, available with the provided grantee documents, for detailed project activities and results.



Map of CMM’s pilot watersheds in the Minnesota River Basin.

Nitrogen Loss Reduction in Crops (MO)

University of Missouri

Project #: 2008-0116-024

NRCS CIG Funds: \$410,317

Grantee Matching Funds: \$410,978

Total Project Funds: \$821,295

Project Description: Assist corn and cotton producers in trying sensing technology for variable-rate nitrogen management on their farms. Project will closely match nitrogen fertilizer rate to crop need, reducing nitrogen application and loss to water.

Project Location: Missouri

Project Status: In-Closure

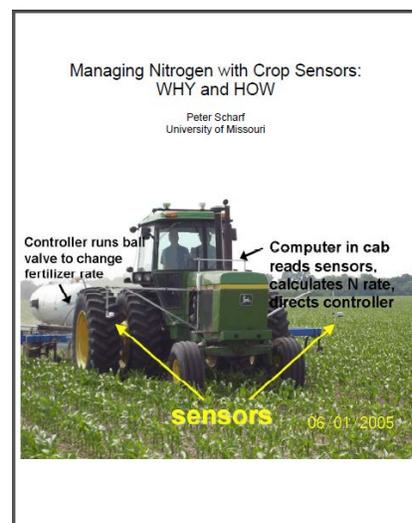
Final Report Summary:

The primary objective of this project was to help corn and cotton producers to reduce nitrogen loss from their fields to water and air. The use of sensor-based diagnosis and control of variable-rate nitrogen fertilizer applications was demonstrated in 80 corn and cotton fields. Outcomes were compared for standard nitrogen fertilizer management compared to the conservation (sensor) practice. In corn, use of sensors increased partial profit by \$17/acre, and in cotton by \$22/acre. In both crops the increase was due to a combination of increased yield and reduced nitrogen fertilizer use. Less fertilizer applied and more in the crop means less nitrogen available to be lost from fields to water and air. Several producers and retailers have invested in and adopted this technology as a result of our demonstrations, and others are actively considering adoption.

Six field days were conducted to educate farmers about the capabilities and performance of the crop sensors for managing nitrogen. A total of 500 people attended these educational sessions. 26 additional educational presentations were made to a variety of groups with a total attendance of 1,610. Audiences included a mix of crop advisors, farmers, farm service providers, agency personnel, and scientists. We had numerous discussions with both major crop sensor manufacturers regarding farmer needs and technical performance issues. Both manufacturers have adopted features or approaches that we pioneered.

Our practical experience in conducting these field demonstrations taught us many lessons that could be of value to others attempting to use crop sensors to manage nitrogen fertilizer. These lessons are summarized in the publication “Managing Nitrogen with Crop Sensors: WHY and HOW”. This publication is available online at <http://plantsci.missouri.edu/nutrientmanagement/nitrogen/sensor%20manual.pdf>.

Please refer to the project’s Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.



[Managing Nitrogen with Crop Sensors: WHY and HOW](#) (PDF)

Alternative Forages for Livestock Producers (MS)
*North Central Mississippi Resource Conservation &
Development Council, Inc.*
Project #: 2008-0116-025

NRCS CIG Funds:	\$54,000
Grantee Matching Funds:	\$54,000
Total Project Funds:	\$108,000

Project Description: Introduce native warm season grasses to livestock producers in north Mississippi as alternative forages to be used for haying and grazing. Project will reduce input costs, improve water quality, livestock forage, and wildlife habitat.

Project Location: North Mississippi

Project Status: In-Closure

Final Report Summary:

The primary goal of this project was to introduce native warm-season grasses (NWSG) to livestock producers in North Mississippi as an alternative forage offering decreased inputs, greater drought tolerance, and greater wildlife habitat benefits than traditional non-native forages. The project partners identified two limiting factors: (1) lack of infrastructure (i.e. equipment, vendor information, technical knowledge) to deliver NWSG; and (2) lack of landowner interest in NWSG as forages. To address these factors we developed the following goals: (1) purchase two specialized drills for planting NWSG and make them available to landowners; (2) conduct a grass-roots educational campaign consisting of presentations to landowner groups (i.e. Soil and Water Conservation Districts, Cattleman's Associations, etc.); and (3) establish NWSG forages on 250 acres on private farms within the designated focal area.

As a result of this project and associated partnerships, the ability of natural resource professionals to deliver native warm-season grass conservation practices were greatly increased in Northern Mississippi. Two-hundred and forty-six acres of native warm-season grasses were planted on thirteen different landowners properties in seven counties. Additionally, landowner field days were conducted and public presentations were given at twelve public meetings reaching more than 300 landowners. The partners in this project are currently working with Mississippi Natural Resource Conservation Service to develop a Job Sheet with improved practice standards and incentives for increasing the use of NWSG forages through EQIP. The partners are also cooperating with Mississippi State University Extension on a similar project to develop landowner information packets about NWSG forages. Furthermore, technical information and infrastructure achieved through this project was essential in the successful delivery of Mississippi's bobwhite SAFE CRP practice which has already impacted more than 4,000 acres and may improve as many as 9,500 acres for bobwhites and other grassland birds.

This project has contributed to our ability to make recommendations for a model for NWSG forage conservation practices. Our recommendations for future NWSG forage programs in Mississippi include the following:

- Increase landowner incentive payments and spread the payment over two growing-seasons (e.g. \$100 in year one and \$50 in year two).
- Work with Cooperative Extension and USDA agronomists to develop a more effective method for establishing switchgrass for forage.
- Market NWSG forages to beginning producers and other producers, such as dairy and custom grazing operations that rely on a variety of forage production techniques.
- Continue to work with local Soil and Water Conservation Districts and others to purchase and make available innovative equipment such as specialized NWSG planting equipment and

sprayers. Based on the results of this project, conditioner mowers or other equipment with easily adjustable cutting height is also a great need for landowners who wish to produce NWSG hay.

- Target focal areas for maximum wildlife and water quality benefits.

Information gained from this project will be compiled into a project sheet for Mississippi NRCS. Additionally, this information (lessons learned and landowner testimonials) will be used as marketing material for other NWSG forage efforts throughout the state.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project accomplishments and activities.



Innovative Cover Crop Management System (NC)*North Carolina State University*

Project #: 2008-0116-026

NRCS CIG Funds: \$249,288

Grantee Matching Funds: \$253,327

Total Project Funds: \$502,615

Project Description: Demonstrate and evaluate the weed control and resource conservation benefits of the roll-kill/no-till production system in organic grain production. Project will publish a technical guide for distribution to farmers and agricultural professionals.

Project Location: North Carolina

Project Status: Closed

Final Report Summary:

This project tested 20 varieties of rye and legume cover crops to determine adaptation of the no-till/roll-kill system in North Carolina, how well they complemented organic corn and soybean planting in North Carolina, and their ability to produce biomass, suppress weeds, and provide additional nitrogen in the system (legumes). We held 5 workshops focused on this cover cropping and planting system and how it can be implemented in North Carolina. We reached approximately 340 farmers, crop advisors, and conservationists through the workshops and newsletter articles. At least 8 farmers in North Carolina have adopted the no-till/roll-kill systems due to this project.

An article about this project was written up in our e-newsletter in December 2009 (*Fertility and Weed Control in No-till Organic Production*; <http://www.organicgrains.ncsu.edu/Newsletters/Dec2009.htm>), and in the December 2010 issue (*Rolled Rye Mulches for Weed Control in Organic No-Till Soybeans*; <http://www.organicgrains.ncsu.edu/Newsletters/December2010.htm>). Also, two Extension bulletins based on these two years of field trials will be published in spring 2011 by NC State University, and will be distributed to NC Extension personnel, NRCS personnel, farmers, and crop advisors. These Extension bulletins will also be published on our website (www.organicgrains.ncsu.edu) in a new organic no-till section.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.

Innovative Resource Conservation Practices (NC)	NRCS CIG Funds:	\$30,806
<i>Center for Agricultural Partnerships</i>	Grantee Matching Funds:	\$30,806
Project #: 2008-0116-027	Total Project Funds:	\$61,612

Project Description: Develop and implement a conservation training program for North Carolina strawberry growers. Project will create a resource assessment tool to facilitate resource conservation and perform a programmatic case study.

Project Location: North Carolina

Project Status: Closed

Final Report Summary:

The project has organized a joint training program for strawberry growers, extension agents, and NRCS staff, and conducted the first of two field level training sessions at three strawberry farms located in key areas of North Carolina. Field meetings are also schedule for late July which will be coordinated by North Carolina State University (NCSU) staff even though the project is formally ended. Step by Step guides have been developed for each of these practices to provide a user-friendly tool for growers in implementing these practices. The guides are currently being reviewed by NCSU specialists and will be made available to growers this summer at the field meetings.

In coordination with NRCS state and county Staff, NC Department of Agriculture staff, and NCSU staff, the Center for Agricultural Partnerships (CAP) has developed a conservation workbook for growers, agents and conservationists to use in understanding conservation needs and assessing conservation opportunities for strawberry growers. In addition to the workbook, a list of practices has been compiled to provide growers and NRCS staff with options to consider in meeting the entire range of resource concerns on strawberry farms. Both of these tools will be made available to strawberry growers at the field sessions through the NC Strawberry Association even after the project's completion.

The project assisted the growers, on who farms the field sessions are being conducted, to apply for support from EQIP to implement conservation practices. Even if their applications were not successful, they were provided support for the implementation of strawberry specific conservation practices that will be implemented this fall. That implementation will take place despite the formal project end. The demonstration of those practices will take place at the summer field session and the results will be made available at a panel discussion presented during the Annual Strawberry Expo in the fall of 2011.

Please visit the grantee organization's website for more information: <http://www.agcenter.org/>.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities and results.

Strawberry/Conservation Field Days

The photo to right was taken on March 27 at Dail Farms in Edgecombe County, NC, during the second of three Strawberry/Conservation Field Days recently held. About 35 people attended, including both growers and a large number of personnel from the district offices of the Natural Resources Conservation Service (NRCS). NRCS is now offering several EQIP practices that can provide financial incentives for strawberry growers to use row covers, methyl bromide replacements, and VIF plastic. For many NRCS staff, this was an opportunity to learn the basics of the strawberry cropping system – they mostly work with row crops and livestock producers.

Strawberry Extension Specialists Barclay Poling and Hannah Burrack came to the Field Day to share their observations and recommendations, and Hannah passed around leaves and hand lenses so participants could see aphids and mites. Dail Farm is one of the sites comparing alternative fumigants as part of NCSU's Methyl Bromide Alternatives Project – Rob Welker described the trials there (methyl bromide, Telone C-35, and Midas). There was no visible difference at this time between the treatments, but Rob was taking plant samples today, and Scott will collect data on yields at harvest. In a short row with no fumigation at all, plants were visibly smaller and weedier.

The first field day was held March 25 at Buckwheat Farm in Apex, NC, the farm of Karma and Jim Lee. Here, discussion centered on the conservation challenges faced by many strawberry farms. For example, it is difficult for many producers, like Karma, to practice crop rotations, because the farm doesn't have enough land, or market considerations require that land easily visible and accessible from the road be used. Plastic-covered beds increase erosion, but it can be hard to lay any kind of contour beds or change their orientation.

This farm is one of three farms par-



Scott Dail, in the white shirt, explains his use of row covers and irrigation at the Conservation/Strawberry Field Day on his farm. The field day brought together growers and conservationists to learn about each others' programs and practices.

ticipating in a project researching the use of summer cover crops in strawberries. Researchers Michelle Schroeder-Moreno and Gina Fernandez and graduate student Ben Garland were on hand to discuss the project; expect to learn more in a future newsletter. Plant pathologist Mahfuzur Rahman looked closely at Karma's fields for signs of disease (and found none). Only one farm seems to have a serious problem with anthracnose crown rot this year, he said.

The final Field Day is on April 1, as this newsletter goes to press, at Joan and Kenneth Rudd's farm in Greensboro, NC. All three of these farms are applying for the new NRCS strawberry EQIP programs and have agreed to serve as hosts for field events such as these. A second round of field days will be held this summer and will focus on especially on fumigation issues.

The EQIP strawberry conservation programs are not direct grant programs;

Strawberry Field Days will be held on April 9 (in Sanford) and May 5 (in Salisbury). See page 11 for more info!

growers must apply to NRCS and develop a conservation plan. Applications are then ranked based on various factors, competing for a limited pool of available funds. The process takes a while, but can be started at any time. There are many other non-strawberry-specific conservation programs that growers may be interested in and qualify for on their farms. Conservationists also offer conservation planning advice and technical assistance. Growers interested in participating in the NRCS programs should start by contacting their local NRCS office. (Note that while these strawberry programs are NC only, NRCS is a federal office, and in all states.) Visit www.nrcs.usda.gov/ and click on "Find a Service Center Near You".

This project to increase the participation of specialty crop producers in conservation programs is a project of the Center for Agricultural Partnerships (www.agcenter.org). The project is also developing fact sheets for growers and NRCS personnel, a conservation planning workbook, and resources to help growers choose and change to MB alternatives. ❖

Strategies for Biogas and Nutrient Management (NC)
North Carolina State University
Project #: 2008-0116-028

NRCS CIG Funds:	\$374,659
Grantee Matching Funds:	\$460,404
Total Project Funds:	\$835,063

Project Description: Demonstrate effective, economically-feasible uses for biogas and nutrients derived from swine waste. Project will test a variety of energy production and nutrient capture technologies and educate agricultural stakeholders about their implementation.

Project Location: North Carolina

Project Status: In Closure

Final Report Summary:

Biogas generation and capture using covered lagoons is a promising renewable energy technology that can be utilized by North Carolina swine farmers to increase on-farm income and mitigate rising energy costs. Covering lagoons would also reduce ammonia and greenhouse gas emissions, particularly methane, and have potential to obtain Carbon Credits or other environmentally driven payment programs. Currently, swine producers in the state have reservations about covering lagoons for biogas production as the economic recovery associated with energy generation equipment is unknown for NC and concerns about nutrient management have lead state officials to exclude covered lagoon projects from state conservation agricultural cost-share programs. An overlooked aspect of anaerobic digestion is the use of the nutrients in the production of crops that can be converted into value-added agricultural products. Algae and duckweed are examples of energy crops that could be grown in a media similar to digested swine wastes and then used in the production of biofuels.

This project demonstrated several technologies at a single farm to illustrate a fully integrated system for utilizing biogas and improving on-farm nutrient management. The project was also the basis for several extension and outreach activities to educate swine producers in North Carolina about opportunities associated with covered anaerobic digesters and nutrient management practices. The development of marketable products (duckweed and struvite) that serve as a nutrient management activity were novel demonstrations that had not been fully disseminated to the producers. The project ultimately showed that several technologies are available and can be implemented in varying scales to deliver proven results for numerous swine producers interested in biogas utilization or improved nutrient management with value-added product generation.

Please refer to the project's Final Programmatic Report, available with the provided grantee documents, for detailed project activities, data, results, and report appendices.



Installed Nitrification Biofilters



Duckweed Collection

Reducing Soil Erosion Through Pest Control (NE)*Propane Education & Research Council*

Project #: 2008-0116-029

NRCS CIG Funds: \$46,128

Grantee Matching Funds: \$46,729

Total Project Funds: \$92,857

Project Description: Demonstrate that weed flaming for agronomic crops can reduce or eliminate the need for tillage operations, thereby conserving moisture and limiting soil dispersal. Project will test propane flaming technology and disseminate educational materials.

Project Location: Nebraska

Project Status: Closed

Final Report Summary:

This project studied the effectiveness of flame weed control and its potential to reduce soil erosion better than conventional tillage. In general, there was much better soil conservation in cropping system that utilized flaming for weed control compared to inter-row cultivation. Flaming reduced soil loss by 0.2 ton/acre/year compared to the tillage cultivation. Flaming provided better weed control than cultivation. Crop yields were similar between the propane flaming and tillage cultivation treatments. This is suggesting that propane flaming has potential to replace, or significantly reduce the overall use of conventional cultivation for weed control, thus reduce potential for soil erosion. Fuel savings of about \$10.00 per acre were estimated by using the flame weeding operation for weed removal compared to the cultivation treatment.

There were four field tours with demonstration of flame weeding at participating farms with attendance of about 50 people per each tour. The largest one was in late August 2009 as part of the annual field tour that witnessed nearly 100 people in attendance. This event was covered by a local television crew from Channel 14 of Sioux City, Iowa.

In 2010, we held two Winter Extension workshops related to flaming: one at Lincoln on January 9, 2010 and a second one at Norfolk on March 5, 2010. We had about 50 people attend and many were from neighboring states including South Dakota, Colorado, and Iowa.

The grantee organization has information on this project and other related projects on their [website](#). They also produced a fact sheet available [here](#) (snapshots provided in this report).

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project data, activities, results and accomplishments.

Attachment 1
Photos of the Propane-fueled thermal weed control unit





Propane Flaming Technology for Weed Control

Technology Fact Sheet

Thermal weed control is an environmentally friendly alternative to herbicides that is approved for use in organic farming and conventional farming operations.

After successful research efforts, new easy-to-use propane flaming technology is being developed to better address the diverse weed control needs of growers seeking more sustainable, energy-efficient farming practices. This hooded weed flamer is safe and effective in a variety of weather conditions and crop growth stages, and it allows farmers to return to the field immediately after weed treatment.



Flaming can be as effective as chemical weed control treatments. The benefits of flaming are that it does not leave chemical residues and is not affected by weather variability. —Organic Farming Research Foundation



A Closer Look

Propane Flaming Technology: How It Works

- The hooded weed flamer uses propane-fueled flames to transfer heat to weeds over a short exposure time. The flamer does not burn the weeds; rather, the resulting cell structure damage and disruption of photosynthesis causes the weeds to wither and die.
- Torch hoods better focus the flames and protect them from the elements to kill weeds more effectively and reduce fuel consumption. A split-hood configuration allows more mature crops to flow through the machine undamaged while an adjustable torch mount enables a wider range of treatment capabilities.
- A separate flamer-cultivator prototype has been designed to control weeds by flaming in the intra-row space and cultivating in the inter-row space. The unit dramatically increases energy efficiency (four gallons of propane per acre per application), reduces task time, and consolidates two tasks into one piece of equipment.



Testing of propane flaming with torch hood

Projects:

Commercialization of Efficient Flame Weed Control Equipment (**Docket 17385**)
Integration of Propane Flaming and Mechanical Cultivation for Effective Weed Control in Agriculture (**Docket 16711**)
Innovative Propane Flaming Technology for Crop Production (**Docket 15920**)

Partners:

Behlen Manufacturing Co., University of Nebraska, Lincoln

Research Process (✓ = completed; ➤ = in progress; ★ = upcoming)

Development and Testing ✓

- Evaluate newly designed torches with flaming hoods and incorporate them into a four-row weed flamer.
- Conduct testing of four-row flammers on corn and soybeans at two different testing sites.
- Evaluate six methods of weed control that include hand weeding, mechanical cultivation, and flaming to determine the most effective treatment plan.

Commercialization ➤

- Commercialize the hooded flaming system in various row widths, including four-row and eight-row units.

What's Next?

Commercialization of the hooded weed flamer is taking place in 2012 and beyond. The University of Nebraska, Lincoln is also developing a how-to manual to transfer their research to farmers, explaining how to effectively use flaming for weed control.

Current Status: Demonstration



- PERC and the University of Nebraska, Lincoln have collaborated on several research projects to test the efficiency and efficacy of hooded flaming technology.
- Agricultural Flaming Innovations (AFI) has secured patents and plans to commercialize the new product in 2012 through a partnership with Behlen Manufacturing.

Technology Features

- Multiple hood configurations to enable treatment throughout the growing season.
- Versatile torch designs for various crop treatments.
- Dual-stage filtering process to prevent plugged torch nozzles.
- Easy-to-use safety features, including flame sensors and remote re-ignition.

Hooded Propane Flaming Technology: Key Benefits

Consumes about nine gallons of propane per acre per application.

Requires half as much energy as conventional open flaming technology.

Offers a treatment option weeds cannot become resistant to, unlike herbicides.

Preserves soil and water quality, prevents soil erosion, and conserves water.

Allows farmers to return to the field immediately after treatment, in contrast to herbicide application.

Enables more cost-effective treatment than hand weeding and organic herbicides.

For more information on this and other research projects, go to www.agpropane.com.



FOR MORE INFORMATION:

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February 2012

Subsurface Drainage Water Management (NY)

Cornell University

Project #: 2008-0116-030

NRCS CIG Funds: \$284,683

Grantee Matching Funds: \$288,268

Total Project Funds: \$572,951

Project Description: Achieve a better understanding of how liquid dairy manure interacts with soil porosity. Project will investigate how this interaction influences transport of liquid manure constituents to subsurface drainage outflows.

Project Location: New York

Project Status: In Closure

Final Report Summary:

The primary goal of this project was to increase awareness and better address water quality problems associated with land applying liquid manure to subsurface drained lands. The project objectives and phases included a combination of both laboratory- and applied field-based research efforts at EQIP farm cooperator sites to investigate how liquid dairy manure applications may contribute to water quality impairments; and a suite of extension and outreach efforts implemented to include demonstrations of controlled drainage installations, presentations to land improvement contractor professionals, producers and nutrient management planners, Cooperative Extension, Soil and Water Conservation District, and Natural Resource Conservation Service, and development and review of fact sheet publications.

The results of the laboratory-based research with soil columns indicated that liquid manure at a low solids content of 3.5% applied to the soil surface tended to quickly increase the soluble reactive phosphorus load and concentration leached from soil consisting of macropores of 3 mm diameter size in response to a wetting event. The field-based research effort at the EQIP farm cooperator site in New York's Great Lakes Eco-Region where a paired- controlled drainage versus no drainage control field site evaluation was carried out indicated that controlled drainage could reduce the accumulated load loss of phosphorus during a single large storm event by about 10 percent. The reduction, however, was not substantial and the benefit appeared to be offset simultaneously by a somewhat higher loss of total nitrogen. The benefit of controlled drainage for field sites that receive most of their applied nutrients from manure sources appears to require some additional research, particularly with regards to the loss of various organic and inorganic forms of nitrogen. The field-based research effort at the EQIP farm cooperator site in New York's St. Lawrence Champlain Valley Eco-Region showed similar concentrations of nutrients being discharged from the drain as a result of liquid manure applications, but lacking a better paired type control versus uncontrolled monitoring arrangement, few conclusions could be drawn about whether or not there was a benefit with the controlled drain. Any benefit or nutrient load reduction was most likely a result of some reduction in the drain discharge, something the producer was not very pleased with since he pulled the water level control gates out of the structure during one of the larger storm events.

The extension, demonstration and outreach efforts reached a broad array of several hundreds of stakeholders described above as several presentations and discussion of the research was made at a number of different local, state, national, and internationally held meetings. The initial positive impact of this project effort appears to be that producers and nutrient management planners are paying more attention to the liquidity of the manure and how, when, and where it's being applied to drained fields. Producers are more cognizant that the drain effluent may be impaired and are watching it more closely to avoid a potential water quality violation citation. However, perhaps another important lesson learned from this effort is that producers install drainage for the purpose of removing excess soil-water to obtain the benefits of improved field operations timeliness and increased yields, and the nutrients lost in the

drain effluent are of minor concern. Thus, further implementation of controlled drainage for the primary purpose of improving downstream water quality will remain an interesting challenge.

With regards to extension publications, two drainage factsheets were prepared (Agronomy Fact Sheets #57 and 58 - <http://nmsp.cals.cornell.edu/guidelines/factsheets.html>), and a review was provided for the Drainage Water Management factsheet for the Midwest (<http://www.extension.purdue.edu/extmedia/WQ/WQ-44.pdf>).

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, data, results, outreach and lessons learned.



Drain discharge monitoring equipment at EQIP cooperater site in Finger Lakes Region.



Drainage control structure and water sampling equipment at the EQIP farm cooperater site in the Champlain Valley.

Cornell University Cooperative Extension
Agronomy Fact Sheet Series Fact Sheet 57

Subsurface (Tile) Drainage Benefits and Installation Guidance

Introduction
Subsurface tile or artificial drainage is the practice of placing slotted drain tubes beneath the soil surface well below tillage depth to help lower the water table of poorly drained fields and/or wet areas within fields. Though the concepts and benefits of artificial drainage are ancient, it continues to be an important crop production practice for modern agriculture and changes in input prices and crop values has made subsurface drainage an even more valuable investment.

While watersheds are very dynamic systems and research continues to improve understanding of the role of land use within a watershed, there is evidence that manure constituents can leach to subsurface drain lines if not properly managed. Fact sheet 59 addresses mitigation options to reduce the risk of loss of manure nutrients by leaching and transport through tile lines.

In this fact sheet we discuss the benefits of tile drainage for forage and grain crops and give practical guidance on tile drainage installation. It should be recognized that tile drainage is equally useful on vegetable and fruit farms, particularly apples, and protects the grower's large investment in expensive trees.

Benefits of Tile Drainage
The extent to which subsurface drainage benefits field crop production depends on soil type and varies with weather conditions in any given year. By helping convey subsurface water away from the field that would otherwise remain saturated for a longer period of time, tile drainage results in the following benefits:

- The soil surface dries more quickly and more uniformly (helping to reduce or eliminate wet areas), and soils warm up faster. This means that land preparation and planting can begin sooner.
- Crops can establish a deeper root system resulting in greater access to both soil nutrients and soil water, allowing for reduced

sensitivity to both extreme wet and extreme dry conditions.

- Crop yield and forage quality increase compared to undrained conditions, as a result of better timing of crop establishment in the spring, improved growing conditions all year, and less weather-dependent harvest timing. Enhanced forage and grain crop production on the farm reduce the need for feed imports and this makes farms more environmentally sustainable as well.
- Tile drainage reduces overland flow and the loss of soil and nutrients through erosion and runoff.

When to Consider Tile Drainage?
Tile drainage is a good investment when the planting of crops is often delayed due to saturated soil conditions in early spring, where the harvest window is uncertain or erratic due to saturated conditions, and where yields are low, perhaps requiring forage to be purchased.



Figure 1: Clean water exiting a modern tile drain.

Field Crops Extension **College of Agriculture and Life Sciences**

Fact Sheet #57: The full fact sheet is available with provided grantee reports or [online](#).

Cornell University Cooperative Extension
Agronomy Fact Sheet Series Fact Sheet 58

Subsurface (Tile) Drainage Best Management Practices

Introduction
Subsurface drainage (also referred to as artificial or tile drainage) is the practice of placing slotted drain tubes beneath the soil surface, well below tillage depth, to help lower the water table of poorly drained fields and/or wet areas within fields. In agronomy fact sheet 57, benefits and guidance for installation of subsurface drainage are presented. In this fact sheet, we discuss currently recognized best management practices to reduce the risk of manure nutrients exiting tile lines.

Nutrient Loss through Preferential Flow
The main nutrients of concern are nitrogen (mainly nitrate-N) and phosphorus (P) although pathogens can also be a concern in some cases. Nitrate-N is water soluble and can be lost through leaching and runoff. Phosphorus is typically bonded to soil particles and can be lost when erosion occurs. However, a fraction of P is also water soluble and this dissolved P fraction can be lost through leaching and runoff as well. Installation of tile drains can reduce overland flow and hence reduce the loss of nutrients through runoff and erosion. When nutrient rich water is filtered through the soil, less N and P will exit the soil profile and enter the groundwater. However, when cracks in the soil and/or wormholes (called "macropores") create a direct link between the surface of the field and the tile lines (called "preferential flow"), nutrient losses can be large. There are no one-size-fits-all answers to dealing with preferential flow but there are some mitigation options that could be considered.

Mitigation Options
Nutrient loss through preferential flow is most likely to be an issue if manure is being spread within about 10 feet to either side of subsurface drainage lines and tiles are running. Currently, there is no application equipment that allows for manure application with the level of accuracy needed to avoid application directly over tile lines. In addition,

the exact location of those tiles might not be known for older subsurface drainage systems.

More practical approaches to addressing preferential flow include avoiding manure application when tiles are actively flowing and to increase soil-manure contact at the time of application. The latter can be done through either (partial) incorporation of the manure (as opposed to surface application without incorporation) or through the installation of water table control technologies.

A promising approach that involves manure incorporation is to use aerators for (shallow) incorporation (Figure 1). The aerator will break preferential flow patterns with minimal soil carbon loss, reduce N volatilization from the manure as compared to surface application, and reduce erosion risk (greater surface residue) as compared to chisel or moldboard plowing.



Figure 1: Incorporating manure with an aerator.

Management of the water table through control structures at drain outlets is also a promising approach to reducing the amount of nutrients that exit the tile lines. Research has shown that if water is stored in the soil (by plugging the outlet) for 7-10 days after manure application, much of the manure nutrients that would otherwise be lost can be retained in the soil. This practice requires installation and management of a water control structure on each outlet (Figure 2). Some new

Field Crops Extension **College of Agriculture and Life Sciences**

Fact Sheet #58: The full fact sheet is available with provided grantee reports or [online](#).

Grand Lake St. Mary's Shoreline Stabilization (OH)
Mercer County Soil and Water Conservation District
Project #: 2008-0116-031

NRCS CIG Funds: \$50,000
Grantee Matching Funds: \$50,000
Total Project Funds: \$100,000

Project Description: Utilize geotextile tubes to protect 800 lineal feet of Grand Lake St. Mary's shoreline in mid-west Ohio. Project will show that geotextile tubes are cost effective as compared to traditional shoreline stabilization techniques.

Project Location: Ohio

Project Status: In-Closure

Final Report Summary:

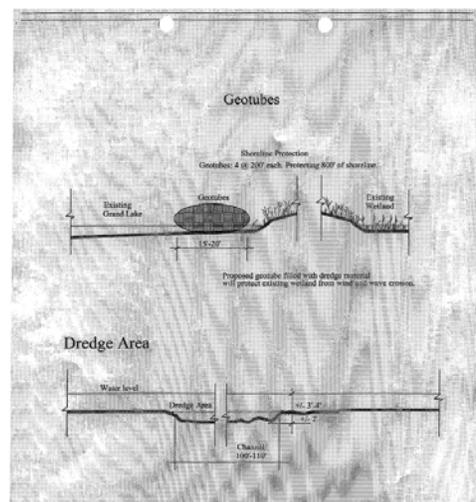
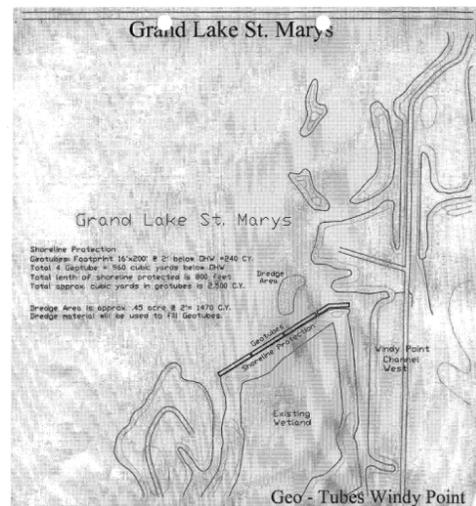
It was determined that geotextile tubes can be used to protect lake shoreline by utilizing the Grand Lake St. Mary's State Park dredge. To make this project most effective, the tubes should be near a dredge material location area (DMRA) and a gate valve should be utilized to provide maximum daily dredging capacity.

Floating wetlands were installed and data was taken to determine which plants had the most biomass and tissue phosphorous concentration. Results showed biomass and tissue phosphorous concentration did not have a direct correlation. Lizard's tail had the highest tissue phosphorous concentration.

All information associated with this grant is kept at the Mercer County Soil and Water Conservation District. This means that all information is public record. The Grand Lake/Wabash River Watershed Coordinator is the grant coordinator at the local level. The watershed coordinator reports to many different groups and organizations. Often her information is picked up by newspapers, radio and even television stations. Throughout this project there were multiple newspaper articles, radio mentions and clips from the television news crews.

Information on this project has also been disseminated by the Grand Lake St. Mary's State Park. Specifically they answer many telephone calls about the project. They also have mentioned both phases of the project at various meetings and discussions. When they discuss the project with their peers, they mention the lessons learned, pros and cons to this type of project. The State Park also included floating wetland information with their dock bills in 2011.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, data, and lessons learned.



Great Lakes Biochar Demonstration Project (OH)*Ohio Farmers Union Family Farm Center*

Project #: 2008-0116-032

NRCS CIG Funds: \$70,900

Grantee Matching Funds: \$0

Total Project Funds: \$70,900

Project Description: Demonstrate carbon sequestration and additional greenhouse gas emissions for nutrient trading systems and opportunities. Project will demonstrate and field test an innovative system to manage animal manure to address Great Lakes water quality impacts.

Project Location: Ohio

Project Status: Closed (Terminated)

**National Fish and Wildlife Foundation
Closure Memo**

To: Donn Waage
From: Emily BarenBregge
Date: 9/23/010

Project: The Great Lakes Biochar Demonstration Project (OH)
Number: 2008-0116-032
Grantee: Ohio Farmers Union Family Farm Center

Project Description: Demonstrate carbon sequestration and additional greenhouse gas emissions for nutrient trading systems and opportunities. Project will demonstrate and field test an innovative system to manage animal manure to address Great Lakes water quality impacts.

Final Products: There are no final reports for this project. The project was put on hold for investigation due to suspicion of embezzlement after funds for Phase 1 were disbursed. Deliverables for Phase 1 include site selection, completed business plan/economic feasibility assessment, and technology/unit selection. As a result of the investigation, NRCS has approved NFWF's decision to terminate this award.

NFWF award: \$200,000 **NFWF funds spent:** \$70,900

Match requirement: \$200,000
Match spent: undetermined

I recommend closing this grant.

A copy of the official termination letter is available with the grantee documents provided.

Conservation and Integrated Pest Management (OK)

Oklahoma State University

Project #: 2008-0116-033

NRCS CIG Funds: \$222,972

Grantee Matching Funds: \$225,733

Total Project Funds: \$448,705

Project Description: Field-test, evaluate, and implement innovative no-till production practices and systems in Oklahoma and the southern Great Plains. Educate farmers about benefits of no-till farming and methods for controlling the Hessian Fly with no-till practices.

Project Location: Oklahoma

Project Status: In-Closure

Final Report Summary:

The overarching objective of this project was to increase no-till adoption in the southern Great Plains through demonstration and education. Over the course of this project we provided educational opportunities at four statewide extension conferences, ten in-field demonstration days, and 64 county-level extension meetings reaching over 6,000 stakeholders. Research sites demonstrated that biologically diverse cropping systems were feasible in Oklahoma and that IPM strategies for pest management were extremely effective in controlling Hessian fly activity in wheat. The educational opportunities created and demonstration plot findings assisted in a 25% increase in no-till adoption and a significant shift towards wheat cultivars resistant to Hessian fly.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, data, and lessons learned.



Alternative rotational crops such as corn, soybean, grain sorghum, and winter canola are highlighted at our Lahoma, OK demonstration site.



Approximately 225 producers attended field days during April at our Lahoma demonstration site.



M.S. Graduate student Casey Andrews plants warm-season cover crops after wheat harvest at the El Reno, OK location.

Early Detection & Rapid Response to Invasives (OR)

The Nature Conservancy
Project #: 2008-0116-034

NRCS CIG Funds:	\$78,246
Grantee Matching Funds:	\$80,065
Total Project Funds:	\$158,311

Project Description: Create an invasive species Early Detection and Rapid Response program. Project involves creation of training sessions and educational materials to be taught to local organizations and individuals who will assist in reporting the presence of invasives.

Project Location: Oregon

Project Status: Closed

Final Report Summary:

The Early Detection & Rapid Response to Invasives Program resulted in the development of 16 Early Detection Networks across Oregon. Each Network has the following elements: (1) Priority Species List; (2) Educational materials and education program delivery; (3) reporting information; (4) a primary contact/coordinator; (5) a database for tracking reports; and (6) response pathways with response leads identified. Collectively these programs have resulted in 53 trainings, 1,353 people were trained, and at least 115 invasive species reports (only reports from our four core programs were tracked). Our work has resulted in increased support and awareness among citizens and land managers all over Oregon. Due to this awareness we are gaining more support for coordinated statewide network.

This project led the creation of four core early detection networks in the following regions: (1) Upper Willamette Valley (Willamette Education and Early Detection of Invasives Network); (2) SW Oregon Early Detection Network (Formerly SW Oregon Invasive Species Network, or SWORISN); (3) Crook County Invasives Patrol; and (4) Lake County Weed Watchers. For each of the four core programs, we developed early detection species lists, educational materials, and contact lists for reporting pathways. Materials are posted on the www.westerninvasivesnetwork.org website.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, data, and lessons learned.



Brooke Gray points out how to identify scotch thistle as part of the Crook County Weed Patrol Training in 2009.



2010 Crook County Invasives Species Patrol Field Training Day – Looking at a Mediterranean sage site.

Facilitating the Private Carbon Offset Market (OR)

George McKinley

Project #: 2008-0116-035

NRCS CIG Funds: \$24,800

Grantee Matching Funds: \$24,800

Total Project Funds: \$49,600

Project Description: Target quantitative carbon sequestration to existing and emerging carbon offset markets. Pilot project will link voluntary forest management.

Project Location: Oregon

Project Status: In-Closure

Final Report Summary:

The project assessed the feasibility of Non-Industrial Private Forest/Family Forest (NIPF/FF) owner access to carbon offset markets and created a framework to facilitate access that includes cost-effective landowner strategies that also demonstrate quality assurance for markets. The framework emerged from a stand level pilot project planned and implemented to integrate forest adaptation needs with carbon offset market opportunity. While forest planning, carbon modeling and market driven project development and verification needs are generally beyond the fiscal or technical capacity of many NIPF/FF owners, these are essential components of forest sequestration projects that hope to realize economic return in offset markets. Absent federal climate change mitigation legislation and clear compliance signals for associated markets, the voluntary carbon offset market offers best opportunity for NIPF/FF owners. Voluntary markets provide greater project flexibility and increased opportunity for owners to offer high quality offsets for higher fiscal return, and often recognize the additional public and private goods and services generated by NIPF/FF restoration and management activity.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, results, data, and lessons learned.



Pre-treatment condition



Post-thinning condition

Enhancing Air Quality on Dairy Farms (PA)*Environmental Credit Corporation*

Project #: 2008-0116-036

NRCS CIG Funds: \$225,000

Grantee Matching Funds: \$249,592

Total Project Funds: \$474,592

Project Description: Implement and demonstrate a new program for controlling agricultural air pollution. Project will use bag digester technology to reduce emissions of greenhouse gases, particulates, and volatile organic compounds on 10-12 dairy farms in Pennsylvania.

Project Location: Pennsylvania

Project Status: Closed

Final Report Summary:

The project resulted in the creation of three new anaerobic digester systems at three dairy farm facilities in the Chambersburg, PA area during the reporting period. Although the reporting period is over, construction continues at the three sites, as the facilities are expanding the scope of the project beyond the subject of the Grant Agreement. The three sites are implementing renewable energy projects utilizing the methane captured by the digester systems, as well as implementing solids separators to provide bedding and compost from the manure solids.

The Environmental Credit Corporation (ECC) partnered with NativeEnergy on these projects, allowing us to expand beyond the implementation of the digester and create three comprehensive renewable energy projects. The completion and full operational status of the projects is expected in the third quarter of 2011, although ECC's involvement in the digester portion of the installation is at an end.

As part of our commitment to provide educational opportunities and resources to stakeholders in the dairy community, ECC and NativeEnergy organized a workshop and a facility tour on June 28, 2011. ECC invited local dairy farmers, state and local officials, and environmental associations to attend the workshop and tour. The workshop and tour were offered free of charge to all interest stakeholders. More than 40 attendees heard from speakers on a wide variety of related topics including project implementation, utility contracting and net meeting, carbon credit/emission reduction topics, and solids separation. Attendees were also invited to attend a tour of the JEM Farm project, where the project leaders and the host farm owner described the digester construction, operation, contract terms, and plans for the renewable energy component's installation.

Project deliverables include: (1) Installation of small-scale anaerobic digesters will reduce agricultural emissions of particulates, odors, volatile organic compounds from three small dairy operations in Pennsylvania; (2) the combustion of captured methane on these farms will reduce greenhouse gas emissions by 2,700-3,200 metric tons of CO₂ equivalents per year; (3) provide a public educational workshop and facility tour in June 2011 with over 40 attendees including animal producers, state and local agencies, environmental groups and other stakeholders; (4) expand a market-based program to provide carbon credit incentives to deploy anaerobic digesters on three dairy farms in Pennsylvania; (5) demonstrated a mechanism for supplementing on farm income with carbon revenues and/or reducing production costs; and (6) provided opportunities for enrollment, verification and registration of carbon credits resulting from best management practices in animal agriculture and nutrient management.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for additional project details.

Groundwater Desalination in a Cenozoic Aquifer

Michael McCulloch

Project #: 2008-0116-037

NRCS CIG Funds: \$32,896

Grantee Matching Funds: \$91,859

Total Project Funds: \$124,755

Project Description: Adapt a desalination process to provide water for livestock, wildlife and trees used for windbreaks along the Cenozoic water aquifer along the west side of the Pecos River in Texas.

Project Location: Pecos River watershed, Texas

Project Status: Closed

Final Report Summary:

The key accomplishments of this project were three-fold. First, ground water with 13,000 ppm TDS was processed to potable water of 500 ppm TDS. Second, the rain water collection assembly will catch an average of 28,027 gallons per year. Third, the adaptation of the desalination unit to be powered by solar components producing 8 kw per day has provided a methodology for future installation. All this was done while at the same time conserving the air, land, energy, and water.

The activities of this project are as follows:

- 1) Installation of 24,300 ft. of 1 Y4 PE pipe
- 2) Design, manufacture, and installation of a 10,000 gallon rain harvesting and water storage vessel
- 3) Placement of two water troughs
- 4) Drilling water well
- 5) Rehabilitation of existing water well
- 6) Solar equipment installation
- 7) Desalination equipment installation
- 8) Rain water harvesting equipment installation



The objectives of the project were achieved as conceived. Water for wildlife and livestock is provided autonomously, not being dependent upon any water or energy provider. Ground water that is considered worthless is now serving a purpose that is visible with no detrimental consequences to the environment. In fact, this project, though minutely, protects the environment by using no fossil fuels in its operation, directly or indirectly.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, results, data, and lessons learned.

Winter Pasture Management on Dairy Farms (VT)

University of Vermont

Project #: 2008-0116-038

NRCS CIG Funds: \$248,027

Grantee Matching Funds: \$248,227

Total Project Funds: \$496,254

Project Description: Establish a leadership group of Vermont dairy farmers to implement ecologically sound winter pasture feeding and bedded pack management practices. Project will reduce feed and energy costs, improve soil and forage quality, and increase carbon storage.

Project Location: Vermont

Project Status: In Closure

Final Report Summary:

Innovations in management intensive grazing (MIG) have allowed many small farms to become profitable by reducing feed, labor and energy costs. Bedded pack, out-wintering, and stockpiling season extension were monitored on Vermont dairy farms for soil health and forage quality. All three practices favor bacterial decomposition, increase plant productivity, and improve soil food web structure. No physical compaction was detected. Both the project team and farmer partners observed that composted bedded pack materials enhanced forage growth in paddocks with poorer initial soil quality.

Summary of Project Activities & Results – A total of nine cow dairy farmers were identified, three from each of three counties, Franklin, Addison and Orange counties in Vermont (Figure 1). On each farm, a pair of similar adjacent defined pasture sites (0.4 - 2.0 ha) were sampled, one as a control and the second as an implemented treatment. Baseline samples were collected in autumn 2008. Study sites were sampled during spring (May/June) and autumn (October/November) 2009 and 2010 for a total of five sample seasons. Soil and forage samples were collected along the same two 90-m linear transects located randomly within each field.

There were three deviations from our original plans. First, we added an activity to support further adoption of the practices studied. A survey was developed for farmers focused on bedded pack use. This survey will help direct technical assistance and support for farmers. Second, one of the nine farmers passed away toward the end of the project, and his pastures were not managed as planned, and were not sampled in the final year of the project, at his wife's request. Third, a panel of farmer partners from this project will speak at upcoming (Feb 2013) meetings of the Northeast Pasture Consortium, discussing their experiences with bedded pack management. A full-color publication developed for this project has been distributed to members of the Northeast Pasture Consortium, and will be distributed to attendees at the meeting as well. Interest in this meeting is high, as



Figure 1. Nine grass-based cow dairy farms sampled in Addison, Franklin, and Orange counties of Vermont.

evidenced from email traffic from members, stating that there is a lot of interest in bedded packs in their areas (Connecticut, New Jersey, Massachusetts, and New York), and they look forward to this session.

The use of bedded pack, out-wintering, and stockpiling season extension have potential as sustainable and effective pasture management practices. With few exceptions, soil and forage quality was similar among treatments. Bedded pack, out-wintering, and stockpiling season extension practices maintain favor bacterial decomposition, increase available resources and plant productivity, and improve soil food web structure (Table 1). Both the project team and farmer partners observed that composted bedded pack materials enhanced forage growth in paddocks with poorer initial soil quality.

Risk of compaction is high in out-wintering and stockpiling season extension due to seasonally high soil moisture during spring and late autumn. Soils with high clay content are common in Vermont and have higher risk for compaction and long-term impacts of treading. Fortunately, negative impacts to soil physical structure were not detected under season extension treatments.

An economic analysis was performed, estimating the mean cost of housing per cow per day was \$3.98, with a range from \$2.07 up to \$5.03. The higher costs were associated with crowded packs because the need for bedding and demands for labor increase.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, results, data, lessons learned, and information on dissemination of project documents.

Nutrient Capture in an Anaerobic Digester (WA)

Washington State University

Project #: 2008-0116-039

NRCS CIG Funds:

\$414,013

Grantee Matching Funds:

\$414,013

Total Project Funds:

\$828,026

Project Description: Increase capture and efficient management of manure nutrients from dairy producers who use anaerobic digesters for manure treatment. Project will be conducted in a watershed that contains seven dairy and beef producers with 3,000 animals combined.

Project Location: Washington

Project Status: In Closure

Final Report Summary:

The focus of this project was to define the flow, transformation, and nutrient use efficiencies of anaerobically digested (AD) and non-AD manures, and the equitable redistribution of nutrients to cooperator dairies based on their contribution and their need. This project demonstrated the capture, redistribution (economics and nutrient use), and use of nutrients (N and P) from post-Anaerobic Digester (AD) liquid manure.

The project was divided into 5 specific components:

1. Nutrient flows through the Anaerobic Digester (AD)
2. Nutrient (N and P) use efficiency for crop growth
3. Economic nutrient redistribution model
4. Phosphorus removal from liquid manure in the form of struvite
5. Extension and outreach efforts

Project Summary Questions**1. Is AD manure a more efficient source of manure compared to non-AD?**

Results of a three year field study suggest that AD and non-AD manure support equal grass production when applied at equal amounts of total N. Anaerobically digested dairy slurry was shown to provide adequate soil fertility and N availability for crop uptake and forage production over the three field seasons.

2. What is the efficiency of phosphorus use for crop growth from AD and non-AD manure?

There was no indication of differences between sources of manure for pounds of uptake of P by the grass crop. However, more P was applied with non-AD manure vs AD manure which complicates the interpretation. When the P uptake data was expressed as a ratio (P uptake/P applied) the AD manured forage showed a higher ratio. Further investigation of P availability from AD manure is warranted.

3. Does the method of manure incorporation (surface or sub surface deposition) have an effect on forage growth?

Subsurface deposition of manure did not increase forage yield or N uptake compared with surface broadcast application, possibly because the slurries were low enough in solids to infiltrate readily into the soil, and because the subsurface injectors may have disrupted plant growth.

4. What are the conditions under which phosphorus, in the form of struvite, can be efficiently removed from post-anaerobic digester (AD) liquid manure?

Progress was made in efficiency of P removal from liquid manure and reducing the chemical cost of the process. Specific achievements were:

- a) The best means of integrating chemical pre-treatment with solids removal was determined
- b) Quick on-site tests were developed for orthophosphate phosphorus (OP), total phosphorus (TP), magnesium, calcium, ammonia, and iron. This quick analysis information improved the ability to evaluate performance and adjust conditions as necessary.
- c) The system routinely achieved 80 to 92% of orthophosphate phosphorus (including both dissolved and suspended forms)
- d) Progress was made in limiting chemicals cost. A calcium-blocking approach was developed and is now patented by WSU. In this approach, calcium was trapped using EDTA (ethylenediaminetetraacetic acid) to release phosphorus from calcium phosphorus compounds rather than accomplishing this simply by depressing pH to dissolve the compounds.
- e) New ways of forming the product resulted in excellent prototypes of tablets, pellets, spikes, and plugs. The ability to form the product in this way is key to the economics of the extraction process because it can increase the value of the struvite by custom-forming it to specific market applications.
- f) Struvite product testing was evaluated in a related project by WSU to determine its performance as compared against conventional phosphate fertilizer. Struvite, due to its non-burning character, can be placed closer to, or even in contact with, roots, seedlings, and seeds, thus potentially further increasing its phosphorus delivery efficiency.

5. **Can information be integrated into a decision aid tool and be used answer questions related to economic redistribution model of nutrients amongst participating dairies in a community AD?**

An economic simulation model (ADOPT) – Anaerobic Digester Optimization Tool) was developed of the anaerobic digester using monitoring data on its inflows and outputs. The model evaluates the anaerobic digester outputs (lagoon effluent value, electricity, tipping fees, compost sales, and carbon credits). The model examines rules for lagoon effluent redistribution back to the participating dairies.

6. **Does source of manure impact soil enzymes and microbial communities?**

Our goal was to evaluate if AD manure had any negative impacts in the soil microbial communities. Source of manure had little effect on soil enzymes or microbial communities. Greatest treatment differences were seen between the manure and urea treatments. Flooding of the plot area had a dramatic yet fleeting impact on the enzymes and communities. Application of anaerobically digested slurry did increase nitrifier and denitrifier gene copies that correlated with N₂O production.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, data, results, lessons learned, and information on dissemination of project documents.

Optimizing Manure Nutrient Utilization (WI)*University of Wisconsin - Madison*

Project #: 2008-0116-040

NRCS CIG Funds: \$165,426

Grantee Matching Funds: \$184,165

Total Project Funds: \$349,591

Project Description: Enhance economic and environmental nutrient management performance in integrated crop and livestock systems. Project will develop a manure sampling protocol to evaluate nutrient content and uniformity in manure at separation, storage, and application.

Project Location: Wisconsin

Project Status: In Closure

Final Report Summary:

We evaluated the ISS manure separation (ultra-filtration, UF) technology in a CAFO (confined animal feeding operation: 3,000 dairy cow) context, measured the variability of nutrient composition in the separated manure fractions (1st Stage Solids, and 2nd Stage UF permeate and 2nd Stage UF Concentrate (retentate), and developed 3 types of nutrient management plans to use these 3 main manure fractions: one for the UF permeate to be irrigated and/or hose drag applied (gallons); one for the UF Concentrate slurry which was dragline/hose injected (gallons); and, one for the solids which were applied to fields (and/or sold) as solids (tons).

We developed the cost of separation and application for each of these separated manure fractions. We were then able to link these costs to total volumes spread on fields at different distances to calculate the costs of application and efficiency of the movement of nutrients.

We spent a great deal of time interfacing this new technology with environmental compliance agencies (WI DNR) encouraging them to allow producers to be able to apply the UF permeate with center pivot rather than with trucks, tractors, tankers and/or dragline hoses.

The innovative manure separation technology as well as the new manure management concepts improved nutrient management and farm profitability.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, results, data, and lessons learned.

DBA Green Tier Advancement Project (WI)*DBA Green Tier Advancement Project*

Project #: 2008-0116-041

NRCS CIG Funds: \$100,000

Grantee Matching Funds: \$50,000

Total Project Funds: \$150,000

Project Description: Provide dairy producers/processors who participate in the Green Tier Charter with information, resources and training to develop and implement Environmental Management Systems programs. Project will foster land stewardship and water quality improvements.

Project Location: Wisconsin

Project Status: In Closure

Final Report Summary:

The Dairy Business Association (DBA) Green Tier Advancement Project (CBA-GTAP) is a joint venture between DBA and the Natural Resources Conservation Service (NRCS) with the purpose of changing attitudes and behavior in the Wisconsin dairy sector by exploring the use of environmental management systems (EMS) as a tool to establish voluntary environmental improvement goals, measure progress and ultimately protect the natural resources within the state of Wisconsin.

Through the efforts of DBA, Validus, and the National Fish and Wildlife Foundation (NFWF), the project provided producers who participated in the Green Tier Charter with information, resources, and training to help them develop and implement an EMS. In addition, it assisted producers in implementing innovative and effective environmental performance practices which led to environmental protection, enhancement and conservation.

The overall goal of the project was to change attitudes, behavior and ultimately the dairy business climate in Wisconsin. By developed an effective and useable Environmental Management System, producers can strengthen their relationships within the broader community by providing measurable environmental improvements that dispel misleading propaganda and prove their commitment to environmental stewardship.

The program was sanctioned by state law s.299.83 Wis. Stats, and had two tiers of participation. The first tier was an entry level status designed to encourage innovation, collaboration and new environmental goal setting for producers. Tier 2 was more rigorous and placed greater emphasis on superior environmental performance, and used contracts as a means of giving customized regulatory flexibility proportional to environmental performance.

The Interested Persons Group final report is located at the Dairy Business Association's website located at www.widba.com.

Please refer to the project's Final Programmatic Report and Project Summary, available with the grantee documents provided, for detailed project activities, results, and accomplishments.

Grazing System for Improved Soil Ecology (WV)*West Virginia University Research Corporation*

Project #: 2008-0116-042

NRCS CIG Funds: \$174,892

Grantee Matching Funds: \$208,268

Total Project Funds: \$383,160

Project Description: Evaluate the suitability of co-grazing sheep with cattle to provide soil ecology benefits and improve the economic status of Appalachian hill farmers. Project will develop a marketing system for harvested sheep and publish a technical manual.

Project Location: West Virginia

Project Status: In Closure

Progress Report Summary:

During the period of October to December 2010, the project director and the program assistant coordinated with project cooperators with an initial marketing pool of lambs from the new flocks introduced onto the farms in the spring of 2010. Assistance was also provided to cooperating farmers with winter feeding strategies for the newly introduced sheep flocks to insure protection from predators, adequate watering facilities, management of the temporary net fencing during high snowfall periods and feeding/grazing recommendations for the pre lambing period of the winter. Cooperators were invited to attend the Annual WVU Sheep short course and WV Shepherds Association Meeting.

In the spring of 2011, the project personnel met to plan our summer activities. Requests were made to our cooperators to submit year one and two cost share reports to the project director. 13 of the 14 farmers completed and returned signed reports. 5 project cooperators were selected this spring. They were trained individually to use the falling meter and then given a falling plate meter to determine accurate forage growth during the grazing season. This grazing data will be collected during the next two years to determine if the multispecies grazing conservation effect is demonstrated with additional forage production (<http://www.caf.wvu.edu/~forage/fallplate.pdf>). The project group returned to these 5 cooperating farms and selected multispecies grazing fields and control fields (cows only or hay fields) to determine soil carbon status. Soil carbon sampling methods were reviewed and this fall project members selected the Rapid Carbon Assessment Project method used by NRCS and the National Soil Survey Center in Lincoln, NE. The soil collection and analysis is planned for winter and spring of 2011-2012.

In the fall of 2011, a second lamb pool was organized and cooperating farmers have committed 60 lambs to the pool. This year the lambs will be delivered to the New Holland Livestock Auction. Individual weights of lambs will be recorded along with breed and the project economist will compare profitability of marketing this group of lambs locally and the New Holland Livestock Auction. Pickup of lambs is scheduled for November 6th, 2011. Other accomplishments this project year included educational outreach. An article was submitted to the State small ruminant newsletter, multispecies grazing talks at a farm field day in Marshall County, WV on September 10, 2011, and an evening Farm Bureau County Meeting in Ona, WV on September 27th, 2011.

In August 2012, the grantee submitted a request to amend the scope of work for this project. Due to a change in soil investigation methods during the final phase of this project and need for additional assistance with exit interviews of our cooperating farmers, the grantee requested the scope of work be amended, as follows:

1. Soil Carbon Determinations for Cooperative Farmers

A valid method to determine carbon content of pasture soils for our cooperating farmers that have implemented the projects prescribed grazing practices is fundamental to the success of this project. A new method to determine soil carbon content was adopted by NRCS in 2010. (<http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=26599.wba>) To adopt this soil carbon determination method, additional time and effort will be expended until the end of the project.

2. Exit Interview Assistance

To determine suitability of our conservation practice by the cooperating farmers, a rural sociologist is needed to develop and provide an interview instrument, conduct the interviews, and contribute to the analysis of those interview outcomes. This additional time and effort will be needed until the conclusion of the project.

Please refer to the project's FY11 Annual Report and Amendment Request, available with the grantee documents provided, for detailed project activities, results, and accomplishments to date.

Awaiting submission of Final Programmatic Report by the Grantee.

Precision Agriculture on Grasslands (WV)
West Virginia University Research Corporation
Project #: 2008-0116-043

NRCS CIG Funds:	\$42,848
Grantee Matching Funds:	\$54,697
Total Project Funds:	\$97,545

Project Description: Evaluate the suitability of using precision agriculture to improve the economic status of farmers in West Virginia's Greenbrier Valley. Project will include soil sampling, GIS-based nutrient mapping, and variable-rate nutrient application on grasslands.

Project Location: West Virginia

Project Status: Closed

Final Report Summary:

The Demonstration of Precision Agriculture on Grassland in the Greenbrier Valley project has definitely been an educational benefit for producers. A goal of forty producers participating in the program was set in 2008. When the project was completed in 2010 thirty six producers, representing 3,842.87 acres, had soil sampled via precision methods. The initial sampling goal was set at 2,900 acres, but do to the lack of monies used for spreading of nutrients and lime using precision methods, these monies were moved, and devoted to the sampling portion of the program. The goal for acreage spread for fertilizer and lime was also set at 2,900 acres for each, bringing the total spreadable acreage goal to 5,800 acres. For the fertilizer spreading portion of the project twelve producers, representing 1,265 acres, elected to have fertilizer applied using precision methods, and twenty producers, representing 1,773.9 acres, opted to have lime applied using the new technology.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project background, activities, results, and accomplishments. Several attachments relevant to this project are included in the Final Programmatic Report including Producer Letters, Contracts, Surveys, Maps, and Brochure.



Three County Project Map



Sampling Photo

Gasification of Poultry Litter for Energy (WV)*Coaltec Energy USA, Inc.*

Project #: 2008-0116-044

NRCS CIG Funds: \$475,500

Grantee Matching Funds: \$548,894

Total Project Funds: \$1,024,394

Project Description: Determine a best practice method for utilizing gasification of poultry litter in a broiler operation, including chilled air, to maximize an existing gasification system for improved bird health and environmental benefits.

Project Location: West Virginia

Project Status: In Closure

Final Report Summary:

Based on an using an existing commercial gasification system, the objectives of this project were to culminate in: 1) a best practice model for incorporating gasification of poultry litter at a broiler operation; 2) evaluation of the value of the biochar, including marketing studies; 3) completion of an economic evaluation to determine the optimal economics that would drive transferability of the technology in the marketplace; 4) design and installation of a chiller and air control system using the energy from the gasifier; 5) provide opportunities for technology transfer.

The objective of this project was to demonstrate the ability to develop an on-farm gasification system that would provide positive economics for the farmer and verify the environmental impact. There were a variety of deliverables associated with this effort but the main goal was to provide sound economics and environmental benefits. Previous work has proven that the gasification technology does work and is effective, but the development of commercial projects has been stalled by concerns about the economics. This project was successful in developing sound economics and providing a formula for future commercial projects. It also developed a new concept for how these types of projects can be economical through establishment of multiple revenue streams.

Economic drivers make or break commercial technology projects. Five years ago it was commonly thought that the logical use for the energy from a gasification project was to generate electricity; however the assumption for this project was that converting the energy to chilled air to use in the broiler house made more sense in this application. As the project progressed it became obvious that the economic drivers were multi-targeted with the greatest benefit for the vast majority of projects, including this one, coming from the ash in the form of biochar. The benefit of the chilled air was determined to be of much less value compared to the capital expense.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, results, and lessons learned.



Biochar



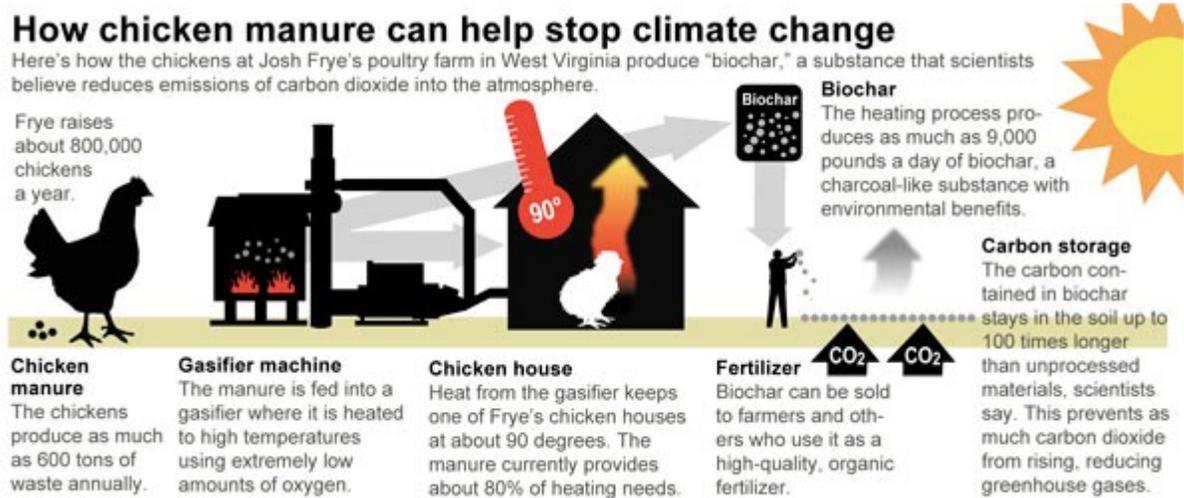
Frye Poultry litter shed



Gasification system Frye Poultry

The following is a list of some of the articles/videos featuring the Frye Poultry project:

- Time Magazine. “Carbon: The Biochar Solution”. Abend, Lisa. 04 Dec 2008. <http://www.time.com/time/magazine/article/0%2C9171%2C1864279%2C00.html>
- USA Today. “Could chicken manure help curb climate change?” Winter, Brian. 11 Feb 2010. http://www.usatoday.com/news/nation/environment/2010-02-10-cheap-carbon_N.htm
- International Biochar Initiative. <http://www.biochar-international.org/Frye/Poultry>
- Dr. Johannes Lehmann video featuring Coaltec gasification project at Frye Poultry <http://www.venearth.com/hqpromise.html>
- Animal Planet – Animals in the News. “Can poultry poop save the planet?” 27 Oct 2009. http://blogs.discovery.com/animal_news/2009/10/can-poultry-poop-save-the-planet.html
- Mother Earth News. “Frye Poultry Manure Gasifier”. “Wilson, Kelpie. 5 Mar 2009. <http://www.motherearthnews.com/Energy-Matters/Biochar-Poultry-Manure.aspx>
- Forest Trends – Advancing Biochar in the Chesapeake. http://www.forest-trends.org/documents/files/doc_2891.pdf



Sources: Frye Poultry; Cornell University; USA TODAY research
From USA Today Article featuring the Frye Poultry project.

By Julie Snider, USA TODAY

Flat Plate Fish Screen for Cutthroat Trout (WY)

Trout Unlimited, Inc.

Project #: 2008-0116-045

NRCS CIG Funds: \$48,000

Grantee Matching Funds: \$50,385

Total Project Funds: \$98,385

Project Description: Develop and install flat plate fish screens on key Bear River irrigation diversions to reduce entrainment and death of Bonneville cutthroat trout and other native fish species. Project will inform fish conservation efforts in the western United States.

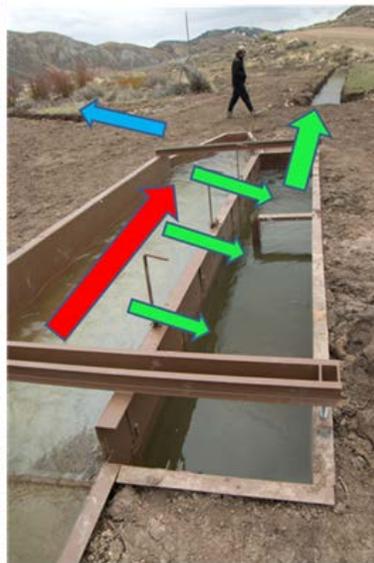
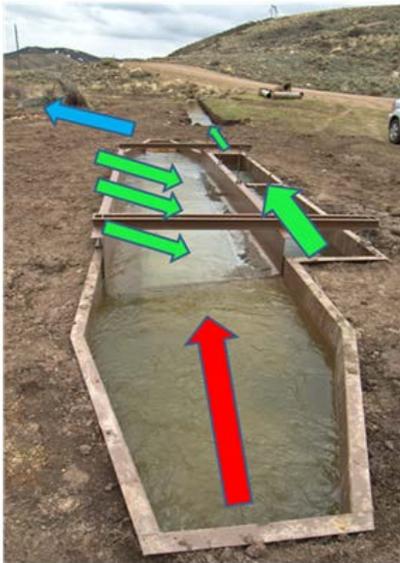
Project Location: Lincoln County, Wyoming

Project Status: Closed

Final Report Summary:

Canal entrainment is a major source of mortality for many western native trout populations. In the Bear River, canal entrainment of migratory Bonneville Cutthroat Trout has been shown to be a significant threat to life history diversity thereby reducing this unique population's resilience. To address this problem fisheries managers have employed a number of techniques to screen irrigation intakes using varying levels of equipment complexity. To refine this overall effort, Trout Unlimited (TU) and project partners developed a new and relatively simple, self-cleaning, flat plate fish screen design. We then fabricated, installed, and tested two sizes of this design, a 5 and 10 cfs model, at four key locations on Bear River tributaries in Southwest Wyoming. Both sizes of this new flat plate screen design effectively eliminated canal fish entrainment while also meeting the needs of agricultural water users.

Please refer to the project's Final Programmatic Report, available with the grantee documents provided, for detailed project activities, results, maps, photos, and accomplishments.



Schematic diagrams of 10 CFS capacity flat plat fish screen in operation. The red arrow indicates unscreened diverted stream water entering the screen and sweeping across the screen plate, green arrows show the infiltration of irrigation water through the perforated stainless steel screen plate and down irrigation supply canals, the blue arrows indicate the return of fish and channel debris back to the stream via the return pipe (underground and out of view in this image).

Example of cleaned and improved irrigation ditches that increase water conveyance efficiency.

NFWF Contact Information

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