



*Preliminary*  
**Final Programmatic Report**  
**NRCS CIG 2008**  
**Chesapeake 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  
Chesapeake Agreement  
Final Programmatic Report**

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**NFWF Contact Information**

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# **Overview of NRCS CIG 2008 Chesapeake Agreement**

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# Final Programmatic Report: NRCS Conservation Innovation Grants 2008 Chesapeake Agreement

## NRCS Partnership with NFWF for CIG 2008 Projects

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The Natural Resources Conservation Service (NRCS) partnered with the National Fish and Wildlife Foundation (NFWF) to manage the 2008 round of Conservation Innovation Grants (CIG) projects. This included 11 Chesapeake projects. Project solicitation and selection was managed by NRCS with NFWF serving as the grant administrator. NFWF donated its services and did not charge for management cost associated with administering these grants or creating reports.

## Summary of Projects Funded

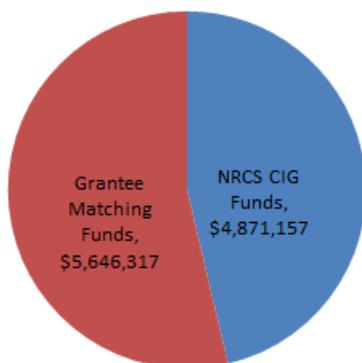
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NRCS provided NFWF with \$5 million to fund 11 projects through this agreement. All \$5 million in Chesapeake Bay funding was awarded to high quality projects. Of the 11 projects approved, seven projects have completed all programmatic activities and are in the closure process, and four projects are closed. Of the \$5 million originally awarded, approximately \$4.8 million was disbursed to sub-recipients. This is due to two projects closing under budget.

NFWF consistently submitted performance reports to NRCS on a semi-annual basis for this 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 December 2012 in addition to detailed summaries of project progress or final reports. All grantee reports are being provided electronically in conjunction with this report.

*NFWF Leverage of NRCS CIG Chesapeake Funds*




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*NFWF leveraged more than **\$4.8 million** in NRCS CIG funds into over **\$10.6 million** in total project funds to benefit the Chesapeake Bay.*

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NFWF



## About this Report

This report provides an in-depth overview of each of the projects funded through the NRCS CIG 2008 Chesapeake 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. When 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.

## NFWF Contact Information

Copies of most individual project final reports are available on NFWF’s online grant library and have been provided electronically in conjunction with this report. Hard copies of individual project final reports will be provided upon request. Questions or comments regarding this report or any individual project should be directed to the contacts listed below.

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The National Fish and Wildlife Foundation is a 501(c)(3) non-profit that preserves and restores our nations native wildlife, species and habitats. Created by Congress in 1984, NFWF directs public conservation dollars to the most pressing conservation needs and matches those investments with private funds. [www.nfwf.org](http://www.nfwf.org)

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# **Summary of Projects Funded through NRCS CIG 2008 Chesapeake Agreement**

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**Managing Poultry-Source Nutrient Delivery (MD)**

*Caroline County Soil Conservation District*

Project #: 2008-0110-001

NRCS CIG Funds: \$188,100

Grantee Matching Funds: \$194,280

Total Project Funds: \$382,380

*Project Description:* Demonstrate two innovative options for reducing nutrient discharge from agricultural drainage channels. Project will implement treatment systems in areas of the Upper Choptank and Tuckahoe River watersheds that are fertilized with poultry manure.

*Project Location:* Caroline County, Maryland

*Project Status:* In Closure

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*Final Report Summary:*

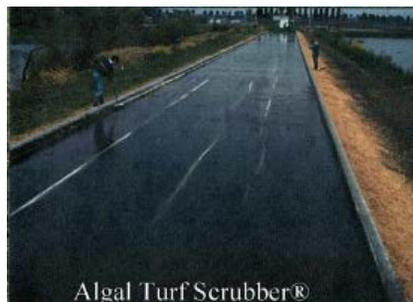
This project’s objective was to demonstrate two innovative options of reducing nutrients from agricultural drainage systems before they reach natural waterways. Treatment systems were targeted to sub-watersheds with large acreage that receive poultry manure application. One part of the project involved demonstration of the hydrologic modification of a ditch to slow the flow of the drainage water and increase the residence time of water in the ditch system by modifying a 2,000-foot drainage channel to mimic natural floodplain conditions and attenuate the flow of nutrients and sediment. The second project component was to demonstrate nutrient reduction by pumping drainage water through shallow raceways lined with a suitable attachment surface (algal turf scrubbers or ATS) which provide support for algae to grow and take up nutrients from the drainage water.

**Hydromodification** – In August of 2010 the Caroline Soil Conservation District completed the construction of a hydromodification project along the Ober Schulyer drainage channel. The pre and post monitoring showed no difference in nutrient levels in the drainage ditch, six months to one year later, than background water nutrient levels from a control site and a site that had received a full ditch cleanout.

**Algal Turf Scrubber** – A second study of the nutrient removal effectiveness and costs of an algal turf scrubber was conducted over a two year period. The objective of this study was to determine rates of nutrient removal and costs using pilot scale ATS raceways located on a primary drainage canal (Long Marsh) near Bridgetown, Maryland. Additional objectives were to evaluate solar-powered pumping systems for off-grid ATS deployment and to determine the effect of water flow rate on algal growth and nutrient removal. Estimated yearly costs were \$42/lb of N and \$230/lbs of P. For the seven month period the raceway operated, approximately 350 lbs “N” and 40 lbs “P” were removed from the waterway by the scrubber system.



*Attenuated Drainage*



*Algal Turf Scrubber®*

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

**Switchgrass Environmental Benefits (MD)**

*University of Maryland, Wye Research and Education Center*

Project #: 2008-0110-002

NRCS CIG Funds:	\$300,000
Grantee Matching Funds:	\$400,000
<b>Total Project Funds:</b>	<b>\$700,000</b>

*Project Description:* Establish 80-100 acres of switchgrass in riparian areas of the Chester River watershed. Project will evaluate biofuel production potential, changes in nitrogen inputs to shallow groundwater, changes in soil carbon storage, and impacts on bird habitat.

*Project Location:* Chestertown, Kent County, Maryland

*Project Status:* In Closure

*Final Report Summary:*

This project was the foundation for a switchgrass planting effort in the Chester River watershed that has expanded approximately fivefold beyond the 100 acres planted in this project. This project introduced the concept of planting switchgrass in riparian areas to the local agricultural and conservation communities and local expertise and capability have developed for planting, managing and harvesting switchgrass. As a part of this project, the solar energy capture and nutrient uptake ability of switchgrass were evaluated as well as changes in subsurface nitrate concentrations after conversion of cropland to switchgrass.

Switchgrass was found to dramatically reduce nitrate leaching rates, and groundwater concentrations in riparian areas although there was site-to-site variability depending on the depth to groundwater. Bird use of switchgrass buffers was evaluated in both summer and winter and found to be used for winter habitat and nesting by a variety of species, including Dicksissels, which are highly unusual in the region. While the goal of establishing a biofuel production base was achieved, a biofuel end use has not yet been developed. A project partner, the Chester River Association, recently produced a webinar on growing and marketing switchgrass and nutrient trading opportunities and a USDA NRCS practice for switchgrass planting in riparian areas recently was developed as a direct consequence of this project.

The primary activities in this project were to establish approximately 100 acres of switchgrass on riparian cropland in the Chester River watershed, introduce switchgrass production to the local agricultural and conservation communities, to monitor the effects of switchgrass on subsurface nitrate transport and soil carbon, and to evaluate bird use of switchgrass plantings. Landowner participation goals were achieved and 100 acres of switchgrass were planted in 2009 on 11 different farms in the Chester River watershed in both Kent and Queen Anne’s county. Soil sampling results indicate that switchgrass is highly effective for reducing soil profile nitrate concentrations relative to cropland settings.



*Replanting a switchgrass plot in 2010 in Queen Anne’s County.*



*Harvesting switchgrass in early spring 2011 on the Pease farm.*

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

## Implementing the Bay Bank (DE, MD)

Pinchot Institute for Conservation

Project #: 2008-0110-003

NRCS CIG Funds: \$450,000

Grantee Matching Funds: \$450,000

Total Project Funds: \$900,000

**Project Description:** Collaborate with national and regional experts to develop the Bay Bank, an innovative marketplace for ecosystem services. Project will connect landowners to non-traditional markets, including new forest conservation and carbon sequestration programs.

**Project Location:** Chesapeake Bay Watershed in Maryland and Delaware

**Project Status:** Closed

### Final Report Summary:

The Pinchot Institute achieved three major accomplishments through this project (listed below). Please refer to the Final Programmatic Report which contains very detailed information related to each of these accomplishments.

- 1) Created protocols or strategies that help farm and forest landowners better access sources of conservation funding including markets for ecosystem services and help conservation buyers (e.g. foundations, agencies, corporations, etc.) better target and account for their investments
- 2) Integrated the protocols and strategies into a collection of user-friendly landowner and project developer tools. The tools are LandServer ([www.landserver.org](http://www.landserver.org)), Bay Bank marketplace (<http://www.thebaybank.org/marketplace>), and Ecosystem Crediting Platform.
- 3) Developed a business strategy to sustain funding in order to provide landowner assistance and support the long-term maintenance of the tools.



[LandServer Fact Sheet for Landowners](#)



[LandServer Fact Sheet for Agencies & Organizations](#)



[Bay Bank Fact Sheet](#)

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

**Manure Gasification Project (PA)***Windview Farm*

Project #: 2008-0110-004

NRCS CIG Funds: \$100,000

Grantee Matching Funds: \$118,100

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Total Project Funds: \$218,100

*Project Description:* Install a manure gasification hot water boiler at Windview Farm in Snyder County, Pennsylvania. Project will fuel the boiler with poultry manure and thereby reduce annual phosphorus loads to the Susquehanna River by approximately 18 tons.

*Project Location:* Port Trevorton, Snyder County, Pennsylvania

*Project Status:* Closed

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*Final Report Summary:*

The objective of this project was to install a manure gasification hot water boiler at Windview Farm in Snyder County, Pennsylvania and fuel the boiler with poultry manure and thereby reduce annual phosphorus loads to the Susquehanna River by approximately 18 tons. The goals of the project were: (1) reduce annual phosphorus loads to the Susquehanna River by approximately 18 tons; (2) reduce the overall operating costs associated with the farm by \$30,000 annual; (3) produce a higher growth yield due to a more efficient heating system; (4) reduce dependence on a natural resource; and (5) partner with the Pennsylvania Small Business Development Center (SBDC) Environmental Management Assistance Program (EMAP) to educate farmers about the project.

Two turkey houses were fitted with ceiling mounted heat exchangers, and a 586kW (2 mill BTU/hr) boiler with a chain grate fuel delivery system to allow this farm to burn spent turkey litter. This equipment performed well during the extreme conditions of 2009/2010 winter (mean 34F, range 0-70F), reducing propane to approximately 10 % of normal during brooding, and 0 % thereafter. Litter temperature and quality was very good, house ammonia, carbon dioxide levels and humidity (<50%) were low for the first few weeks and very reasonable afterward, and flock production performance was above average. Flock monitoring continues and outreach has included 3 field days, 2 presentations to state government and sponsors, and several posters and presentations at local and national conferences.

Flock monitoring and furnace performance continues at the Curtis farm and extension/outreach has included 3 field days, 2 presentations to state government and sponsors, and several posters and presentations at local and national conferences. An overview of the farm, equipment and results thus far is located at the website <http://poultryextension.psu.edu/Nutriman.html> and [http://poultryextension.psu.edu/Turkey\\_Litter-Alternative\\_Brooding\\_Fuel\\_2010](http://poultryextension.psu.edu/Turkey_Litter-Alternative_Brooding_Fuel_2010). YouTube video footage to share the equipment, site and results has been taken and will also be available shortly.

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

**Phosphorus Control in Farm Waste Management (PA)**

*Trout Unlimited, Inc.*

Project #: 2008-0110-005

NRCS CIG Funds:

\$254,034

Grantee Matching Funds:

\$255,654

Total Project Funds:

\$509,688

*Project Description:* Use the P-sorption capacity of mine drainage residuals to demonstrate an innovative phosphorus recovery technique. Project will incorporate iron-rich residuals into an operational manure waste management system on a major Clinton County dairy farm.

*Project Location:* Mill Hall, Clinton County, Pennsylvania

*Project Status:* Closed

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*Final Report Summary:*

This project investigated the potential for using mine drainage residuals (MDR) for lessening the potential for phosphorus pollution from dairy and swine manure management operations. In Pennsylvania, a manure's potential for producing phosphorus pollution is evaluated by measuring its Phosphorus Source Coefficient (PSC). The project determined that an amendment of 10g/L MDR to high-phosphorus manure decreased the PSC by 50%. Several MDRs were tested and the best performing one was from a lime treatment plant operated and maintained by the Pennsylvania Department of Environmental Protection.

All project activities were successfully conducted and all project deliverables were accomplished with the exception of two items that are discussed here. The "Contact" piece of equipment was not fabricated based on the results of the field demonstrations at the Paul Dotterer and Sons Farm and Orner Farm. Additionally, the final field demonstration of the most cost-effective method of MDR utilization was not conducted due to Trout Unlimited's (TU) unsuccessful attempts to solicit another dairy farm for this activity. Funds that were budgeted for these project activities were reallocated to help fund additional collection and sampling of a variety of MDR and manure sources, additional MDR and manure dose/effect tests and lab analyses, lab analyses of MDR sources to screen for hazardous substances according to EPA Section 503 standards for biosolids used in land application, testing to determine effect of MDR upon crop yield, and increased collaboration and planning with agriculture technical experts from the USDA Agriculture Research Service, Penn State University Crop and Soil Science Department, Penn State University Dairy and Animal Science Department, Penn State University Cooperative Extension, Red Barn consulting firm, and TeamAg Inc. consulting firm. A detailed discussion of all the results is found in the final technical report, "Controlling P in Animal Waste Management Systems with Mine Drainage Residuals", available with the provided grantee documents. The single most important result of the project is the demonstration and finding that an amendment of 10 g/L MDR to high phosphorous manure decreased the phosphorus source coefficient (PSC) by 50%.



*MDR treated manure being spread (Orner)*



*Orner field with MDR treated manure*

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

**Integrated Nutrient Management Program (PA)**

University of Pennsylvania

Project #: 2008-0110-006

NRCS CIG Funds: \$607,866

Grantee Matching Funds: \$961,687

Total Project Funds: \$1,569,553

*Project Description:* Implement a nutrient management program in the Lower Susquehanna Subbasin. Project will engage 16-20 dairy farms, increase milk yield and feed efficiency, and reduce annual nitrogen and phosphorus loads by 490,000 pounds and 138,000 pounds, respectively.

*Project Location:* Lower Susquehanna Subbasin, Pennsylvania

*Project Status:* In Closure

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*Final Report Summary:*

The project helped small-holder dairy farms sustain their business (12% growth in milk cow numbers), increase milk output (21% increase in milk volume, 7.8% increase in milk yield per cow per year), enhance herd health and reproductive performance (4% increase in pregnancy rate), and increase nutrient use efficiency and lower excretion of nitrogen (17%) and phosphorous (13%) per lb of milk produced. The project demonstrated that it is possible to achieve sustainable improvements in small dairy operations through integrated management programs that are farm specific, problem solving, efficiency driven, and that address production and environmental issues at the same time. Project outcomes highlight the critical importance of integrated programs focused on helping small farms improve production efficiency to achieve environmental goals.

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



*Fecal collection for nutrient analysis and fecal P*



*One of the Amish farms with component feeding*



*Concrete removed and replaced with deep bedded sand*



*A new free stall barn for lactating cows*

**Chesapeake Nutrient Neutral Fund***Chesapeake Bay Foundation, Inc.*

Project #: 2008-0110-007

NRCS CIG Funds: \$500,000

Grantee Matching Funds: \$495,967

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Total Project Funds: \$995,967

*Project Description:* Establish a self-sustaining nutrient offset market that will leverage private dollars and catalyze support for regional water quality markets. Project will develop watershed-wide nutrient credit standards and create a web-based credit registry.

*Project Location:* Chesapeake Bay Watershed

*Project Status:* Closed

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***Final Report Summary:***

The Chesapeake Fund, a partnership of the Chesapeake Bay Foundation (CBF), the World Resources Institute and Forest Trends, has been established as a division of Forest Trends. The Chesapeake Fund's structure is based on taking businesses and individuals through a four step process:

- 1) Estimate the nitrogen footprint: The Fund helps citizens, businesses, and organizations estimate their impact on water quality using nitrogen calculators and accounting processes to estimate a nitrogen footprint;
- 2) Reduce onsite nitrogen emissions: The Fund encourages citizens and businesses to reduce their nitrogen footprint through simple behavior changes or by providing technical assistance in the development of a nitrogen reduction strategy;
- 3) Purchase nitrogen offsets: For those emissions that can't be reduced, we encourage citizens and businesses to purchase nitrogen "offsets" through the Chesapeake Fund; and
- 4) Invest in best management practices: The Chesapeake Fund invests the offset purchases in on-the-ground, cost-effective nitrogen reduction projects and practices.

Since its inception, the Fund has hired a Fund Director (August 2008); established an advisory board (August 2008); developed a strategic plan (November 2008); released a web-based nitrogen footprint calculator for individuals (December 2008); developed a logo, branding, and marketing materials (December 2008, see attached); completed a market analysis to evaluate the willingness of businesses to participate in the Fund (April 2009, see attached) and capitalized the Fund with \$200,000 in private corporate investments (January 2009). We are close to finalizing an agreement that would put those dollars on the ground. We have developed guidance for: ranking and scoring project proposals (Sept 2009), verification and monitoring procedures for projects (Sept 2009), estimating nitrogen offset credits (Nov. 2009) and assessing the nitrogen footprint of small businesses (July 2010) (see Project Documents). Finally, as detailed below, we have several entities with whom we are working/have worked to assess their nitrogen footprint.

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

**Warm Season Grasses as Cash Crop for Farmers (VA)**

Virginia Polytechnic Institute

Project #: 2008-0110-008

NRCS CIG Funds: \$645,762

Grantee Matching Funds: \$920,400

Total Project Funds: \$1,566,162

*Project Description:* Plant 3,070 acres of warm season grasses. Project will produce an estimated net profitability increase of \$169/acre over corn and reduce annual nitrogen and phosphorus pollution by approximately 164,000 pounds and 13,195 pounds, respectively.

*Project Location:* Statewide Virginia

*Project Status:* In Closure

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*Final Report Summary:*

The Commonwealth of Virginia Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy identified reduction in agricultural runoff as a key strategy for reducing nitrogen and phosphorous in waterways. Planting of warm season grasses (WSG) is a recognized and effective strategy to reduce agricultural runoff, sedimentation, and nutrification of waterways. In order to achieve agricultural runoff reduction targets landowners need a profitable crop that competes with other commodities and meets the objectives of the conservation community.

The overall purpose of the project was to implement an innovative strategy to make the planting of WSG profitable to the landowner either as a stream buffer or whole field planting. The strategy involved the planting of substantial acreage of WSG, monitoring the results of these plantings on the local ecology, and providing outreach and demonstration opportunities to local landowners. There were three primary project goals for the project:

1. Plant native perennial warm season grasses as a viable crop and as streamside buffers in the Virginia Chesapeake Bay watershed.
2. Investigate the economic potential of WSG markets in the region and communicate to landowners for planning their agricultural operations.
3. Monitor the environmental effects (e.g. loading of nitrogen and phosphorous to receiving streams, soil carbon sequestration, and wildlife habitat) of implementation of WSG plantings.

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

This project will close with \$104,238 of NRCS funds remaining unspent of the \$750,000 originally obligated. The award amount has been reduced to \$645,762 to reflect that this project will close under budget.



*Big Bluestem*



*Indian Grass*



*Switchgrass*



*Little Bluestem*

**Chesapeake Water Quality Initiative (MD, PA, VA)**

American Farmland Trust

Project #: 2008-0110-009

NRCS CIG Funds: \$650,000

Other NFWF Federal Funds: \$25,000

NFWF Non-Federal Funds: \$25,000

Grantee Matching Funds: \$650,000

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Total Project Funds: \$1,400,000

*Project Description:* Conduct a multi-state, field-scale demonstration of the Best Management Practices Challenge for Enhanced Nutrient Management. Project will reduce nitrogen loads to the Chesapeake Bay watershed by 190,000 to 260,000 pounds over a three-year period.

*Project Location:* States of Pennsylvania, Maryland, and Virginia

*Project Status:* In Closure

*Final Report Summary:*

The American Farmland Trust (AFT) conducted a multi-state, field-scale demonstration of the Best Management Practices Challenge for Enhanced Nutrient Management with the aim of reducing nitrogen loads to the Chesapeake Bay watershed by 190,000 to 260,000 pounds over a three-year period.

<b>Activity/Objective</b>	<b>Indicator</b>	<b>Baseline</b>	<b>Projected Project Output</b>	<b>Projected Outcome</b>
1. Increase cost efficiencies for nitrogen removal using enhanced nutrient management protocol and <i>Enhanced BMP Challenge</i> .	Cost per pound of N removed.	\$2.98	\$2.68 (10 %)	\$2.23 (25%)
2. Integrate <i>Enhanced BMP Challenge</i> into state and federal conservation incentive programs.	Number of state and federal programs for which <i>Enhanced BMP Challenge</i> is eligible.	0	1 program per state 1 Federal program	6 state programs 3 Federal programs
3. Reduce N applications acres through enhanced nutrient management.	Difference between traditional and ENM N application rates.	0	200,000-270,000 pounds of N reduced per year from participating farms	25 percent of corn acres where program is available
4. Generate water quality trading contracts through enhanced nutrient management.	Total signed contracts.	0	Minimum of 5	25 percent of corn farmers for whom the program is available
5. Initiate cooperative conservation nutrient management program in targeted sub-watershed.	Increase number of farmers and organizations identifying themselves as cooperative on improved conservation performance within selected sub-watershed.	Number cooperating at project start date	30 farmers 10 organizations	Measureable improvements in water quality achieved at sub-watershed level and replications in additional watersheds.
6. Integrate investments in conservation NMPs with farmland that has been permanently protected.	Protected farms gain preferential consideration from programs or markets for ENM adoption.	Not occurring	Minimum of 1 observable preference introduced or demonstrated	Routine preferences for protected farms in all three states.

AFT took a number of steps to reduce the cost of the Enhanced BMP Challenge (Subsequently changed to Planned Nitrogen Reduction, PNR) during the grant period. These included adjusting farmer incentives, targeting higher loading acres, and ultimately, using the BMP CHALLENGE (BMPC) with other practices. To assess our success in meeting the outcome, we compiled the costs for guarantee payments, farmer incentives, and the in-field work by the crop consultants and expressed this in terms of the cost of pounds of nitrogen reduced. AFT did reduce the total cost of N reduction about 7% (from \$2.93 to \$2.73) between the pre-NFWF funding period through 2010; the time period when the project focused on the PNR flat 15% reduction practice. This was below the objective of 10-25%. In 2011, the PNR work terminated and the majority of farmers implemented manure incorporation or injection. That year saw a cost per pound of nitrogen of \$2.35, a 20% reduction. Thus, we were able to show some responsiveness in the cost of the PNR.

The second objective was to integrate Enhanced BMP Challenge into state and federal conservation incentive programs. Our experience in all three states showed that PNR, while it reduces nitrogen at a comparatively low cost (average of \$2.70/lb.), is not a practice to be routinely recommended to farmers as a practice because of the significant and consistent yield losses. However the BMP CHALLENGE has indeed shown itself to be valued by producers and crop advisors, successful at getting practice adoption and relatively low in cost. Please refer to the Final Programmatic Report for details on the specific successes on getting the BMP Challenge integrated with existing programs.

The third objective was to reduce N applications acres through enhanced nutrient management. Technically, we could claim credit for the 2008 crop year as this CIG project started in September, which would make a total reduction of 211,933 pounds over five years. If we count the 4 full crop years beginning after the official starting time of the project, the reduction was 187,275 pounds. In either case, the reductions were lower than we had projected. The reduced rate was due primarily to the change in practices from PNR 15% reduction exclusively, which averaged 27 pounds reduction per acre. After 2009, we began to recruit some PNR fields at a 10% reduction as a cost cutting measure. By 2010, we had numerous demonstrations using precise nutrient management tools other than the PNR and by 2011 we had ceased using the PNR altogether.

The fourth objective was to generate water quality trading contracts through enhanced nutrient management. During 2009 and 2010, AFT and 10 participating farmers generated 6,164 nitrogen credits using the PNR approach practice with verification based on the implementation protocols used in the BMPC system. Ultimately, 4,981 credits were certified by Pennsylvania Department of Environmental Protection (PA DEP). Due to the still small, shallow, and underpriced market, no actual transactions were made and all the credits were donated to the Lancaster Farmland Trust and to the PA DEP rather than being sold.

The fifth objective was to initiate cooperative conservation nutrient management program in targeted sub-watershed. AFT took a leadership role in spurring federal and state efforts to target conservation resources in showcase watersheds in Pennsylvania, Maryland and Virginia. AFT helped initiate discussions about this concept beginning with a town hall meeting on the farm bill's CBWI.

The sixth objective was to integrate investments in conservation BMPs with farmland that had been permanently protected. AFT presented two specific options related to this outcome at a meeting with NRCS Chief Dave White in 2010, that would enhance the linkage of land conservation and investments in BMPs: (1) use the federal Farm and Ranch Land Protection programs as to capitalize on the CBWI funding (currently the Environmental Quality Incentive Program for specific on-farm management practices is the only program receiving CBWI funding); and (2) Encourage more conservation funding to be invested on protected farms by including points in the EQIP program ranking criteria if a farm has an easement. This approach has been adopted by both Delaware and Pennsylvania, and AFT shared the

procedures with Virginia and Maryland. In 2011, AFT started a quite different approach that has provided fruitful results. In collaboration with the USGS, Maryland Department of Planning, and Chris Brosch of Water Stewardship, we have succeeded in providing solid analysis that the current TMDL accounting system is failing to properly value the efficacy of conserved working lands (forests as well) for the long term protection and maintenance of water quality. In fact components of the EPA and Bay Program policy guidance are dis-incentivizing land conservation.

Additional materials related to this project include:

**[Maryland Nutrient Trading Program – Introductory Video](#)**

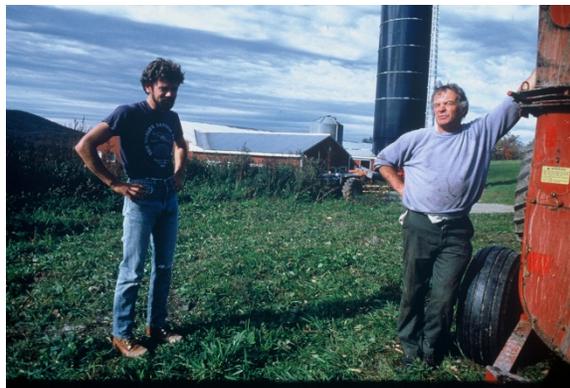
Developed by AFT under contract to Maryland Department of Agriculture (MDA) in 2010

**[Hooking the Slippery Fish: N Efficiency in a Water Quality World](#)**: AFT sponsored presentation to producers and crop advisors on BMP CHALLENGE, Precision Nutrient Management and Precision Dairy Feeding. Audio and Presentation broadcast by PSU Center for Agriculture and the Environment.

**[Conserving Chesapeake Landscapes](#)**: AFT served on the publication’s advisory committee and assisted in identifying technical experts and organizing the listening session. We provided significant input to drafts and presented the report for the first time at the Chesapeake Bay Watershed Forum. The website for this report can be accessed [here](#).



*AFT, Crop Advisor, and Farmer at BMPC soil test*



*Lancaster BMPC Participants*



*N Credit Donation to Lancaster Farmland Trust*

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

**Cacapon Watershed Restoration Collaborative (WV)**  
*West Virginia University Research Corporation*  
Project #: 2008-0110-010

NRCS CIG Funds:	\$625,395
Grantee Matching Funds:	\$650,000
<b>Total Project Funds:</b>	<b>\$1,275,395</b>

*Project Description:* Demonstrate how environmental improvements can increase the economic capacity of farmers in the Cacapon River watershed. Project will stabilize 3,700 feet of stream, establish 10 acres of warm season grasses, and plant 5,000 native trees and shrubs.

*Project Location:* Hampshire County, West Virginia

*Project Status:* In Closure

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*Final Report Summary:*

The overriding objective of this project was to implement on-the-ground demonstration areas to show how environmental improvements can take place along with increased economic capacity by farmers in the Cacapon watershed. Our long-range goal is to maximize improvements in water quality, wildlife habitat, and pollinator diversity and abundance, while simultaneously improving the economic vitality of farmers by changing the current cultural norms of farmers in headwater areas of the Chesapeake Bay.

Study results suggest positive changes in stream morphology, non-point source pollution and riparian buffer conditions following stream restoration. One year following completion of restoration, the average abundance and diversity of woody vegetation was higher than control and reference reaches. Water quality testing above and below restoration site during active construction phase indicated much higher turbidity readings below the restoration reach, suggesting that the reach was a large source of sediment during this time. However, similar testing at these sites a year after construction was completed revealed similar turbidity readings above and below the restoration sites. Total phosphorus, nitrate and total suspended solids decreased downstream of treatment sites after restoration. Overall however, no statistically significant difference in nutrient and sediment concentrations were measured across study reaches. Macroinvertebrate samples taken across this time period suggested that benthic community composition over time were reflective of these changes in water quality over time but responded favorably to restoration. Channel morphology varied within and across study reaches during the study period, however mass balance calculations indicate that sediment and nutrient erosion from across study reaches decreased dramatically in sites following restoration. Pollinator corridors were established at restoration sites through the planting of 5,000 trees and shrubs representing a pollinator corridor of over 5 acres. Post-construction public meetings with landowners and resource agency personnel across the watershed as well as presentations at regional conferences have reported project successes as well as lessons learned. Such outreach ensures continued interest by regional landowners as well as the continued application of effective restoration methods into the future.

This project will close with \$24,605 of NRCS funds remaining unspent of the \$650,000 originally obligated. The award amount has been reduced to \$625,395 to reflect that this project will close under budget.

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



*Photograph of the Joe Frye/Rudolph restoration reach prior to restoration, taken during March 2010. Mr. Jackie Rudolph's property is on the left, Mr. Joe Frye's property on the right.*



*Photograph of the Joe Frye/Rudolph restoration reach taken during July 2010. Mr. Rudolph's property is on the left, Mr. Joe Frye's property on the right. Note the native tree plantings (with white tree tubes) and log vane on the right, and the electric exclusion fencing visible on the left.*



*Photograph of the Joe Frye restoration reach during restoration, taken during May 2010. Notice how the eroded banks (see Figure 4) were terraced to provide a gentler slope and small floodplain to decrease erosion and increase aggregation of sediment.*



*Trees and shrubs were planted on both sides of the restoration reach to re-establish the riparian zone and aid in bank stabilization. Tree tubes were placed around every sapling to prevent herbivory, taken during June 2010.*

## **Nitrogen Management During Corn Production**

*University of Delaware*

Project #: 2008-0110-011

NRCS CIG Funds: \$550,000

Grantee Matching Funds: \$550,229

Total Project Funds: \$1,100,229

*Project Description:* Use innovative sampling and monitoring to improve nutrient management on 900 cornfields based on specified crop requirements. Project will reduce the amount of fertilizers applied while sustaining productivity.

*Project Location:* Chesapeake Bay Watershed (States of Maryland and Delaware)

*Project Status:* In Closure

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### *Final Report Summary:*

The Chesapeake Bay is the largest estuary in the United States and represents an extremely important ecosystem and food web. The quality of the water in this bay has been in jeopardy for decades, and one of the contributing factors to the reduced water quality is excess nitrogen (N). Nitrogen is a very important element that is required by crops for optimal production and is especially important during corn production. Of all the crops grown in the Chesapeake Bay region, corn requires the largest applications of N fertilizer to optimize production. This N that is applied to fields as fertilizer or manure during corn production can be lost from these fields when excess rainfall occurs. There has been substantial evidence generated to show that excess N does leach from soils and can result in elevated nitrate concentrations of our nation's water supplies.

During the production of corn, if too little N is applied, a substantial loss in farm income can occur because of decreased corn yield. However, if too much N is applied, this extra N will most likely leach out of the rooting zone and eventually find its way into ground or surface water supplies, such as the Chesapeake Bay. The challenging part of N management in corn is determining the difference between the optimal rate and any rate above this optimal. From a plant health or yield standpoint, it is impossible to determine the difference between the optimal rate and any rate greater. This means that a grower cannot tell the difference between the economic optimum rate and a rate as much as 100 lb/acre too much or even higher.

This project proposed using the cornstalk nitrate test in conjunction with remote sensing to demonstrate the value of an end-of-season assessment of N management practices. This cornstalk nitrate test was first developed in the early 1990s by the lead investigator of this proposed project. The test has been widely evaluated and shown to be of value in other research projects throughout the corn growing regions of the United States; however, this test has never been widely adopted as an N management tool in production agriculture. Recent evidence suggests that this cornstalk test has potential to improve grower confidence when managing N during the production of corn. We feel there is a strong need to develop a performance-based N management system that could be used to evaluate the degree of accuracy of current corn grower N management systems while at the same time give corn producers greater confidence in their abilities to manage N because of (1) the importance of water quality in the Chesapeake Bay; (2) the amount of corn grown in the region; and (3) the fact that we currently have no way of evaluating current N practices.

Objectives of the Project included: (1) Evaluate the N status of 900 cornfields (300 per year) in the Chesapeake Bay region of Maryland and Delaware using guided stalk nitrate sampling and remote sensing; (2) Evaluate alternative N practices (e.g., rates, timing, forms) on 75 cornfields (25 per year) in the Chesapeake Bay region of Maryland and Delaware; (3) Develop and evaluate a performance-based N

recommendation system; (4) Reduce the amount of N applied to corn in the Chesapeake Bay watershed; and (5) Create a “paradigm shift” in our current N recommendation system.

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

# NFWF Contact Information

Questions or comments regarding this report should be directed to the contacts listed below.

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