

National Fish and Wildlife Foundation
Final Programmatic Report

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Project Name Chesapeake Water Quality Initiative

Organization Name American Farmland Trust

Organization Web Address www.farmland.org

1) Summary of Accomplishments

In four to five sentences, provide a brief summary of the project's key accomplishments and outcomes that were observed or measured.

2) Project Activities & Results

1. Evaluation Logic Framework:

Each Log frame outcome from the proposal is reproduced here with comments on the extent of accomplishment immediately below.

ACTIVITY	INDICATOR	BASELINE	PROJECTED PROJECT OUTPUT	PROJECTED OUTCOME
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 percent)	\$2.23 (25 percent)

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. (See Table 1 in Attachments).

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 to 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.

Key Factors:

- ◆ Corn prices were the most important factor in overall costs since the price is part of the guarantee "fee" or premium the project paid to Agflex to cover each demonstration. Corn prices ranged from a low of \$2.20 per bushel in 2006 to a high of \$6.01 in 2011. For each increase of a dollar in the price of corn, PNR costs increased by approximately \$16 per acre and \$1 per pound of N-loss reduction.
- ◆ The biggest reduction factor was in lowering and ultimately eliminating the farmer incentive payment rates. These incentives were deemed necessary because of the anticipated yield losses. They went down 50% in 2010 and resulted in a 30% reduction over all. When other practices were employed, the incentive was dropped all together. Farmers found sufficient value in the practices that stressed nutrient efficiency rather than a flat percentage cut not to need an incentive.
- ◆ Changing to more precise nutrient management practices was also an important factor. Manure incorporation/ injection (introduced in 2010 and making up the majority of acres in 2011) and "12, is a far less risky practice, averaging \$21 per acre in payouts as compared to \$39 for PNR. Table one show the cost per pound of N at \$2.35 for that year. Had it not been for one field that produced a freakishly large loss, the cost would have been just \$11.

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
<p>This objective implies two things. First that the BMP CHALLENGE Adaptive Management system (that combines expert technical expertise for the producer, an on-farm demonstration and a yield guarantee) would be integrated into state/federal programs. Second that the "Enhanced BMP CHALLENGE" (aka PNR, 10-15% N reduction from university recommendations) would be integrated as a BMP. Our experiences 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 farmers as a practice because of the significant and consistent yield losses. In fact, Dr. Douglass Beegle of Penn State University Extension was unwilling to use the term BMP for the PNR. 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 (See below in Lessons Learned and in Attachment 1, Feasibility Study Page 28).</p> <p>We had four specific successes getting the BMP Challenge integrated with existing programs, though we were unable to get the full endorsement from NRC as we had hoped:</p> <ul style="list-style-type: none"> ➤ The BMPC was an integral part of the nutrient credit trading protocol approved by PA DEP in 2009 and used to generate credits that were approved and certified by the PADEP Trading Program. ➤ The Maryland NRCS created a payment schedule for the BMPC in connection with manure incorporation using CCPI/EQIP funding. This was run with seven farmers for three years. The schedule made a small payment to farmers and covered portions of the technical assistance and guarantee payment costs of the project. ➤ In 2010 in Virginia and in 2012 in Pennsylvania, technical partners (NRCS Field Agronomists, Richard Fitzgerald and Dr. Doug Beegle), independently identified the BMPC as the most appropriate tool to increase adoption of the pre-sidedress nitrate test, a basic tool for enhancing adaptive nutrient management. The Virginia project is nearing the end of its first year and efforts are being made to fund it for two more years. The PA work was submitted as a joint proposal of AFT and PSU Extension to the DEP Growing Greener program. ➤ AFT held extensive consultations with NRCS PA, MD and Headquarters staff in 2010 about a pilot effort to integrate the BMPC into national programming. We had support from the states and a number of headquarters senior staff. NRCS Chief Dave White requested the State offices to use the Agricultural Management Assistance Program to create a payment schedule to include guarantee payments and program administration costs. Unfortunately, some administrative difficulties and differences of opinion on technical issues meant that AFT was unable to secure NRCS Headquarters funding to support the <i>BMP Challenge</i> directly. 				
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
<p>Technically, we could claim credit for the 2008 crop year as the CIG started in September and AFT time contributed to the project was counted as match. That would make a total reduction of 211,933 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 that the PNR and by 2011 we had ceased using the PNR altogether. Geography and culture also played a role as we changed recruiting criteria that resulted in farmers with less acreage. In Pennsylvania we made a conscious effort to recruit Plain Sect farmers who generally have smaller operations. We also targeted farmers in Lebanon county PA (in an attempt to get some located in the Conewago Showcase Watershed) and also in the Shenandoah valley who likewise have smaller fields due to topography. These farmers, averaged 40 acre per demonstration field rather than 100+ that we experienced with larger dairies and grain farmers mainly in Lancaster County in the first two years. We also had several demonstrations that failed due to weather related causes so that no nitrogen was in fact applied after planting. In the end, the reductions averaged about 20 pounds per acre.</p>				
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

<p>Over 2009 and 2010, AFT and 10 participating farmers generated 6164 nitrogen credits using the PNR approach practice with verification based on the implementation protocols used in the BMPC system. Ultimately, 4981 credits were fully certified by DEP. The farmers participating in 2010 received certifications valid for three years. Subsequently, five farmers agreed to generate credits in 2011, using PNR, as part of a credit auction organized by PennVest. AFT developed formal contracts to use with the farmers and with Environment Banc and Exchange (an ecosystem services aggregator), to generate and deliver the credits in the event that bids for purchase were accepted. 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.</p>				
5. Initiate cooperative conservation nutrient management program in targeted sub-watershed.	Increase number farmers and organizations identifying themselves as cooperating on improved conservation performance within selected sub-watershed.	Number cooperating at project start date.	30 farmers 10 organizations	Measurable improvements in water quality achieved at sub-watershed level and replications in additional watersheds.
<p>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. When then-State Conservationist Craig Derickson decided to target efforts in the Conewago Watershed, AFT collaborated with Dr. Saacke Blunk of PSU's Center for A&E and others to develop the concept. Throughout the grant period, AFT served on several showcase watershed committees and attended and presented at meetings. However, repeated efforts to recruit farmers in the Conewago and Upper Chester met with no success largely due to timing issues and a greater emphasis on structural practices than on nutrient management.</p>				
6. Integrate investments in conservation BMPs 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.
<p>As previously reported, AFT held a meeting with the chief of NRCS, Dave White in 2010 on this topic along with the former board chair of the Maryland Farmland Protection Foundation and the MALPF executive director. We presented two specific options related to this outcome that would enhance the linkage of land conservation and investments in BMPs.</p> <ul style="list-style-type: none"> ➤ Use the federal Farm and Ranch Land Protection Program 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.) ➤ Encourage more conservation funding to be invested on protected farms by include 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. <p>In 20011, AFT started a quite different approach that has provided fruitful results. In collaboration with the USGS and MD 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. Through our research and collaborations we have:</p> <ul style="list-style-type: none"> ➤ Determined that the actual load value that the CBP Model assigns Ag land is 20 percent less than that of developed land when those comparisons are done correctly. ➤ Supported modeling analysis that shows how protective land use policy can act as a water quality BMP by affecting the loads of future growth and participated in pushing policy based on that view. ➤ Worked to ensure that ag land, most especially preserved ag land, be understood to provide the essential "nutrient offset capacity" that every state, county and township in the Bay watershed will be required to have if they are to enjoy population or economic growth once the TMDL cap has been met. (See Attachments 2 & 3). <p>AFT's accomplishments in this area can be seen in aspects for the Maryland "Accounting for Growth" policy that owes some of its features to analysis and dialogue conducted and convened by AFT (according to Joe Tassone of the MD Department of Planning). We are in the process of convening a series of meetings and dialogues in the next several months that we hope will result in additional policy changes.</p>				

Additional Activities

1. **BMP Challenge on-farm demonstrations:** Over the four years of the grant, AFT worked with 12 crop advisors to implement the BMPC with 73 farmers on 9,400 acres. All demonstrations in the first crop year were with the PNR. In 2010 we began to branch out to other practices, ending the PNR in that year. In 2011 and '12 we had shown the efficacy of the BMPC with working 8 different nutrient management or nutrient efficiency practices as well as conservation tillage. Our main recruitment was through 2 crop consulting companies (TeamAg and AET) who do not sell agronomic products but rather sell nutrient consulting services. We also worked with one extension agent (Lebanon County) two university researchers and, in Virginia, three recently graduated Virginia Tech dairy science students.
2. **Change in crop advisor recruiting:** In 2011 crop season, AFT revised our approach to recruiting farmers and crop advisors. In previous years the participants were recruited by a contracted private crop advisor company (TeamAg or AET) that had a target number of producers to recruit, based mainly on the project budget. This single source arrangement made sense at the outset when the objectives were to demonstrate how the BMP CHALLENGE operates and determine the efficacy of the Planned Nitrogen Reduction practice. But as the project moved to wider array of nutrient management practices and the issue of getting to scale became more prominent, we decided to adopt a more "retail" approach. This change influenced how we reached identified producer cooperators, their advisors and the practices that we would guarantee. For the last two years, we have used meetings, mailings and webinars to engage with a broader, region-wide audience that included Ag retailers, independents, extension and district staff as well as companies like Team Ag and AET. They included an Agricultural Research Service researcher focusing on variable rate nitrogen applications; a second consultant from AET, who facilitated a collaboration with Willard Agri-Services, one of the largest ag retailers and consulting companies in the Mid Atlantic; Delbert Voight, Penn State Extension agent in Lebanon County who focused on tillage practices; Dr. Josh McGrath, Nutrient Management Specialist; an independent consultant in Lancaster County; An NRCS agronomist in the Shenandoah Valley; and finally three different Virginia Tech recent alums recommended by of Dr. Katherine Knowlton of Virginia Tech.

As a result, we have expanded our practice mix and consulting partners considerably. We are still finding it difficult to engage the private companies that provide mainly product sales to farmers. As one Ag retailer put it "There are guys losing money because we are doing what they tell us to do instead of what we would recommend that they do." The remark is telling not only for what it says about some producers, but what it says about the dilemma that some in the retail ag business face, that nitrogen efficiency can be seen as conflicting with a business model focused primarily on product sales. More sophisticated producers, who understand bottom-line implications are more likely to actively seek advice from public or private farm advisors, participate in cost share programs and drive the leading edge of greater efficiency. Yet many acres remain untreated with basic practices when farmers are not as driven by knowledge and net returns calculations and industry is slow to adopt more consulting-based business models. This is a good opportunity for the BMPC approach, but without more advisors recruitment is a challenge.

7. Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project's methods, monitoring, or results. How could other conservation organizations adapt their projects to build upon some of these key lessons about what worked best and what did not?

- a) **BMP CHALLENGE for Nutrient Management is a highly workable and cost effective method to gain adoption of improved practices compared with other conservation practices:** A feasibility study, funded by the PA Growing Greener matching grant, analyzed BMPC non-PNR results from this project and nationally through 2010. Even with the payouts for negative net returns, the Nutrient BMP CHALLENGE is highly competitive with other practices when comparing the cost of reducing nitrogen losses. Cover crops, a popular practice being promoted in the Chesapeake Bay region to achieve nutrient reductions, cost \$7.34 per pound based on state and federal cost-share payments. This

compares to \$4.14 per pound in the Nutrient BMP CHALLENGE, a 43% difference. Unlike cover crops that require additional annual investment by the farmer for seed and planting costs, most Nutrient BMP CHALLENGE farmers reported a reduction of N application rates on a majority of their acres after one year of participation without additional assistance. Eighty-eight percent of respondents to a 2011 survey said they were continuing or planning to continue the new practice (or modified form of the practice) after their experience. BMP CHALLENGE methods and mechanics are attractive to both producers and crop advisors alike. AFT believes that the unique structure of the BMPC, on-farm expert technical assistance, an in-field comparison and the yield guarantee, is the reason for this success. Each of these components fits with the way farmers think and operate and addresses key barriers to adoption – knowledge, yield risk and a crisp, straight forward sign up and implementation procedure.

- b) **Adoption risk is real and needs to be addressed.** Our work with the PNR showed that PSU nutrient recommendations are not conservative and that farmers cannot cut applications by 10% to 15% without suffering significant yield loss (unless precise methods are used to increase nutrient use efficiency). Also, the BMP CHALLENGE™ results with practices other than PNR demonstrate the risk involved in implementing even basic nutrient management. Forty percent of 100 fields participating in various nitrogen management practices experienced a loss, even if small precisely because nitrogen availability is subject to so many factors in a given year. It is, as we say a “slippery fish. Thus, fear of loss is a major – and justifiable - barrier to adoption. Farmers need to be able to use practices for a sufficient amount of time in a “safe” environment and to be assisted in focusing on the net profitability of the practices. This approach helps to focus attention on practices that work for farms as businesses and clean the water at the same time.
- c) **Based on these experiences, Nutrient BMP CHALLENGE represents an opportunity to significantly reduce N loadings into the Bay** in a proven, cost effective way that allows farmers to gain experience with nutrient management and then apply it to additional acreage. Assuming Bay producers apply nitrogen at similar rates and experience similar results to those found in the Feasibility Study, it is possible that a one-time investment of \$6 million in scaling up the Nutrient BMP CHALLENGE to address 104,000 acres (25% of the 417,000 Pennsylvania corn acres that are at highest risk for N losses) would result in a direct reduction of 1.13 million pounds of N load to the Chesapeake Bay.

To realize this potential, a new effort is needed to apply the Nutrient BMP CHALLENGE to increase the adoption of Land Grant University recommendations in key corn-producing regions that are most at risk of N losses. This effort can accelerate adoption of the range of recommended adaptive nutrient management practices to increase nitrogen use efficiency. These include basic practices such as split N applications, using PSNT or chlorophyll meter readings and full crediting of manure N values. They also include new technology, such as active sensors with the potential to more accurately distribute sidedress N based on need within specific areas of the field. All such practices could be supported by the BMP CHALLENGE.

AFT has submitted a proposal to the PA DEP for just such a project (on a much lower scale) focused on demonstrating the effectiveness of the pre sidedress soil nitrate test in guiding farmers to determine their final spring fertilizer application. According to our principal collaborator, Dr. Beegle, *“If we could reduce the risk associated with following the PSNT recommendation, that would hopefully give more farmers confidence to follow these recommendations. That to me is the beauty of the BMP Challenge.”*

- d) **A holistic conversation about adaptive nutrient management.** A complaint about the BMPC that was frequently voiced, particularly by private crop consultants and agronomists, was that it focuses on a single practice rather than addressing the numerous steps involving the timing, rate, placement and product selection for an enhanced or precision fertilization plan... Over the life of the project, AFT has adapted our approach to address a more holistic view but also, seen the value of a single practice focus.

Each year in the winter, we convene the participating farmers in their separate states to review the results of their demonstrations jointly, and to discuss what could be learned. At this point, the meetings have expanded to include more people and a broader conversation. We were initially

inspired by the approach used by the Bay Farms Network where farmers were encouraged to discuss and debate and learn from each other – using their collective experience to, in effect, multiply their data set of understanding of the dynamics of the nitrogen cycle. In Virginia in the last two years we have also been inviting additional, non-participating farmers so that they can both add their own experience and multiply the number of farmers influenced by the experiences of the participants. We have also invited additional agency staff that is collecting data on the topic to further enrich the discussion. Finally we have invited private consultants in to take part as well. We can again benefit from their perspective and, we hope influence their views as well. As this conversation grows, the single practice that farmer is testing becomes one piece in the puzzle of management decisions that the farmers are making not only to balance nutrients but build soil health, be profitable..

While we see the importance of getting to this more sophisticated conversation, we still retain the single practice focus. In part this is simply the nature of the BMPC that it can only compare one variable at a time. But it is also because, while it is easy to get excited about the bells and whistles of technology and astonishing complexity of high end nutrient management, there are still many basic practices that are not being fully adopted or only partially so. The CEAP reports from NRCS confirm this, as do data from many field technicians. The BMP CHALLENGE brings a simple yet well-tested approach: have a trusted advisor work one-on-one with the producer, set up a real world comparison at a scale that means something and take out the risk so s/he can sleep at night. Allow the farmer to test and evaluate the experience. Then, with experience as the base, broaden the context to other aspects of the system. While high end technology will be an essential part of keeping farms profitable and the water clean, we must ensure that the basics are being addressed on the leakiest operations and bring them up the management curve.

8. Dissemination

During the project period, the AFT Mid Atlantic Director presented at or contributed to well over 60 meetings and events engaging over 2000 participants. These included large conferences such as the USGS Alternative Futures, The Goal Line Conference on Nutrient Management and the annual Ag Networking Forum. It also included regular meetings of the Waste Solutions Forum, the PA Farmland Protection Association and meetings of the showcase watersheds. In each state we have held end of year meetings where participating farmers hag

9. Project Documents

- Photos are included in an Email Attachment
- Several project deliverables are described here with links. Additional project documents and press articles are being sent via post...

Maryland Nutrient Trading Program - Introductory Video (Click on video at bottom of page)
Developed by AFT under contract to 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.

Alternative Futures Sponsored the USGS conference, Alternative Futures: Accounting for Growth in the Chesapeake Bay Watershed, along with The Nature Conservancy and National Center for Smart Growth. Held on September 15 in Baltimore, the goal was to gather input from more than 50 Bay state and county planners regarding land use policies and priorities for growth and conservation. Their comments served as input for developing a number of land use scenarios showing how more or less protective policies would impact water quality.

Nutrient Processing

The Maintain Healthy Watersheds Goal Implementation Team (GIT4) collaborated with the Scientific and Technical Advisory Committee (STAC) to convene a workshop in March, 2012 to consider whether there is a scientific basis for changing Chesapeake Bay Watershed Model nutrient and/or sediment processing rates that are assigned to natural landscape features. As a Workshop Planning Committee member, Baird worked on the initial scoping document and workshop and on the final workshop design. AFT pushed for the inclusion of working lands in the event agenda. While the focus was ultimately narrowed to natural features, we successfully demonstrated that any mechanism inserted in the TMDL process to credit conserving natural lands would apply to agricultural land as well.

Comparing Water Quality Impacts of Agricultural and Urban Land Uses in the United States: A Literature Review. This is a review of publications that assess the contributions to water pollution loadings from different land uses.

Modeled Value of Agricultural Land Conservation/Preservation in Baltimore Co and Maryland: AN analysis: An analysis of model loading data with parameters that reflect the realities of agriculture and development nutrient pollution.