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PERFORMANCE PROGRESS REPORT
SF-PPR

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1 Federal Agency and Organization Element to Which Report is Submitted USDA - Natural Resources Conservation Service	2. Federal Grant or Other Identifying Number Assigned by Federal Agency NRCS 69-3A75-7-124	3a. DUNS Number 879176188	
		3b. EIN 52-6002033	
4 Recipient Organization (Name and complete address including zip code) Maryland Department of Agriculture, Office of Resource Conservation 50 Harry S. Truman Parkway Annapolis, MD 21401		5 Recipient Identifying Number or Account Number 53105	

6. Project/Grant Period		7 Reporting Period End Date	8 Final Report? ☑ Yes ☐ No
Start Date: *(Month, Day, Year)*	End Date: *(Month, Day, Year)*	*(Month, Day, Year)*	9. Report Frequency ☐ *annual* ☑ *semi-annual* ☐ *quarterly* ☐ *other* *(If other, describe:* _____ *)*
10/01/07	12/30/10	12/30/10	

10 Performance Narrative *(attach performance narrative as instructed by the awarding Federal Agency)*

Piloting Point Source to Non-Point Source Nutrient Trading in the Upper Chesapeake Bay

A) Purpose of Grant:

Development of the policies and guidelines for an agricultural non-point source nutrient trading program in Maryland, refinement of quantifiable nutrient reductions associated with the implementation or installation of agricultural best management practices (BMPs) related to trading, and the demonstration of nutrient trading in the Chesapeake Bay watershed

B) Deliverables:

1. Develop policy and guidance documents
2. Research and refine quantifiable estimates of nutrient reductions for agricultural BMPs

11. Other Attachments *(attach other documents as needed or as instructed by the awarding Federal Agency)*

12. Certification: I certify to the best of my knowledge and belief that this report is correct and complete for performance of activities for the purposes set forth in the award documents.

12a. Typed or Printed Name and Title of Authorized Certifying Official John C. Rhoderick, Administrator	12c Telephone *(area code, number and extension)* 410-841-5896
	12d Email Address rhoderjc@mda.state.md.us
12b Signature of Authorized Certifying Official John C Rhoderick	12e Date Report Submitted *(Month, Day, Year)* 12/06/11
	13. Agency use only

OMB Approval Number: 0970-0334
Expiration Date: 6/30/2009

3. Conduct stakeholder forums to gather input on nutrient trading involving non-point sources
4. Develop a website to promote and facilitate nutrient trading
5 Develop an economic evaluation of program costs and incentives
6. Attend one national meeting hosted by the Natural Resources Conservation Service (NRCS)

C) Performance Narrative:

In January 2008, the Maryland Department of the Environment (MDE) issued a document entitled *Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed,* representing the initial phase of the state's policy development on nutrient trading. This document describes the purpose and form of nutrient trading in Maryland and sets forth the fundamental principles and guidelines for Maryland's trading programs. It also details the requirements and procedures for point source to point source nutrient trades.

To complement and build on MDE's efforts focused on point sources, the Maryland Department of Agriculture (MDA) initiated a second phase in the fall of 2007 by creating an advisory committee comprised of a diverse group of expert stakeholders from state and federal agencies, regional and national organizations, and private industry to address the opportunities for trading involving non-point sources. Since MDA staff wished to participate in the development process, MDA contracted with Dr. Mark M. Bundy, who is the former Assistant Secretary of Chesapeake Bay Programs at the Maryland Department of Natural Resources, to act as facilitator for the then newly formed Maryland Agricultural Non-point Nutrient Trading Advisory Committee and oversee the preparation of the necessary documents and tools. Two contracts were executed covering the development and roll-out phases of Dr. Bundy's assigned responsibilities, and the deliverables for each were as follows:

Bundy I

1. Develop expectations, objectives, work plan, timeline, and operational logistics for the Advisory Committee
2. Schedule and conduct Advisory Committee meetings to draft, discuss, and review relevant principles and policies and establish appropriate criteria and guidance within the context of the Chesapeake Bay Model and Maryland's conservation and water quality goals
3. Provide tape recordings and minutes of each Advisory Committee meeting as well copies of all discussion papers and other handouts
4. Develop and disseminate draft, interim, and final policies and guidelines for Maryland's non-point nutrient trading program

Bundy II

1. Coordinate and facilitate a series of meetings for the general public as well as a targeted audience including elected state, county, and municipal representatives, county and municipal professional staff, local conservation groups, and potential program participants from the agricultural community and private industry for the purpose of introducing Maryland's nutrient trading program and obtaining comments, questions, and suggestions related to the policies and guidelines governing the program
2. Provide copies of all materials and handouts and prepare summary notes of each public meeting and analyze public comments and other feedback
3. Participate as appropriate in educational workshops and meetings with MDA
4. Schedule and facilitate follow-up Advisory Committee meetings as needed to provide oversight and guidance of the ongoing program
5. Provide tape recordings and minutes of any follow-up Advisory Committee meetings as well as copies of all agendas, discussion papers, and other handouts

A series of seven meetings was held throughout the fall and spring, and in April 2008, the Advisory Committee issued two draft documents *The Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed Phase II A—Guidelines for the Generation of Agricultural Nonpoint Nutrient Credits*, and *Phase II B—Guidelines for Agricultural Nonpoint Credit Purchases*. These documents provide the requirements and procedures for generating credits from agricultural sources for purchase by point sources and other interested buyers and describe the mechanism for the exchange of credits between buyers and sellers (copies of these documents as well as the minutes from every meeting were attached to the quarterly report submitted January 22, 2009).

In order to implement program policies and conduct trading, MDA turned, like other agency counterparts in neighboring states Pennsylvania and West Virginia, to the World Resources Institute (WRI) to adapt and customize that organization's NutrientNet suite of web-based tools to support and facilitate nutrient trading in Maryland. In the fall of 2008, contracts were executed with WRI and two of its collaborative partners, Drive Current and the University of Missouri Center for Applied Research and Environmental Systems (CARES), to develop the following components: a Maryland assessment tool for use in estimating nutrient loads and reductions, determining baseline compliance, and calculating credits generated by agricultural BMPs; a registry to catalogue certified credits and completed trades; a marketplace to enable participants to post, track, and trade credits and manage individual accounts; an administrative module to assist MDA in supervising the overall program and generating relevant reports, and an interactive mapping feature to delineate field boundaries and retrieve and forward allied information. WRI was also tasked with composing website text and compiling a program user manual based on the non-point source trading policy documents. Deliverables for each contract are detailed below:

WRI I

1. Oversee the day-to-day progress of the calculation tool and other modules and provide guidance to the collaborating vendors as necessary
2. Gather and synthesize system requirements and necessary data for trading tool and website development
3. Develop an acceptable methodology for the calculation of agricultural loads and refine existing models to reflect site-specific conditions and factors affecting nutrient reduction efficacy
4. Compile a list of agricultural BMPs to be included in the calculation tool and produce credible, transferable estimates of nutrient reductions achieved through implementation of those BMPs
5. Prepare nitrogen and phosphorus calculation spreadsheets for use in the online tool
6. Assist Drive Current as needed in providing an option for the integration of the NRCS Nutrient Trading/Tracking Tool (NTT)
7. Participate in testing and simulations and provide technical assistance in the development and deployment of the online tools
8. Supply written text and applicable illustrative materials for the program website and deliver draft user manual
9. Conduct training sessions for MDA staff and attend outreach meetings for stakeholder groups
10. Prepare a draft for an ongoing service agreement
11. Submit quarterly reports

Drive Current I

1. Adapt WRI's NutrientNet application for use in Maryland
2. Set up the website and customize each of the applications for the credit assessment and calculation tool, the marketplace and registry, and the administrative module
3. Integrate the interactive mapping feature and incorporate the data sent by the map application into the credit calculation application
4. Develop an option to permit the incorporation of the NTT and test the comparable reduction data
5. Deliver a beta version of the calculation tool and other web-based components for selective testing
6. Rework and de-bug the tool applications as necessary and deliver an interim demonstration version for wider-scale testing
7. Participate in simulations and testing as needed and make changes as appropriate within the contract scope
8. Submit quarterly reports

CARES I

1 Develop a Google Map application programming interface (API) for field boundary delineation

2. Incorporate new data sets, including Total Maximum Daily Loads (TMDLs), watershed segments, Chesapeake Bay Model efficiencies, soil types, and precipitation
3. Set up the online interface to collect field boundary coordinates and calculate field area, query and summarize data, and pass all parameters to the nutrient reduction and credit calculations on the dedicated server
4. Participate in the testing and evaluation of the resulting tool

By the spring of 2009, the development of the initial version of the calculation tool was nearing completion, drafting of the users' manual had begun, and the program website was established with access at all three of the prominent domains, www.mdnutrienttrading.com/.org/.net. However, because of delays caused by the ongoing cycle of testing of the beta version of the online tool as well as the need for some major modifications to the mapping function, MDA extended WRI and Drive Current's contracts and Dr. Bundy's second contract. MDA also executed a supplemental agreement with CARES, and the deliverables for that contract follow:

CARES II

1. Revise tool functionality to permit parcel-level delineations
2. Enhance tool functionality to support the subdivision of parcels into individual fields, the assignment of unique field identifiers, and the capacity to edit entries
3. Modify the interface to enable the submission and retrieval of parcel and multiple field data
4. Provide a read-only map displaying multiple fields and titles as part of the summary page

In August 2009, MDA hired a full-time coordinator to manage the ongoing development of the calculation tool and other online modules, oversee the implementation of Maryland's nutrient trading program, and plan for the growth of a comprehensive ecosystem marketplace within the state. Specific responsibilities of this position include: supervision of the credit verification, certification, and contract review processes; administration of the online marketplace and registry; coordination of the trading program's Advisory and Technical Review Committees; maintenance of partnerships or relationships with MDE, the Chesapeake Bay Program, local soil conservation districts, and other relevant agencies and entities; organization of outreach meetings, educational sessions, and training workshops; promotion of Maryland's trading program and dissemination of information on nutrient and other environmental markets; evaluation and communication of program progress and performance; and participation in interagency and interstate efforts to foster ecosystem markets and create a common nutrient trading platform among the Chesapeake Bay states.

Since MDA had been cooperating with NRCS in the development of the NTT for close to a year and Carroll County, Maryland was one of the pilot sites selected for NTT prototype calibration and testing, MDA received additional NRCS funding in the fall of 2009 to integrate the NTT into the complementary NutrientNet model for use in the Maryland

trading program. The resulting enhanced tool was designed to incorporate county-specific crop, management, soil, weather, and other requisite agronomic data from the NTT into the customized Maryland tool providing Bay Model conservation practice efficiencies and watershed delivery and retirement ratios.

In February 2010, a bill giving MDA the authority to establish an agricultural certification, verification, and registration program in support of nutrient trading was written and introduced in the Maryland General Assembly. After committee hearings during the following two months, the bill passed unanimously in both the House of Delegates and the Senate. The legislation was signed by Governor O'Malley in May and became effective as of June 1, 2010.

Also during that spring, MDA initiated the development of a needed component of credit computations for livestock and poultry production/confinement areas for integration into the enhanced tool. Additional contracts with both WRI and Drive Current were negotiated when testing and simulations revealed that this much more complex version of the Maryland platform required not only changes in tool calibrations and baseline calculations, but also major modifications to the functionality of the website marketplace, registry, and administrative units. Deliverables for those contracts are outlined below:

WRI II

1. Gather requirements for all necessary modifications and improvements to the web-based tools, including the addition of automated data entry on credit applications and the capacity to download and print documents and forms generated online for submission
2. Provide assistance and analytical support to Drive Current as modules are tailored to reflect the needs of Maryland's Nutrient Trading Program and the latest changes implemented in the NutrientNet platform
3. Ensure that data in the credit registration form as well as the retirement ratio calculation are reflected in NutrientNet registry fields
4. Conduct simulations and testing at all stages of enhancement
5. Compile a list of bugs and modifications resulting from testing
6. Submit quarterly reports

Drive Current II

1. Review and revise software applications and add necessary data elements to create required modifications and enhance work flow logic and functionality
2. Design formats and screens to meet program requests and improve ease of use of the online marketplace, registry, and administrative support tools
3. Participate in simulations and testing as appropriate and necessary
4. Deliver beta and final updated versions of all modules
5. Submit quarterly reports

The scope of the work necessitated by these unforeseen issues prompted a request for a no-cost extension of the grant period from June 30, 2010 to December 30, 2010, as well as the amendment and augmentation of the above contract with Drive Current to provide additional time and compensation to complete the required tasks. These delays, together with the weather-forced interruptions in program promotional and educational efforts earlier in the spring, also led to further extension of Dr. Bundy's second contract.

Revisions to website and guidance/user manual text and screenshots were begun during the summer in anticipation of the replacement of the online demonstration site with the second version of the integrated calculation tool and accompanying modules in September. Copies of the updated manual were printed for distribution at the October area workshops as well as any subsequent educational or training activities scheduled in the new year (a copy of the October 8, 2010 document was forwarded with the quarterly report sent April 11, 2011).

A follow-up meeting of the Advisory Committee was held December 20, 2010, to review program progress and address a number of policy issues that surfaced during the testing and application of the calculation tool. As a result of the group's discussion and deliberation, the Committee adopted two significant policy changes to foster credit supply: 1) trading eligibility is to be based on the whole farm rather than individual fields and 2) farms can generate nitrogen or phosphorus credits if the baseline is met in either nutrient (a copy of the minutes from this meeting was also forwarded with the above-referenced report).

At all stages of development of the integrated tool, an ongoing cycle of testing and practice simulations was conducted not only by MDA and its subcontractors, but also a select group comprised of the managers of two geographically diverse soil conservation districts, an independent operator, an aggregator, and a staff member from an international conservation organization. In addition, a series of testing sessions and training workshops was scheduled in various locations around the state and in West Virginia. Attendees included Natural Resources Conservation Service staff, personnel from soil conservation districts in Maryland, Delaware, and West Virginia, Maryland dairymen, livestock producers, and farmers, representatives from the University of Maryland, Maryland and West Virginia state and county agencies, and area not-for-profits and private industry, as well as aggregators, brokers, and other potential service providers.

Testing/Training Workshops:

01/29/10 Annapolis, MD
02/01/10 Annapolis, MD
02/19/10 Chestertown, MD
03/04/10 Salisbury, MD
03/09/10 Annapolis, MD
03/15/10 Chestertown, MD (two sessions, morning and afternoon)
03/18/10 Owings Mills, MD

03/23/10 Shepherdstown, WV
04/12/10 Frederick, MD
10/12/10 Frederick, MD
10/14/10 Chestertown, MD

Throughout the life of the grant, numerous briefings and presentations have been made at meetings or field days of county soil conservation districts, the Maryland Association of Soil Conservation Districts (MASCD), MARBIDCO, the University of Maryland Extension, various producer organizations and other interested parties (among them, the Port of Baltimore, Constellation Energy, and Washington Gas Energy Services). Maryland's nutrient trading platform was also featured at several regional and national conferences in 2010.

Regional/National Conferences:

Ecosystem Markets Conference/Raleigh-Durham, NC (06/10)
International Soil and Water Conservation Society Conference on Ecosystem Services/St. Louis, MO (07/10)
Mid-Atlantic Crop Management School (11/10)

With Dr. Bundy's facilitation, three large educational/outreach meetings were held across the State to introduce the concept of environmental offsets as well as the specifics of the Maryland Trading Program. Along with press releases announcing the meetings to the public at large, targeted notices were sent to the agricultural and environmental communities and over 750 invitations were mailed to elected officials and professional staff in every county and major municipality in Maryland. MDA personnel were joined by representatives from MDE's Water and Air Quality Divisions, the Pinchot Institute, and MASCD in making presentations at each of these meetings.

Public Educational Meetings:

05/25/10 Frederick, MD
06/02/10 La Plata, MD
06/03/10 Wye Mills, MD

By the end of 2010, over 1,200 people had attended various meetings to introduce the Maryland Nutrient Trading Program and/or demonstrate and test the calculation tool and other online components. Additionally, 165 individuals, among them staff from every soil conservation district in Maryland, received hands-on training experiences with the computerized suite of tools available for use by all interested parties at the program's website.

Although no point-nonpoint trade has been effected since the Maryland Nutrient Trading Program was officially launched in June 2010, over 100 accounts have been opened on the trading website and 130 assessments of farm properties have been completed to determine

baseline compliance and credit generation capacity. Figures compiled from available data suggest that 40%+ of assessed farms (in this instance, approximately 53) could be eligible trade, yet only five applications for credit certification and registration have been received to date. Two of these applications were rejected by MDA in December 2010 before final submission, two from Charles County (Potomac Watershed) were verified this year and the credits certified and registered (details can be viewed on the Certified Credit Registry at the trading website), and the credit certification request from Calvert County (Patuxent Watershed) remains under review.

More recent developments, however, suggest increasing awareness of the possibilities presented by nutrient trading and a brighter outlook in the demand for credits. Two new approaches have been made to MDA by the Howard County Soil Conservation District on behalf of a local homeowners' association and an aggregator representing Constellation Energy for assistance in locating nitrogen credits (the latter being a substantial quantity) to use as offsets for discharge permits. If and when either of these efforts proves successful, the Maryland Trading Program would record its first nutrient trade.

Preliminary arrangements were made with the College of Agriculture & Natural Resources at the University of Maryland (UMD) to perform an analysis of the potential net cost of participation in Maryland's trading program, but the insufficient economic data collected in a survey conducted in cooperation with the Maryland Association of Soil Conservation Districts and the lack of any trading activity prevented the planned study from being completed. MDA did provide source material for WRI's Working Paper, "How Baywide Nutrient Trading Could Benefit Maryland Farms" issued in June 2010, and a copy of this paper is enclosed. Also, under the aegis of a grant awarded to WRI in August of 2010, MDA joined with agencies from four other Bay states in an effort to create an interstate trading platform based on the Maryland model. A component of this project is the development of a new calculation tool that will enable program participants to estimate potential costs and quantify the relative profitability of credit generation and nutrient trading activities. When completed, the cost/benefit calculator will be available for use in either individual state programs or the multi-state program.

While there were many challenges along the way and delivery of the final version of the fully integrated calculation tool was delayed beyond the original timeline, the resulting product is not only more precise and user-friendly, but also the most sophisticated and versatile of its kind in the nation. Maryland's program and its online suite of tools have drawn considerable interest, and as noted above, are providing the template for the multi-state platform that could facilitate interstate trades and offer a prototype for large scale water quality trading programs in other parts of the country. Since the trading market opened and the program website went live last June, approximately 5,000 hits were recorded on the site through the end of 2010. The adoption of Bay-wide TMDLs is expected to give even greater utility to the calculation tool because its ability to determine baseline compliance and evaluate the

effectiveness of existing or planned conservation practices can generate extremely useful data for the agricultural sector, whether a nutrient trade results or not.

All Maryland producers who participate in the Nutrient Trading Program would be eligible for EQIP, but there are no producers to identify and no dollars expended to report because no credits had been certified for trading by the end of the grant period. Participants in the trading program may use EQIP and other federal and state financial assistance to meet baseline requirements; however, under Maryland's guidelines, they cannot generate credits from any practice funded by cost-share dollars until the contract covering the implementation and maintenance of that practice has expired. As use of the online assessment tool becomes more widespread, it is likely that producers will increasingly turn to cost-share programs to meet baseline requirements.