TRADING PROGRAM REVIEW

Development of Trading Policy in Maryland:

• Point Source-Point Source Policy issued March 2008 by MDE
  Trading not allowed in lieu of Enhanced Nutrient Removal (ENR) upgrades
  Chesapeake Bay Restoration Fund

• Point Source-Nonpoint Source Policy issued May 2008 by MDA
  Agricultural Certification Program Legislation June 1, 2010 and June 1,
  2012 by Maryland General Assembly

• Greenhouse Gas Emission Reduction Act of 2009
  Sets 25% by 2020 reduction goal
  Directs MDA to stack carbon credits on nutrient/sediment market

• Chesapeake Bay TMDL issued December 29, 2010
  Requires offsets for new growth and development

• Nonpoint Source-Nonpoint Source Policy TBD
  Urban Nonpoint Source (stormwater) trading or Accounting for Growth
  Work Group issued report August 2013 without final conclusions
FURTHER DEVELOPMENTS

• MDA and MDE release Maryland Trading Policy Statement October 23, 2015
  Municipal Separate Storm Sewer System (MS4) permit holders allowed to trade for a portion of impervious surface restoration requirement

• Greenhouse Gas Emission Reduction Act of 2016
  Sets 40% by 2030 reduction goal

• MDA proposes Healthy Soils Initiative to Maryland Commission on Climate Change and convenes Healthy Soils Consortium August 2016

• MDA regulations for generation, verification, and certification of agricultural credits August 29, 2016

• Healthy Soils Program legislation October 1, 2017

• MDE regulations for the Maryland Water Quality Trading Program submitted for review November 8, 2017
HEALTHY SOILS INITIATIVE

• Joint effort of Adaptation and Response and Mitigation Work Groups
  Resilience and sequestration/mitigation capacity

• Complementary to efforts to improve the water quality of the Chesapeake Bay and its tributaries
  Shared practices/dual purposes
  Mindful vs accidental

• Healthy Soils Consortium
  Create a network of agencies, organizations and individuals
  Develop menu of practices, metrics, and measurement tools

• Education and promotion
  Healthy Soils Workshops held April 2017
  Changes to existing MDA programs
HEALTHY SOILS CONSORTIUM

The Healthy Soils Consortium recognizes soil as a vital living system that provides essential sustenance to plants, animals, and humans, plays a critical role in ensuring water quality and availability, and supports other important benefits, including ecological resilience, carbon sequestration, greenhouse gas mitigation, improved nutrient content, higher crop yields, and increased agricultural profitability. Through a diverse network of partners, the Consortium seeks to inform policy makers, environmentalists, the farm community and its service providers, as well as the general public, of the imperative need to protect this precious resource and promote the management and land use practices that will not only prevent further degradation, but also enhance and restore soil health.
HOUSE BILL 1063

AN ACT concerning Agriculture – Maryland Healthy Soils Program

(C) THE PURPOSE OF THE PROGRAM IS TO:

(1) IMPROVE THE HEALTH, YIELD, AND PROFITABILITY OF THE SOILS OF THE STATE;

(2) INCREASE THE CARBON SEQUESTRIAN CAPABILITY OF THE SOILS OF THE STATE; AND

(3) PROMOTE MORE WIDESPREAD USE OF HEALTHY SOIL PRACTICES AMONG FARMERS IN THE STATE.

(D) TO CARRY OUT THE PURPOSES OF THE PROGRAM, THE DEPARTMENT SHALL:

(1) PROVIDE INCENTIVES, INCLUDING RESEARCH, EDUCATION, TECHNICAL ASSISTANCE, AND, SUBJECT TO AVAILABLE FUNDING, FINANCIAL ASSISTANCE, TO FARMERS TO IMPLEMENT FARM MANAGEMENT PRACTICES THAT CONTRIBUTE TO HEALTHY SOILS; AND

(2) DETERMINE WHETHER THE PROGRAM MAY BE IMPLEMENTED IN A MANNER TO ENHANCE OTHER STATE AND FEDERAL PROGRAMS THAT PROVIDE FINANCIAL ASSISTANCE TO FARMERS.
HEALTHY SOILS RECOMMENDATIONS

- Identify most efficient and effective practices
- Determine incentives for a menu of practices
- Inform farm community and promote menu
- Identify metrics and tools for quantifying carbon sequestration and GHG mitigation potential
- Inventory existing programs and integrate healthy soils component
- Develop pilot/demonstration projects
- Explore alternative funding sources
CONSORTIUM LEARNING PLAN

State of the science and economics: This meeting would be dedicated to helping the participants gain a better understanding of what we know and don’t know about the range of environmental and public health benefits of soil health practices (e.g. carbon sequestration, water quality, nutrition content of yield, drought resistance, etc.) and the associated economic benefits of soil health practices (e.g. high crop yield, cost to implement practices).

Soil health measurement and assessment tools in the field: This session will focus on clarifying the purpose of measuring soil health, examining new soil health measurement technology being developed, and survey of measurement tools currently being used in Maryland including the Maryland Soil Health Card and NRCS soil health measurement tools. Book Discussion: brown bag lunch discussion immediately following Consortium meeting The Soil Will Save Us: How Scientists, Farmers, and Foodies Are Healing the Soil to Save the Planet, by Kristin Ohlson

Practical innovations and practice for soil health on all sizes of operations: This session will focus on innovations and practices being used and tested by different sized operations in the US and internationally. Innovations could include: compost, biochar, microbial inoculants, rotational grazing, agroforestry)

Policy frameworks and inventory of existing programs: Inventory Maryland programs and policy frameworks, particularly the Maryland Climate Action Plan and the Bay TMDL/Maryland Watershed Implementation Plan, in addition to other existing programs that could create opportunities to incentivize and otherwise encourage healthy soils practices. Book Discussion: brown bag lunch discussion immediately following Consortium meeting Cows Save the Planet: And Other Improbable Ways of Restoring Soil to Heal the Earth, by Judith D. Schwartz and Gretel Ehrlich

Delmarva Soil Summit: Future Harvest CASA and partners will host a one-day Delmarva Soil Summit that will bring in farmers, scientists, and agricultural professionals to discuss Delmarva-specific innovations in soil health practices.

Understanding metrics and quantifying soil health benefits: Discussion of quantification of the co-benefits of soil health as related to environment, public health, and economy. This session will be cross-disciplinary and examine the range of co-benefits from water quality and carbon sequestration to food nutrition and crop yield.

Opportunities to expand support for healthy soils practices: Discuss recommendations for incentives, technical assistance, financial support, research, and education that MDA and other agencies could expand to carry out the purposes of the Maryland Healthy Soils program. Book Discussion: brown bag lunch discussion immediately following Consortium meeting Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming edited by Paul Hawken
PROGRAM STRUCTURE

• Voluntary

• Market-driven
  State provides infrastructure but does not set prices nor conduct trades

• Performance-based

• Uses an online suite of tools:
  • Calculator
  • Registry
  • Marketplace
  • Administrative module
  • Interactive mapping feature
Chesapeake Bay Nutrient Trading/Tracking Tool (CBNTT)

www.mdnutrienttrading.com
TRADING TOOL RECAP

• Original tool based on the World Resources Institute (WRI) NutrientNet platform as modified to reflect the Chesapeake Bay Watershed Model land use loads, calculations, and BMP efficiencies

• Maryland tool revised to incorporate the USDA/NRCS Nutrient Tracking Tool (NTT)

• WRI used the Maryland template to create a new multi-state platform, the Chesapeake Bay Nutrient Trading/Tracking Tool or CBNTT, that incorporates state-specific tools for Maryland (MNTT), Virginia, and Pennsylvania
Chesapeake Bay Nutrient Trading Tool Load Calculations

- Nutrient Tracking Tool (NTT)
- CBNTT Operations
- Chesapeake Bay Watershed Model

Management Info → NTT → NTT Output (Edge of Farm) → Adj. Factor → Structural BMPs → Trading Eligibility

Chesapeake Bay Watershed Model

Trading Eligibility

Current Load (EOS) ↔ TMDL Baseline (EOS)
NUTRIENT TRACKING TOOL

• NTT was created by USDA using the Agricultural Policy/Environmental eXtender model (APEX) to provide access to environmental outcomes, such as changes in nutrients, sediment, and yields at the field scale.

• NTT calculates the change in N, P, sediment, and yield based upon an initial condition and the adoption of agronomic conservation practices.

• Agronomic options include application methods and type of fertilizer, planting method, harvesting method, cover crops, tillage, irrigation, drainage, etc.

• NTT applies parameters (weather, evapotranspiration, crop growth models, temperature, slope, soils) to inputs.
CALIBRATION OF TOOL TO BAY MODEL

• Edge of field nutrient estimates were cross-walked with Bay Model for validation

• To calibrate, WRI ran NTT on every soil in Maryland and created average values to compare; performed various scenario runs, composed values, and developed multipliers between NTT and Bay Model

• Calibration work was performed in conjunction with Chesapeake Bay Program (CBP) modelers; ongoing calibration workgroups at USDA and CBP
<table>
<thead>
<tr>
<th><strong>DIFFERENCES BETWEEN</strong> NTT</th>
<th><strong>Bay Model</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Field/farm scale loads</td>
<td>Basin-scale average</td>
</tr>
<tr>
<td>Actual field nutrient inputs</td>
<td>Extension recommendations</td>
</tr>
<tr>
<td>Actual application (time and placement)</td>
<td>Fixed sequence of application and timing</td>
</tr>
<tr>
<td>Actual animals (type, number, and grazing time)</td>
<td>2012 Census county data</td>
</tr>
<tr>
<td>Actual yields</td>
<td>2012 Census regional data</td>
</tr>
<tr>
<td>Actual field soil types/slope</td>
<td>No soil types/slope</td>
</tr>
<tr>
<td>Actual residual “P”</td>
<td>No soil “P” residuals</td>
</tr>
<tr>
<td>Actual size and annual numbers of BMPs</td>
<td>Average BMPs</td>
</tr>
<tr>
<td>Thirty years of weather data</td>
<td>Ten years of weather data</td>
</tr>
</tbody>
</table>
BASELINE AND CREDIT CALCULATION EXAMPLE

Input/Uptake | Total N/ac
---|---
Residual in Soil | +5 lbs N/ac | 5 lbs N/ac
Total Application | +133 lbs N/ac | 138 lbs N/ac
Crop Uptake | -114 lbs N/ac | 24 lbs N/ac
Conservation Tillage | -4 lbs N/ac | 20 lbs N/ac
Grassed Buffers | -11.5 lbs N/ac | 8.5 lbs N/ac
Cover Crops | -6 lbs N/ac | 2.5 lbs N/ac
Water Control Structure | -2 lbs N/ac | 0.5 lbs N/ac

Baseline (8.9 lbs N/ac)

1985 Load (22 lbs N/ac)

CBP Model
Welcome to the Maryland Nutrient Trading Program...

The Maryland Water Quality Trading Advisory Committee to Meet on September 18

The next meeting of the Trading Advisory Committee will be held on Monday, September 18, from 1:00 to 4:00 p.m., at the Maryland Department of the Environment’s headquarters, 1800 Washington Boulevard, Baltimore, MD. The Committee acts as an ongoing consultative group to provide direction to the overall trading program and oversee further enhancement of the trading infrastructure. This month’s meeting will again focus on draft trading regulations.

What is Nutrient Trading?

Nutrient trading is a form of exchange (buying & selling) of nutrient reduction credits. These credits have a monetary value that may be paid to the seller for installing Best Management Practices (BMPs) to reduce nitrogen or phosphorus. In general, nutrient trading allows landowners to make choices about maintaining or improving water quality, and potentially earning money for those choices.
AGRICULTURAL PROJECT WORKSHEETS

Username
Password

Remember me

Sign in

Sign up
Forgot your password?
Didn't receive unlock instructions?
FIELD INFORMATION
Enter field information.

Watershed: Chapel Branch-Choptank River
Land river segment: A24011EM3_4321_0000
Major basin: Eastern Shore
TMDL watershed: N/A
Field number:* 2
Field type:*
- Select field type
  - Crop
  - Permanent pasture
  - Continuous hay
  - Animal confinement
  - Non-managed land
Field is adjacent to stream/water body*
The term adjacent refers to land that is physically part of your land parcel.
Notes:

---

CHESAPEAKE BAY NUTRIENT TRADING

AGRICULTURAL PROJECT WORKSHEETS

Home » Projects » My Farm4 » Fields » 2
COMMERCIAL FERTILIZER APPLICATIONS
Enter all commercial fertilizer applications used on this field. Please enter the total nitrogen and total phosphorus values (not ammonium or phosphate).

Add a Commercial Fertilizer Application

MANURE FERTILIZER APPLICATIONS
Enter animal manure applications for the given year. If pasture, manure generated by livestock is automatically accounted for based on the information entered in the grazing livestock section.

Click here to see typical manure values.

Add a Manure Fertilizer Application

OTHER TILLAGE OPERATIONS
Enter tillage operations here. Tillage operations for incorporated fertilizer entered in the previous two sections are already accounted for, so do not enter fertilizer incorporation tillage operations here.

Add a Tillage Operation

HARVEST / END OF SEASON OPERATIONS
Enter the end-of-season harvest and/or termination date(s) for this crop. For annual crops such as corn, you should select ‘Harvest and Terminate Crop.’ Generally, a termination date should occur before the plant date of any subsequent crop in this rotation, though in some instances aerial seeding might be used to plant a subsequent crop before the final harvest and kill dates of an existing crop in which case the harvest and kill dates of the existing crop would come after the plant date of the subsequent crop.

End Of Season 1

End of season operation type:* Select end of season operation type

Select end of season operation type

Date:*

Select end of season operation type

Terminate Crop (No Harvest)
Harvest Only
Harvest and Terminate Crop

Harvest as silage:

Add End Of Season
Fertilizer Application Setback

Setback in place: ✓

Average width of setback:* [ ] ft

Linear feet of setback:* [ ] ft

Area of setback:* N/A ac

Planned: ☐

Wetland

Wetland in place: ☐

Other Land Use Conversion

Please indicate any non-riparian land conversion in place or planned on this field.

Acres converted: [ ] ac

Converted to: Select vegetation type

Planned: ☐

Other Best Management Practices

BMP 1

BMP type:* Select BMP type

Planned:

Add BMP
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Maryland</td>
</tr>
<tr>
<td>County</td>
<td>Caroline</td>
</tr>
<tr>
<td>Watershed</td>
<td>Chapel Branch-Choptank River</td>
</tr>
<tr>
<td>Major basin</td>
<td>Eastern Shore</td>
</tr>
<tr>
<td>TMDL</td>
<td>none</td>
</tr>
<tr>
<td><strong>N LOAD INFORMATION</strong></td>
<td></td>
</tr>
<tr>
<td>Farm meets N baseline</td>
<td>Yes</td>
</tr>
<tr>
<td>Baseline N load fields (EOS):</td>
<td>2,310.00 lbs/yr</td>
</tr>
<tr>
<td>Current N load fields (EOS):</td>
<td>1,043.81 lbs/yr</td>
</tr>
<tr>
<td>Future N load fields (EOS):</td>
<td>772.30 lbs/yr</td>
</tr>
<tr>
<td>Current N load for Animal HQ (EOS):</td>
<td>0.00 lbs/yr</td>
</tr>
<tr>
<td><strong>P LOAD INFORMATION (EOS)</strong></td>
<td></td>
</tr>
<tr>
<td>Farm meets P baseline</td>
<td>Yes</td>
</tr>
<tr>
<td>Baseline P load fields (EOS):</td>
<td>189.00 lbs/yr</td>
</tr>
<tr>
<td>Current P load fields (EOS):</td>
<td>45.62 lbs/yr</td>
</tr>
<tr>
<td>Future P load fields (EOS):</td>
<td>43.66 lbs/yr</td>
</tr>
<tr>
<td>Current P load for Animal HQ (EOS):</td>
<td>0.00 lbs/yr</td>
</tr>
<tr>
<td><strong>SEDIMENT LOAD INFORMATION</strong></td>
<td></td>
</tr>
<tr>
<td>Farm meets sediment baseline</td>
<td>Yes</td>
</tr>
<tr>
<td>Baseline sediment load fields (EOS):</td>
<td>16.32 t/yr</td>
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<tr>
<td>Current sediment load fields (EOS):</td>
<td>2.72 t/yr</td>
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<tr>
<td>Future sediment load for animal HQ (EOS):</td>
<td>0.00 t/yr</td>
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<tr>
<td>Delivery Ratio:</td>
<td>1.0</td>
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<tr>
<td>Total Reductions (EOS):</td>
<td>1.96 t/yr</td>
</tr>
<tr>
<td>Eligible reductions:</td>
<td>1.96 t/yr</td>
</tr>
<tr>
<td>Credits:</td>
<td>2</td>
</tr>
</tbody>
</table>
## NTT RESULTS SUMMARY

Below are the results from the NTT model run. NTT models the N, P and Sediment loads for your field based on field management, soils data and historic weather. The results represent the average nutrient losses at the edge of the field and prior to any structural BMPs (i.e. any BMPs indicated in the “current BMPs” or “future BMPs” tab) being applied.

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N (before BMPs applied)</td>
<td>8.47 lbs/ac</td>
<td>7.92 lbs/ac</td>
</tr>
<tr>
<td>Sediment (Organic N)</td>
<td>2.52 lbs/ac</td>
<td>2.37 lbs/ac</td>
</tr>
<tr>
<td>Soluble N (NO₃)</td>
<td>5.94 lbs/ac</td>
<td>5.54 lbs/ac</td>
</tr>
<tr>
<td>Tile Drained N</td>
<td>0.00 lbs/ac</td>
<td>0.00 lbs/ac</td>
</tr>
<tr>
<td>Total P (before BMPs applied)</td>
<td>0.35 lbs/ac</td>
<td>0.32 lbs/ac</td>
</tr>
<tr>
<td>Sediment (Organic P)</td>
<td>0.17 lbs/ac</td>
<td>0.16 lbs/ac</td>
</tr>
<tr>
<td>Soluble P</td>
<td>0.18 lbs/ac</td>
<td>0.16 lbs/ac</td>
</tr>
<tr>
<td>Tile Drained P</td>
<td>0.00 lbs/ac</td>
<td>0.00 lbs/ac</td>
</tr>
<tr>
<td>Flow</td>
<td>13.53 in</td>
<td>11.74 in</td>
</tr>
<tr>
<td>Sediment</td>
<td>526.71 lbs/ac</td>
<td>433.81 lbs/ac</td>
</tr>
<tr>
<td><strong>Carbon</strong></td>
<td><strong>48.40 lbs/ac</strong></td>
<td><strong>43.62 lbs/ac</strong></td>
</tr>
</tbody>
</table>

Crop Yield

- Corn: 143 bu/ac
- Soybeans: 50 bu/ac
- Wheat, Speltz: 0 bu/ac
- Soybeans: 46 bu/ac
A NEW TOOL FOR URBAN PLANNERS AND MUNICIPALITIES

The Maryland Water Quality Trading Program is a voluntary, public marketplace for the sale and purchase of nitrogen, phosphorus, and sediment credits. The program’s aim is to help bring Maryland into compliance with Total Maximum Daily Load (TMDL) pollution limits established by the U.S. Environmental Protection Agency for the Chesapeake Bay. As economic and population growth occurs within the watershed, it will create additional nutrient or sediment impacts. These impacts must be mitigated on-site or “offset” by load reductions from other sources. The Maryland trading program allows municipalities, wastewater treatment plants, and developers the flexibility to meet load limitations by purchasing offset credits created by farmers who have reduced their runoff through the adoption or installation of best management practices (BMPs). The program is a valuable option not only for regulatory compliance, but also for the introduction of cost-effectiveness and market-driven efficiencies to the realization of pollutant reductions. To facilitate water quality trading between developers or municipalities wanting to purchase urban stormwater offset credits and eligible farmers with offset credits to sell, the Maryland Department of Agriculture (MDA) has expanded its web-based trading platform to enable users to determine offset needs for new growth and development projects.
Step 3
Outline the project location and each individual drainage area using the interactive mapping feature or importing GIS shapefiles of the parcel and/or drainage areas.

Step 4
Complete the requested worksheet information about land use acres, wastewater treatment, and urban BMPs for both the pre-development conditions and the post-development plans within the parcel and the individual drainage areas. Throughout the process, the tabs at the top of each screen can be used to navigate through the tool to review and edit data.

Helpful Tips
Up to three scenarios may be created for each drainage area. This function allows users to test pollution reduction impacts for different BMPs or redistribute acres between pervious and impervious acres. The tool provides calculations for nitrogen, phosphorus, and sediment and compares the load for each scenario to the site’s allocation to determine offset needs or credits generated. There is a printable summary review page that may be submitted in the application and compliance process.

FOR MORE INFORMATION
The Maryland Development Stormwater Offset Tool was developed by MDA in collaboration with the World Resources Institute, the Texas Institute for Applied Environmental Research, and the Maryland Department of the Environment. It is available for replication and use by other institutions.
## RESULTS

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrogen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater allocation provided, EOS:</td>
<td>649.82</td>
<td>649.82</td>
<td>649.82</td>
</tr>
<tr>
<td>Post-development stormwater load, EOS:</td>
<td>1952.8</td>
<td>500.46</td>
<td>832.62</td>
</tr>
<tr>
<td>Post-development stormwater load (with required BMPs only), EOS:</td>
<td>1952.8</td>
<td>1194.94</td>
<td>1328.68</td>
</tr>
<tr>
<td>Reductions from required erosion control BMPs (lb/yr, EOS)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Creditable reductions from erosion control BMPs (lb/yr, EOS)</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Total offset needed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fee units (EOS lbs/yr)</td>
<td>1302.98</td>
<td>N/A</td>
<td>182.8</td>
</tr>
<tr>
<td>Delivery factor</td>
<td>0.46</td>
<td>0.46</td>
<td>0.46</td>
</tr>
<tr>
<td>Market units (DEL lbs/yr)</td>
<td>598.44</td>
<td>N/A</td>
<td>83.96</td>
</tr>
<tr>
<td><strong>Credits generated</strong></td>
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<td></td>
</tr>
<tr>
<td>Fee units (EOS lbs/yr)</td>
<td>N/A</td>
<td>149.36</td>
<td>N/A</td>
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<tr>
<td>Delivery factor</td>
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<td>0.46</td>
<td>0.46</td>
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<tr>
<td>Market units (DEL lbs/yr)</td>
<td>N/A</td>
<td>68.71</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Susan Payne
Coordinator of Ecosystem Markets and Certainty Programs and Healthy Soils Initiative
410-841-5897
susan.payne@maryland.gov
www.mdnutrienttrading.com

MDA is a member of the National Network on Water Quality Trading

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