A MARKET-BASED APPROACH TO AGRICULTURAL NON-POINT SOURCE REDUCTIONS
WATER QUALITY TRADING EXPERIENCES & ESTIMATION TOOLS

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IMAGE: KEVIN MILLCAN AND DJOF
POLICY OPTIONS TO ADDRESS DIFFUSE POLLUTION

- Ecosystem restoration and protection
- Institutions & capacity
- **Market-based instruments**
  - auctions & tenders
  - ecolabeling
  - **regulatory environmental markets**
  - voluntary environmental markets
- Monitoring, evaluation, & research
- Outreach & education
- Price-based instruments
- Regulatory approaches
NITROGEN REDUCTION COSTS DIFFER AMONG SECTORS

USD per pound of annual nitrogen reduction in the Chesapeake Bay Watershed, USA

Source: U.S. EPA and Abt Associates, 2009; Wieland et al., 2009; MDNR, 2008; Stewart, E.A., 2006; WRI analysis using WWTP upgrade costs from MDE and VDEQ
WATER QUALITY TRADING

Trading Between Point Sources

<table>
<thead>
<tr>
<th>TODAY</th>
<th>TARGET</th>
<th>TRADING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant 1 annual discharge: 100</td>
<td>Plant 1 waste load allocation: 70</td>
<td>Plant 1 annual discharge: 60</td>
</tr>
<tr>
<td>Plant 2 annual discharge: 100</td>
<td>Plant 2 waste load allocation: 70</td>
<td>Plant 2 annual discharge: 80</td>
</tr>
<tr>
<td>Combined annual discharge: 200</td>
<td>Combined waste load allocation: 140</td>
<td>Combined annual discharge: 140</td>
</tr>
</tbody>
</table>

$N, P$ Credits

OR

Trading Between Point Sources and Nonpoint Sources

$N, P$ Credits

$
ACTIVE TRADING PROGRAMS IN THE UNITED STATES, NEW ZEALAND, AUSTRALIA, & CANADA TOTALING $20M+ IN SALES

Nutrient trading policies and guidance issued since 2005

- To provide flexibility for point sources to meet compliance schedules and cost-effectively meet upcoming N&P loading caps
- To offset new N&P loads
- Agriculture sector a credit generator
# Agricultural Credit Estimation Methods

<table>
<thead>
<tr>
<th>State</th>
<th>Method</th>
<th>Chesapeake Bay Nutrient Trading Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia</td>
<td>Lookup tables</td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Spreadsheet tool</td>
<td></td>
</tr>
<tr>
<td>Maryland</td>
<td></td>
<td>Chesapeake Bay Nutrient Trading Tool</td>
</tr>
</tbody>
</table>

## Agricultural Project Worksheets

### James Basin BMPs: Single BMP

<table>
<thead>
<tr>
<th>BMP</th>
<th>West of I-95</th>
<th>East of I-95</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TN</td>
<td>TP</td>
</tr>
<tr>
<td>Early Planted Cover Crops</td>
<td>0.54</td>
<td>0</td>
</tr>
<tr>
<td>15% Nitrogen Reduction on Corn</td>
<td>1.75</td>
<td>0</td>
</tr>
<tr>
<td>Continuous No-Till</td>
<td>1.05</td>
<td>0.49</td>
</tr>
</tbody>
</table>

The table shows the nutrient reduction for different BMPs (Best Management Practices) in the James Basin. The values are expressed in tons of nitrogen (TN) and total phosphorus (TP) per acre. The values for East of I-95 are highlighted in yellow.
THE CHESAPEAKE BAY NUTRIENT TRADING TOOL (CBNNTT)

• Estimates on-farm nutrient and sediment loads, trading eligibility, and credit generation

• Powered by USDA’s Nutrient Tracking Tool (NTT)/APEX model for crop and pasture load estimates

• Aligned with EPA’s Chesapeake Bay Watershed Model

• Creates consistency and transparency in credit estimation across the Chesapeake Bay watershed
Spatial Info Inputs

- Farm and field locations using interactive map

Spatial Info Outputs

- Farm and field area
- Soil
- Slope
- Climate
- Watershed
- Chesapeake Bay Watershed Model land-river segment
Management Info Inputs

- Crop rotation
- Planting and harvesting information
- Fertilizer and manure applications
- Tillage operations
- Cover crops
- Grazing operations
Structural BMP Inputs

- Buffers
- Wetlands
- Fertilizer setbacks
- Land use conversion
- Water control structures
- Streambank restoration
- Conservation plans
- Decision/precision agriculture
- P sorbing materials
- Streambank fencing
- Offstream watering
- Prescribed grazing
CBNTT estimates edge-of-stream loads for:

- Nitrogen
- Phosphorus
- Sediment

Actual field loads are compared to baseline loads to determine trading eligibility.
ESTIMATING CREDITS IN FUTURE SCENARIO

- If farm meets baseline, user can enter an alternate scenario
- Follow same data input steps as for current scenario
- Shortcuts available to cut entry time
- Planned management might include additional BMPs, alternate management, or alternate crops
- Credits are calculated as difference between current and planned
## Final Farm-Scale Results

### N Load Information
- **Farm meets N baseline:** Yes
- **Baseline N load fields (EOS):** 1,213.39 lbs/yr
- **Current N load fields (EOS):** 392.63 lbs/yr
- **Future N load fields (EOS):** 364.64 lbs/yr
- **Current N load for Animal HQ (EOS):** 35.62 lbs/yr
- **Future N load for animal HQ (EOS):** 35.62 lbs/yr
- **Delivery Ratio:** 1.0
- **Total Reductions (EOS):** 27.98 lbs/yr
- **Eligible reductions:** 27.98 lbs/yr
- **Credits:** 28

### P Load Information (EOS)
- **Farm meets P baseline:** Yes
- **Baseline P load fields (EOS):** 99.28 lbs/yr
- **Current P load fields (EOS):** 34.01 lbs/yr
- **Future P load fields (EOS):** 27.87 lbs/yr
- **Current P load for Animal HQ (EOS):** 4.69 lbs/yr
- **Future P load for animal HQ:** 4.69 lbs/yr
- **Delivery Ratio:** 1.0
- **Total Reductions (EOS):** 6.14 lbs/yr
- **Eligible reductions:** 6.14 lbs/yr
- **Credits:** 6

### Sediment Load Information
- **Farm meets sediment baseline:** Yes
- **Baseline sediment load fields (EOS):** 12,458.08 lbs/yr (6.23 t/yr)
- **Current sediment load fields (EOS):** 2,505.87 lbs/yr (1.25 t/yr)
- **Future sediment load fields (EOS):** 1,940.93 lbs/yr (0.97 t/yr)
- **Current load for Animal HQ (EOS):** 39.42 lbs/yr (0.02 t/yr)
- **Future sediment load for animal HQ (EOS):** 39.42 lbs/yr (0.02 t/yr)
- **Delivery Ratio:** 1.0
- **Total Reductions (EOS):** 564.94 lbs/yr (0.28 t/yr)
- **Eligible reductions:** 564.94 lbs/yr (0.28 t/yr)
- **Credits (delivered lbs):** 565
SUMMARY

• Water quality trading can be used as a cost-effective mechanism for meeting regulatory obligations and offsetting new loads

• Including NPS can increase cost effectiveness, but estimating credits from diffuse sources can be challenging

• CBNTT combines a site-specific biophysical model with regional policy to estimate creditable agricultural load reductions
THANK YOU!

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