Nutrients and the Role of Trading

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Presented by
Dave Taylor, Madison MSD
Lisa Bacon, CH2M HILL
Cy Jones, World Resources Institute
Presentation Segments

- Introductions
- Trading 101
- Key Issues in Setting Up New Programs & Expanding Existing Ones
  - Establishing a Phosphorus Credit Trading in Wisconsin: Opportunities and Challenges
  - Establishing, Expanding, & Leveraging Trading Programs in the Chesapeake Bay Region
- Ways to Make Trading Easier
- New Opportunities and Challenges
- Closing Remarks
Trading 101:
What are Water Quality Credits?

Water quality credits are created with performance better than required and can be applied to offset exceedences or shortfalls.
Trading is Not New Anymore

- National guidance and resources clarify preferred approaches and detail options

The United States Environmental Protection Agency believes that market-based approaches such as water quality trading provide greater flexibility and have potential to achieve water quality and environmental benefits greater than would otherwise be achieved under more traditional regulatory approaches.

Final Water Quality Trading Policy, January 2003
Trading is Not New Anymore

- Real initiatives showcase alternative market development processes, transaction models, and strategic lessons

Pollutants being traded or considered:

- Nitrogen
- Phosphorus
- Dissolved Oxygen
- BOD/CBOD
- Sediment
- Temperature
- Flow
- Copper
- Mercury
- Selenium

Places where some type of trading initiative or program exists/existed.
Trading Offers Important Benefits

- **Cost-Effectiveness**
  - Compliance more cost-effective, when credits less expensive than on-site options
  - Credit purchases let buyers optimize sizing and scheduling their own projects

- **Speeding Results**
  - Helps regulated parties and voluntary actors produce load reductions and water quality improvements on faster schedule than without trading
  - Creditable projects can have shorter permitting and/or construction schedule and/or require less financial investment

- **Targeting Improvements**
  - Can encourage pollutant reductions in priority locations where they might not otherwise occur
  - Can create incentives for types of projects that are desired but that might not otherwise be economical

- **Leverage State Funds**
  - Helps optimize state investments in public programs via cost-share for credit generation, or direct credit purchases
## Cost-Effectiveness and Cost-Savings Key Driver for Most Programs

### Point-point examples

- **Connecticut POTW nitrogen exchange:**
  - estimated savings = $300M to $400M (33% original basis)

- **Virginia municipal and industrial phosphorus and nitrogen credit exchange**
  - $2.2B no trading
  - Save $410M with trading

### Point-nonpoint examples

- **Clean Water Services temperature:**
  - $50M+ effluent cooling
  - $4M riparian shading

- **Lower Boise River phosphorus control**
  - POTWs $5-200/lb
  - Agriculture $5-50/lb
Basic Conditions for Water Quality Credit
Trading Opportunities and Success

1. **Driver for action:** desired or required water quality improvements

2. **Understanding of water quality:** knowledge about causes, sources, and relative load contributions

3. **Alternative feasible solutions:** more than one combination of enhanced treatment, best management practices, and/or restoration projects

4. **Greater cost-effectiveness:** sufficient differences in relative cost-effectiveness across the various options among the feasible solutions

5. **Market warrants investment:** scale and scope of the expected credit market and potential cost-savings sufficient to warrant proportional investment development and operation

6. **Equal or better results:** science-based assessments and program rules ensure net benefits compared to not trading

7. **Stakeholder-endorsed framework:** if 1-6 met, regulatory, policy, administrative framework for trading can be developed and implemented
Key Trading Program Design Elements

- Trading baselines
- Trading area(s)
- Pollutant reduction options
- What’s creditable
- Supply and demand relationships
- Relative economics within and across source sectors
- Trading frameworks
  - Point-point models
  - Point-nonpoint models
- Implementation mechanisms
- Liability
- Risk management
- Credit certification
- Delivery factors and trading ratios
- Upstream-Downstream directionality
- Credit life
- Reconciliation period
- Length of trade
- Financial arrangements
  - Credit by credit
  - Pooled purchasing
- Administration costs
- Credit pricing

All trading programs have most of these key building blocks—they just may be assembled in different ways.
Two Real Programs

- Virginia Nutrient Credit Exchange: Point-Point Nitrogen and Phosphorus

- Clean Water Services: Point-Nonpoint Temperature
Virginia Nutrient Credit Exchange: Drivers for Trading

- State implementation of regional Chesapeake Bay Program nutrient reduction goals
- New N and P limits for major point sources depending on watershed
  - N range = 3 mg/l – 8 mg/l
  - P range = 0.18 – 1 mg/l
- Individual WLAs derived from new limits and design flow

<table>
<thead>
<tr>
<th>Basin</th>
<th>#</th>
<th>MGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potomac/ Shenandoah</td>
<td>43</td>
<td>405</td>
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<tr>
<td>Rappahannock</td>
<td>22</td>
<td>46</td>
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<tr>
<td>York</td>
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<tr>
<td>James</td>
<td>39</td>
<td>581</td>
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<tr>
<td>Eastern Shore</td>
<td>5</td>
<td>2</td>
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<tr>
<td></td>
<td>120</td>
<td>1,142</td>
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</table>

120 facilities in 5 watersheds affected by WLAS

Graphic by CH2M HILL for the Exchange
Virginia Nutrient Credit Exchange:
Program Development Milestones

- Built on CT program precedent and WERF-funded analysis of MD trading opportunities
- Draft rules by DEQ proposed some trading
- Dischargers proposed own trading program via legislation
- Program enabled by Legislature in 2005
- Authorized creation of Virginia Nutrient Credit Exchange Association to run program
- Directed DEQ to fund technical work to develop Exchange and issue General Permit for Nitrogen and Phosphorus to support implementation

Graphic by CH2M HILL for the Exchange
Virginia Nutrient Credit Exchange: Recruitment and Proof of Benefits

- Discharger Education and Recruitment Process
  - Membership/trading participation voluntary
  - New concept for many
  - Critical to explain benefits and obligations
  - Multiple meetings/workshops

- Compliance Plan Options Analysis and Constructability Evaluation
  - Estimated compliance costs with and without trading
  - Savings with trading as much as $410 M
  - Additional savings/avoided premiums associated with construction market peak impacts without trading

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**Annual Construction Spending with Market Volume Premium**

Trading Case vs. Non-Trading Case

- Savings with trading estimated at as much as $410M on an otherwise $2B investment
Virginia Nutrient Credit Exchange: Program Scale, 2011 - 2016

<table>
<thead>
<tr>
<th>Virginia Nutrient Credit Exchange</th>
<th>Market Estimates 2011-2016</th>
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<tbody>
<tr>
<td></td>
<td>Nitrogen</td>
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<tr>
<td>Class A</td>
<td></td>
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<tr>
<td>Bay Pounds (M)</td>
<td>2.6</td>
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<tr>
<td>Value (M)</td>
<td>$6.40</td>
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<tr>
<td>Class B</td>
<td></td>
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<tr>
<td>Bay Pounds (M)</td>
<td>4.0</td>
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<tr>
<td>Value (M)</td>
<td>$0.62</td>
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<tr>
<td>Other Credits</td>
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<tr>
<td>Bay Pounds (M)</td>
<td>4.5</td>
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<tr>
<td>TOTAL</td>
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<tr>
<td>Bay Pounds (M)</td>
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<tr>
<td>Value (M)</td>
<td>$7.02</td>
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2012 Potomac Basin Nitrogen Credit Ledger
Graphics by CH2M HILL for the Exchange
Clean Water Services:
First in the Nation Watershed Permit

- 4 WWTPs with Tualatin River Discharge
- Stormwater for WWTPs
- Stormwater MS4 for 13 Communities
- Point-point trading option for dissolved oxygen
- Point-nonpoint trading option for temperature

Graphics from Clean Water Services
Clean Water Services:
“Enhanced CREP” for Shade Restoration Credits

- Basic Conservation Reserve Enhancement Program
  - Existing USDA program
  - Voluntary retirement of environmentally sensitive land
  - 10 - 15 year contracts to keep land out of agricultural production
  - Annual payments to participants, plus maintenance and sign-up incentives
  - Up to 50% cost-share

- CWS’ Enhanced CREP
  - Annual payments to landowner significantly increased
  - Landowner can opt to have the SWCD be responsible for all planting and maintenance
  - Landowner can opt to sell the SWCD a conservation easement
Phosphorus Credit Trading in Wisconsin
Phosphorus Water Quality Trading
The Wisconsin Experience

- Phosphorus rules adopted in 2010
  - Numeric water quality criteria
  - Implementation framework
  - Agricultural performance standard

- WDNR-directed to develop a trading framework

- Draft framework presented to Natural Resources Board-July, 2011
Some key issues

- Trade ratios
- Baseline
- Geographic scope
- Permit issues
- Trade administration-broker
- WDNR vs. EPA
Trade Ratios

- How are they established?
- Can/should trade ratios be standardized across state?
Baseline for Nonpoint/Credit Generation

- How is baseline defined?
  - Current condition
  - Future condition
  - Agricultural performance standard

- How much credit do you receive?
  (8 credits? 4 credits?)

- For how long?

- An additional trade ratio

Initial PI  Baseline?  Final PI
10  2  6
Geographic scope

- Where can you trade?
- Upstream vs. downstream
- TMDL can be helpful
Permit Issues

- **Timing of credits-generation vs. use**
  - Generated & used in same month
  - Generated & used in same calendar year

- **What does permit language look like**
  - Level of detail
  - Contractual language or simply a reference
  - Reporting requirements
Administrative/Brokering

- No current centralized administrative framework
- State doesn’t want to be the broker
- A challenge or an opportunity?
Nutrient Trading in The Chesapeake Bay Watershed
Pennsylvania
Maryland
West Virginia
Delaware
Virginia
New York
Washington, D.C.
Nitrogen and Phosphorus Sources

Wastewater Treatment Plants

Urban stormwater

Agriculture

Atmospheric Deposition
PRINCIPAL OXIDIZED NITROGEN AIRSHED FOR:
CHESAPEAKE BAY

[Map showing the principal oxidized nitrogen airshed for Chesapeake Bay]
Agricultural Land is a Major Source of N, P, and Sediment Loads to Bay

### Cost of Nitrogen Reduction

**Dollars per pound of annual nitrogen reduction**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cost per Pound Reduction</th>
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<tbody>
<tr>
<td>Stormwater retrofits</td>
<td>200 - 600</td>
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<tr>
<td>Stormwater mgmt for new development</td>
<td>92.40</td>
</tr>
<tr>
<td>WWTP upgrades -High</td>
<td>47.40</td>
</tr>
<tr>
<td>WWTP upgrades -Low</td>
<td>21.90</td>
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<tr>
<td>Enhanced NMP</td>
<td>15.80</td>
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<tr>
<td>Native oyster aquaculture</td>
<td>7.00</td>
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<tr>
<td>Algal turf scrubbing</td>
<td>6.60</td>
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<tr>
<td>Cover crops</td>
<td>4.70</td>
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<tr>
<td>Land retirement</td>
<td>3.30</td>
</tr>
<tr>
<td>Cons. tillage</td>
<td>3.20</td>
</tr>
<tr>
<td>Grassed buffers</td>
<td>3.20</td>
</tr>
<tr>
<td>Forest buffers</td>
<td>3.10</td>
</tr>
<tr>
<td>Restored or constructed wetlands</td>
<td>1.50</td>
</tr>
<tr>
<td>Forest harvest</td>
<td>1.20</td>
</tr>
</tbody>
</table>

**Average Cost of Selected Nitrogen Reduction Measures (Dollars per pound of annual nitrogen reduction)**

**Differential Costs in Per Pound Reductions Create Trading Opportunities**

- **Stormwater**
- **WWTP**
- **Agriculture**
- **New Practices**

- **Cover crops**
- **Grassed buffers**
- **Forest buffers**
- **Restored or constructed wetlands**
- **Forest harvest BMPs**
Four State Trading Programs in Chesapeake Bay

11 Separate Trading Areas:

- Maryland 3
- Pennsylvania 2
- Virginia 5
- West Virginia 1
# A Brief Comparison of State Trading Programs

<table>
<thead>
<tr>
<th></th>
<th>PA</th>
<th>VA</th>
<th>MD</th>
<th>WV</th>
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<tbody>
<tr>
<td><strong>Trading Areas</strong></td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>1</td>
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<tr>
<td><strong>NPS Baseline</strong></td>
<td>Legal requirements &amp; 20% (or eq.) reductions</td>
<td>Stipulated set of BMPs, eq. to TS reduction</td>
<td>% reduction from 1985 no-BMP average sub-basin load</td>
<td>% reduction from 1985 no-BMP average sub-basin load</td>
</tr>
<tr>
<td><strong>Trade Ratios</strong></td>
<td>Delivery 1.1:1 reserve</td>
<td>Delivery 2:1 uncertainty</td>
<td>Delivery 2:1 uncertainty, 1.05:1 retirement</td>
<td>Delivery 1.7:1 uncertainty 1.3:1 reserve</td>
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<tr>
<td><strong>Liability</strong></td>
<td>Contractual Aggregators True-up period DEP reserve</td>
<td>VNCEA Contractual True-up period DEQ reserve</td>
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<tr>
<td><strong>Platform</strong></td>
<td>NutrientNet</td>
<td>TBD</td>
<td>NutrientNet</td>
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</tr>
</tbody>
</table>
Sorry, but this just ain’t like your Mama’s TMDL!

What’s the Scope of the Bay TMDL?
- Entire watershed
- Nutrients, sediments
- All sources
- Oxygen, clarity/Bay grasses, algae
- All impaired tidal water segments

Impaired Segments
- CWA requires a TMDL for each impaired waterbody
- States, DC have listed Bay tidal waters on the basis of designated use by tidal Bay segments
- TMDL for each Tidal Bay Segment

New Generation of the Partnership’s Bay Models

Airshed Model  Watershed Model  Estuary Model
Chesapeake Bay Total Maximum Daily Load

Final issued December 28, 2010

Four Key Questions:

• What needs to be done?
• Who will be doing it at the state and local scale?
• How will it be done?
• By when will it be done?

Answers in the next generation implementation plans!
Role of Nutrient Trading in the TMDL

Growth Accommodation
State TMDL Choice:
Set Aside Specific Allocation for Growth
or
Rely on Nutrient Offsets to Accommodate Growth

Affordability and Cost-effectiveness

Enabling Backstop Provisions
Role of Nutrient Trading in the TMDL

Growth Accommodation
State TMDL Choice:
No State Chose Set-aside

New or Expanding WWTPS get no allocation for N or P discharges
Land conversion impacts will have to be offset
Role of Nutrient Trading in the TMDL

Growth Accommodation

In the long run...

Continued Growth and Economic Development Will Depend on Trading
Role of Nutrient Trading in the TMDL

Affordability and Cost-Effectiveness

An Extra $13 Billion Needed in 2002 for All Tributary Strategies by 2010

The Cost of a Clean Bay

<table>
<thead>
<tr>
<th>The Big Picture</th>
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<tbody>
<tr>
<td>Total projected cost</td>
</tr>
<tr>
<td>Total projected income</td>
</tr>
<tr>
<td>Unfunded gap</td>
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Unfunded Gap by State

<table>
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<td>Maryland</td>
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Role of Nutrient Trading in the TMDL

Affordability and Cost-Effectiveness

### The Cost of a Clean Bay

#### The Big Picture

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#### Unfunded Gap by State

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2003 Blue Ribbon Finance Panel: $28 Billion

2012???
Cost of Nitrogen Reduction

Dollars per pound of annual nitrogen reduction

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Average Cost of Selected Nitrogen Reduction Measures (Dollars per pound of annual nitrogen reduction)
Potential Savings are Immense if MS4s Can Buy Nitrogen Credits

Credit price = $50/lb
Credit price = $20/lb

Percent of target annual MS4 nitrogen reductions achieved via credit purchases

Million dollars in savings

0 200 400 600 800 1,000 1,200

0% 12.5% 25% 37.5% 50% 62.5% 75%
One Market

Interstate-Interbasin Nutrient Trading
One Market

- Match credit supply to credit demand more efficiently
- Make cheapest credits in Bay available to all buyers
- Increased competition among credit sellers lowers prices
- Preclude credit monopolies or artificially-restricted supplies
- Stimulates technology innovation to generate credits
- Produces a more stable and reliable supply of credits
One Market

Avoid Geographic Mismatches between Supply and Demand
Key Trading Program Design Elements

- Trading baselines
- Trading area(s)
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- What’s creditable
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- Credit certification
- Credit verification
- Delivery factors and trading ratios
- Upstream-Downstream directionality
- Credit life (or life of credit generation mechanism)
- Reconciliation period
- Length of trade
- Financial arrangements
  - Credit by credit
  - Pooled purchasing
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- Credit pricing
Issues that won’t go away, and some new ones

- “Hot spots”
- Trading to achieve vs trading to maintain compliance
- Trading as a way to make point sources pay for agricultural reductions
- Excessive uncertainty ratios
- Unrealistic positions on purpose of trading programs (trading restores/protects water quality)
- Certification and verification of nps reductions
- Social justice
Opportunities

- Reduce cost to dischargers and society as a whole
- Reduce MS4 costs
- Accommodate growth
- Maximize benefits through regional trading
- Demonstrate viability and benefits of large-scale, market-based trading, particularly point source-nonpoint source trading
New Opportunities and Challenges

**Opportunities**

- Stormwater trading
- Investor interest
- Mainstreaming trading
- Adaptive management
New Opportunities and Challenges

**Challenges**
- Quantification of nonpoint source loads
- “We don’t have any pollution” attitude
- Mistrust, misconceptions, misrepresentation
- Data limitations
- LOT philosophy
- Driver delayed, weak, absent
- Many NGOs and state permit staff ambivalent, outright negative on trading
- Disagreement among regulatory decision-makers
Wisconsin Watershed Adaptive Management Option

- **Goals** - achieve WQC:
  - Economically-avoid filtration
  - As soon as possible
  - Consider both point and nonpoint contributions

- **Conditions**
  - Exceedance caused by both point and nonpoint
  - Sum of nonpoint & MS4 at least 50% of total load
  - Proposed WQBEL will require filtration
  - Demonstrate how criteria will be met
  - Demonstrate ability to fund and implement
What Does it Look Like?

- Application by POTW
- 3 permit terms
- Interim limits for POTWs
- Flexible practices
  - Trading without trading framework
  - Pollution prevention/source reduction measures
  - Local ordinances
  - Etc
- Watershed based permitting?
- Outcomes
Anticipated District Compliance Costs

- Filtration
  ($78 million)

- Adaptive management
  ($8 million)

Assumes:
- All sources participate
- Costs assigned proportional to TMDL required reductions

- Pilot project
What is the Potential Price Tag For Adaptive Management?

Yahara Watershed Adaptive Management Cost Estimates
(Point Sources at Current Phosphorus Loads)

- **Background**
  - $3.4 M Total PW Cost
  - $169,000 Annual Cost

- **MMSD**
  - $8.1 M Total PW Cost
  - $405,000 Annual Cost

- **Other Point Sources**
  - $1.9 M Total PW Cost
  - $93,000 Annual Cost

- **City of Madison**
  - $8.6 M Total PW Cost
  - $432,000 Annual Cost

- **Nonpoint**
  - $28.1 M Total PW Cost
  - $1,405,000 Annual Cost

- **Other MS4s**
  - 8.5 M Total PW Cost
  - $425,000 Annual Cost

**$59 M Total PW Cost**
Some ways to make setting up and implementing a trading program easier:

- **Big Picture Things**
  - Clearinghouse/Support network by and for NACWA members
  - Early education/outreach to regulators and other stakeholders
  - In light of nutrient train coming, state-level effort to lay regulatory groundwork for trading option ahead of imminent need
  - Improve watershed data and TMDL analysis: when shortcomings exist, it is usually not only relative to the trading option
Some ways to make setting up and implementing a trading program easier:

- **Project and Program Level Things**
  - Start thinking and talking about trading before the TMDL starts, or at least while it’s being done—not after
  - Piggy-back or otherwise leverage existing programs where possible and they have proven successful
Final Thoughts

- Trading can work-drivers are needed
- Every program is different
- Getting ag to play is challenging, but potentially very rewarding
- Engage stakeholders early
- Thoughtful development of programs
- Wastewater community should be a leader

Those interested in continuing trading discussion can join us in the Rose Room at 5:15