Nutrients and the Role of Trading

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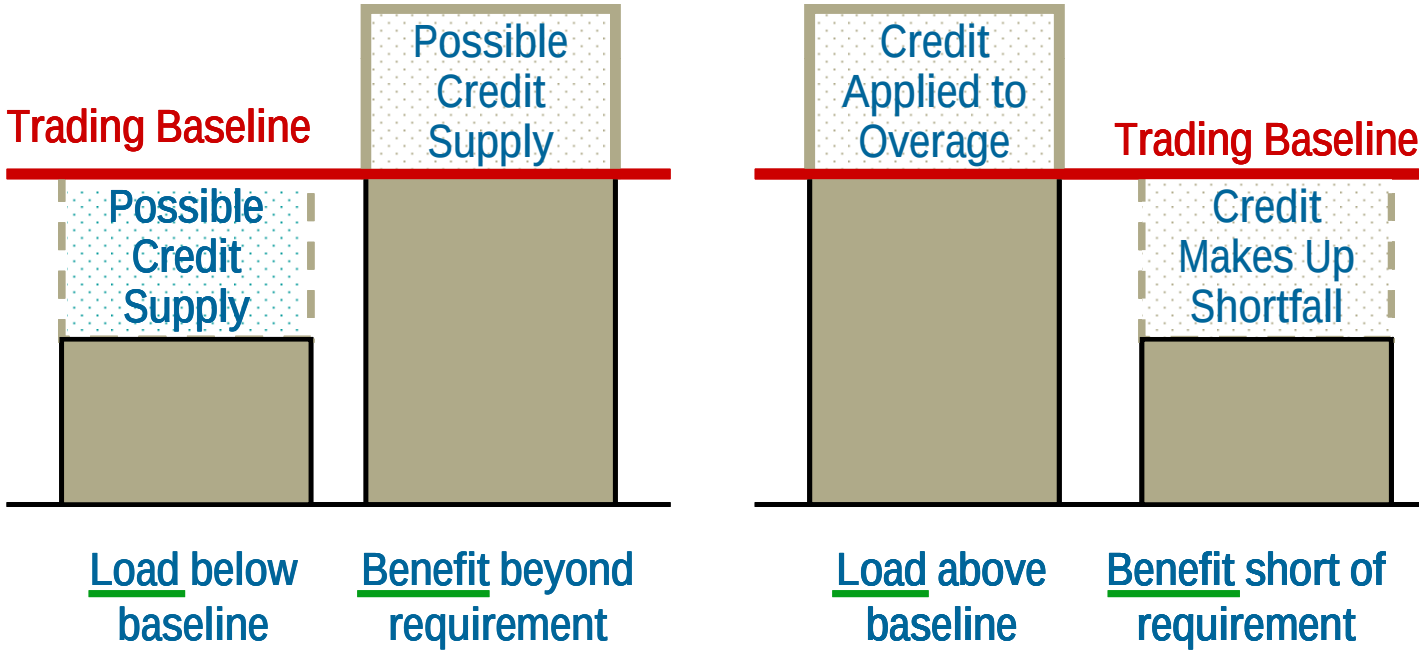
Presentation Segments

- 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

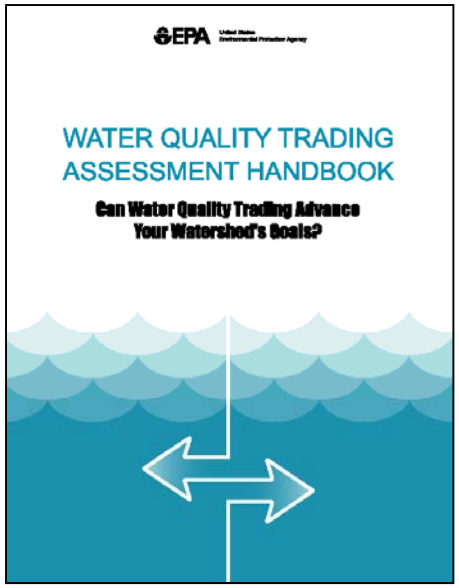
Trading 101:
What are Water Quality Credits?

- 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

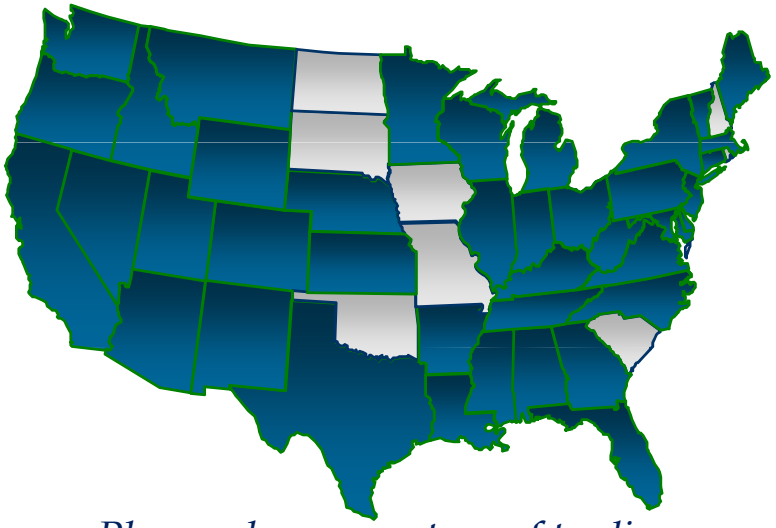


The United States Environmental Protection Agency believes that market-based approaches such as water quality trading provide greater flexibility and have potential to achieve water quality and environmental benefits greater than would otherwise be achieved under more traditional regulatory approaches.

Final Water Quality Trading Policy, January 2003

Trading is Not New Anymore

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



Places where some type of trading initiative or program exists/existed.

Pollutants being traded or considered:

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

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
- 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
- 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
- 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

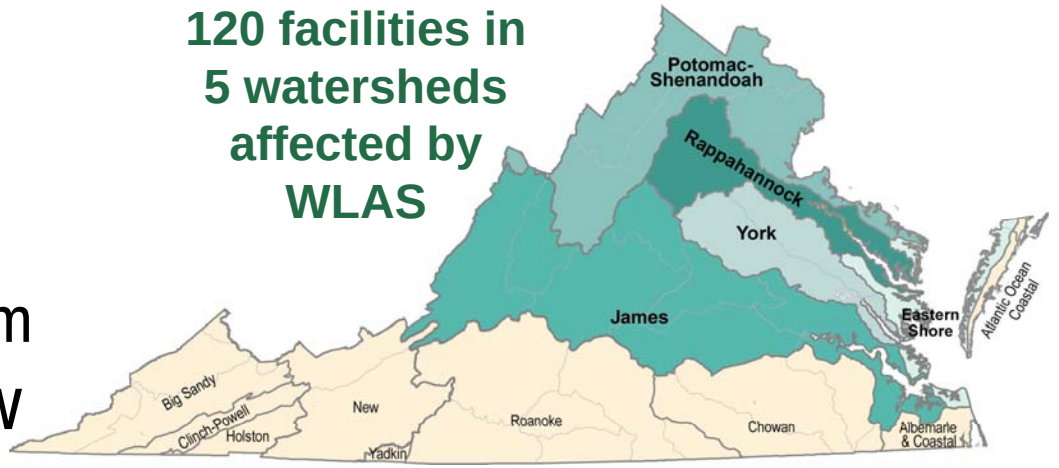
- Clean Water Services:
  Point-Nonpoint Temperature

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

Basin	#	MGD
Potomac/Shenandoah	43	405
Rappahannock	22	46
York	11	108
James	39	581
Eastern Shore	5	2
	120	1,142

120 facilities in 5 watersheds affected by WLAS



Graphic by CH2M HILL for the Exchange

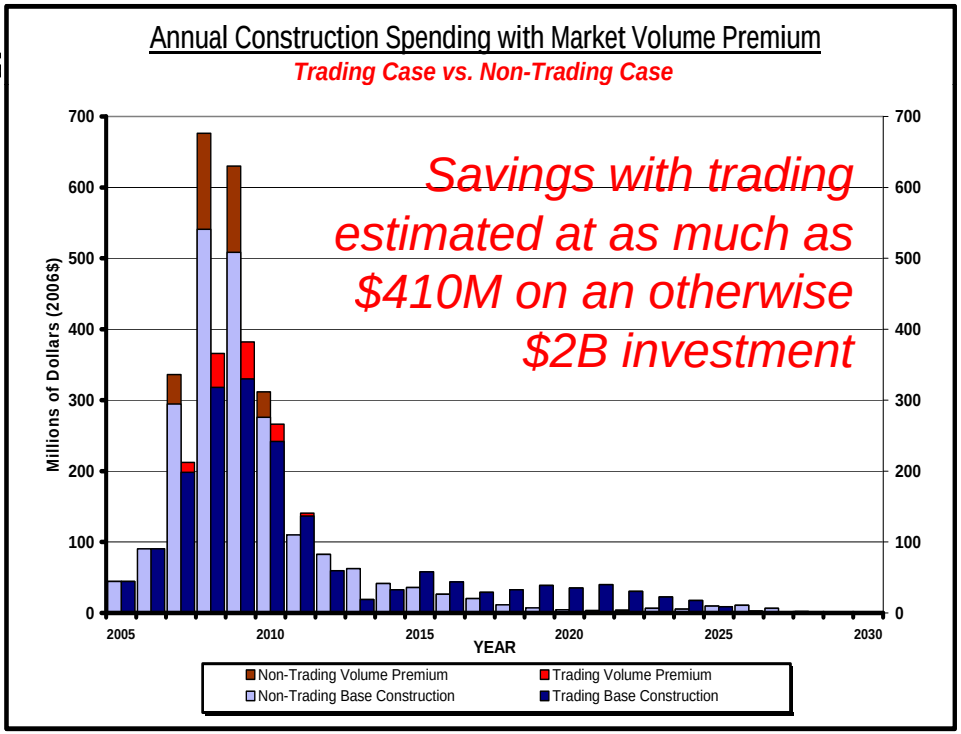
Virginia Nutrient Credit Exchange: Program Development Milestones

- 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



Virginia Nutrient Credit Exchange:
Program Scale, 2011 - 2016

Virginia Nutrient Credit Exchange Market Estimates 2011-2016	NITROGEN	PHOSPHORUS
Class A		
Bay Pounds (M)	2.6	0.412
Value (M)	$6.40	$1.78
Class B		
Bay Pounds (M)	4.0	0.472
Value (M)	$0.62	$0.18
Other Credits		
Bay Pounds (M)	4.5	0.324
TOTAL		
Bay Pounds (M)	11.1	1.21
Value (M)	$7.02	$1.96

EXHIBIT 2-2
2012 Nitrogen Trading Ledger: Potomac-Shenandoah River Basin

POTOMAC Basin: Nitrogen Credit Ledger

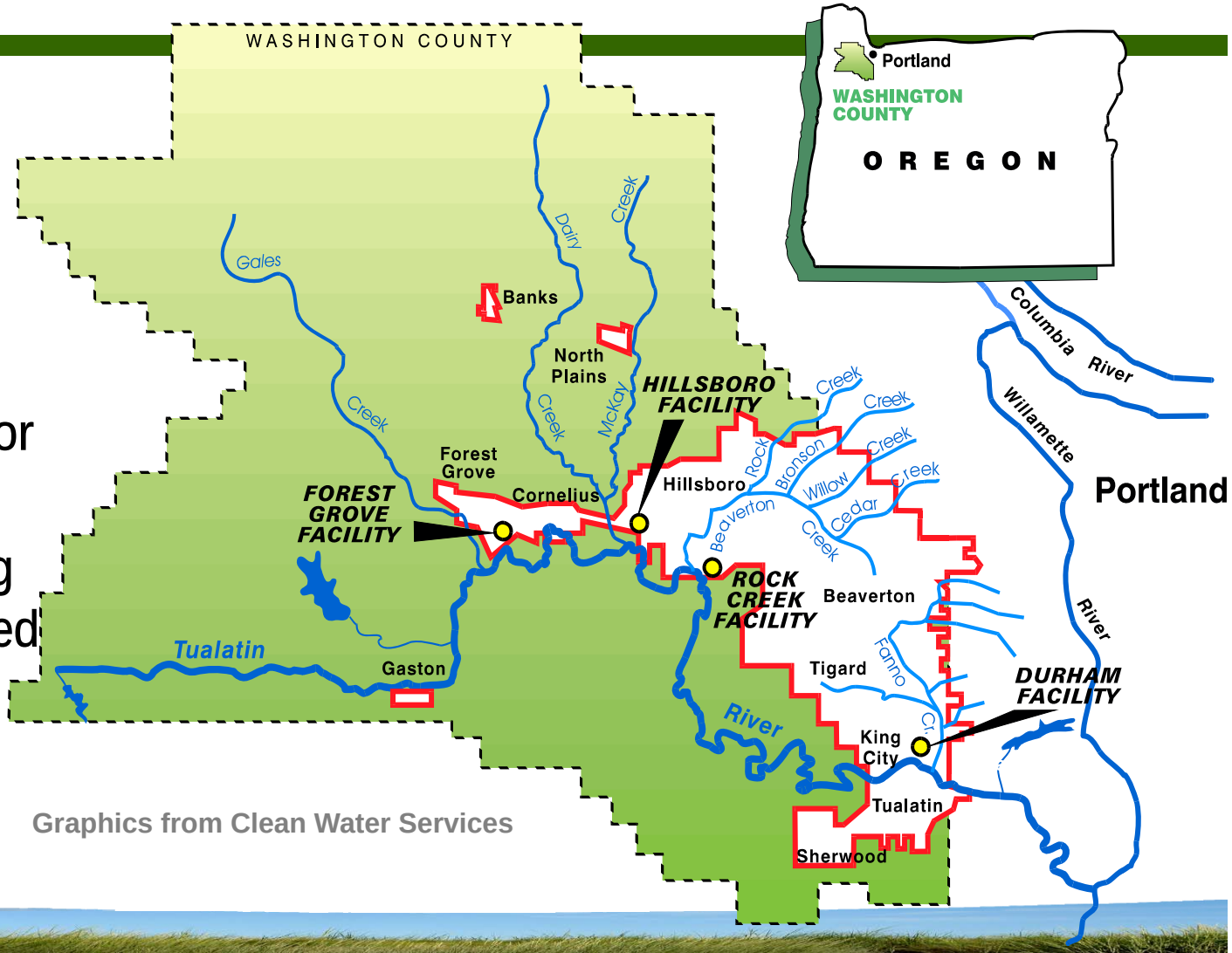
Compliance Year:	2012	Credit Forecasts		Preliminary Use of Credits				Credit Exchange (Pounds)			
Facility Name	Delivered WLA	Expected Load	Expected Credits	In-Bubble Exchange	Private Exchange	WQIF-Held Credits	Expected Net Credits		Class A Sales	Class A* Purchases	Class B** (expected)
								PRICE:	$ 1.29	$ 2.00	$ 0.13
The Exchange (group)	**2,978,779**	**2,718,399**	**260,380**	**-**	**(7,972)**	**(25,278)**	**227,130**		**169,657**	**(122,249)**	**179,722**
ACSA-Fishersville	21,441	12,757	8,684	-	-	-	8,684		4,342	-	4,342
ACSA-Greenville	6,265	1,278	4,987	(4,987)	-	-	-		-	-	-
ACSA-Harriston	2,506	828	1,678	(1,678)	-	-	-		-	-	-
ACSA-Middle River	36,449	27,444	9,005	-	-	-	9,005		4,503	-	4,502
ACSA-Mt. Sidney	3,759	3,743	16	(16)	-	-	-		-	-	-
ACSA-Stuarts Draft	21,441	9,220	12,221	(9,871)	-	-	2,350		1,175	-	1,175
ACSA-Vesper View	2,506	1,219	1,287	(1,287)	-	-	-		-	-	-
ACSA-Weyers Cave	2,680	20,519	(17,839)	17,839	-	-	-		-	-	-
Alexandria S.A.	493,381	493,381	-	-	-	-	-		-	-	-
Berryville	5,713	16,732	(11,019)	-	-	-	(11,019)		-	(11,019)	-
Broadway Regional	19,752	15,855	3,897	-	-	-	3,897		-	-	3,897
Dale Service Corp #1	42,029	36,090	5,939	-	-	-	5,939		-	-	5,939
Dale Service Corp #8	42,029	36,090	5,939	-	-	-	5,939		-	-	5,939
Fairfax Co-Noman Cole	612,158	612,158	-	-	-	-	-		-	-	-
FCWSA-Vint Hill	5,034	1,590	3,444	-	-	-	3,444		-	-	3,444
Front Royal	32,648	96,129	(63,481)	-	-	-	(63,481)		-	(63,481)	-
FWSA-Opequon	90,170	50,438	39,732	-	-	-	39,732		-	-	39,732
FWSA-Parkins Mill	45,074	18,210	26,864	-	-	-	26,864		-	-	26,864
HRRSA-North River	111,492	70,272	41,220	-	-	-	41,220		41,220	-	-
KGCSA-Dahlgren S.D.	9,137	8,649	488	(488)	-	-	-		-	-	-
KGCSA-Fairview Beach	1,827	914	913	(913)	-	-	-		-	-	-
KGCSA-Purkins Corner	1,096	7,614	(6,518)	1,401	-	-	(5,117)		-	(5,117)	-
Leesburg	101,113	57,028	44,085	-	-	(25,278)	18,807		-	-	18,807
Loudoun Water- Broad Run	111,224	50,253	60,971	-	-	-	60,971		54,874	-	6,097
Luray	8,576	3,417	5,159	-	(5,159)	-	-		-	-	-
Massanutten PSC	8,040	10,078	(2,038)	-	-	-	(2,038)		-	(2,038)	-
Merck	6,432	19,297	(12,865)	-	-	-	(12,865)		-	(12,865)	-
MillerCoors LLC	24,121	24,121	-	-	-	-	-		-	-	-
Mt. Jackson	5,713	4,081	1,632	-	-	-	1,632		-	-	1,632
Purcellville	15,167	9,403	5,764	-	-	-	5,764		2,882	-	2,882
PWCSA-HL Mooney	219,280	155,324	63,956	-	-	-	63,956		44,769	-	19,187
Stafford Co-Aquia	73,093	59,937	13,156	-	-	-	13,156		11,577	-	1,579
Stoney Creek	4,897	5,856	(959)	-	-	-	(959)		-	(959)	-
Strasburg	7,999	31,956	(23,957)	-	-	-	(23,957)		-	(23,957)	-
UCSA	763,096	729,392	33,704	-	-	-	33,704		-	-	33,704
Waynesboro	21,441	17,126	4,315	-	-	-	4,315		4,315	-	-
Purchase by Eastern Shore	-	-	-	-	(2,813)	-	(2,813)		-	(2,813)	-
	-	-	-	-	-	-	-		-	-	-

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

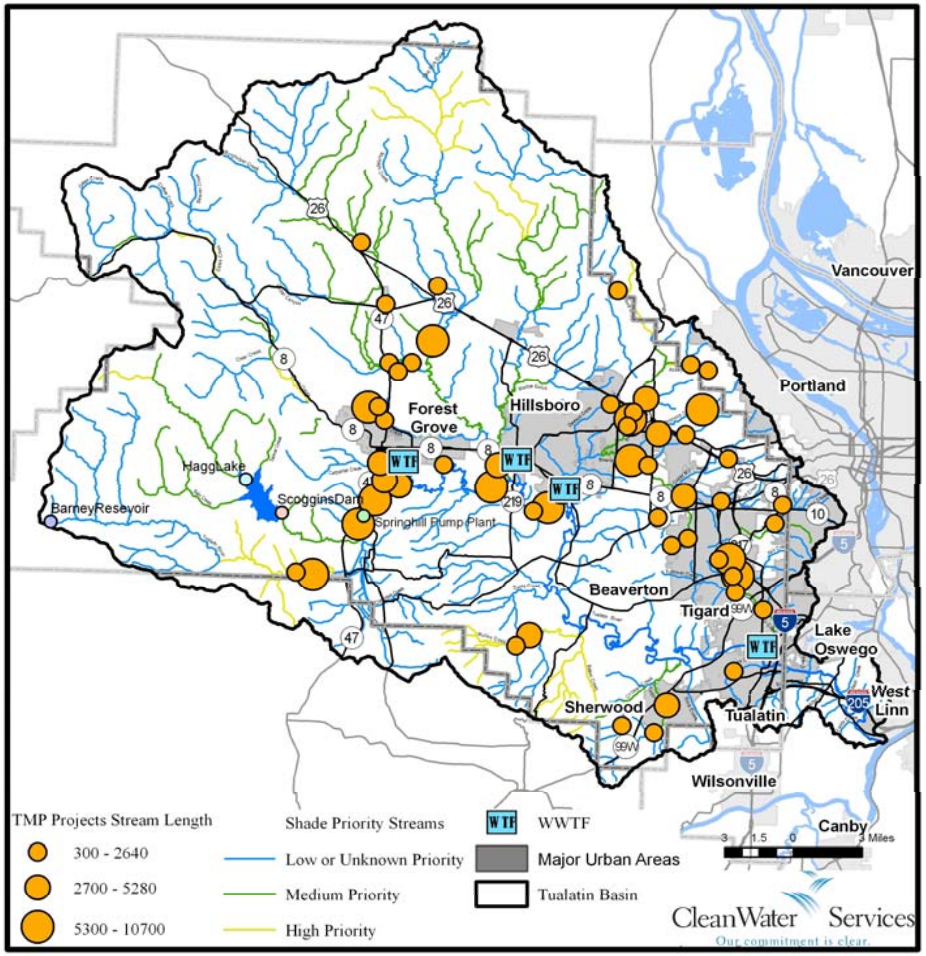


Graphics from Clean Water Services

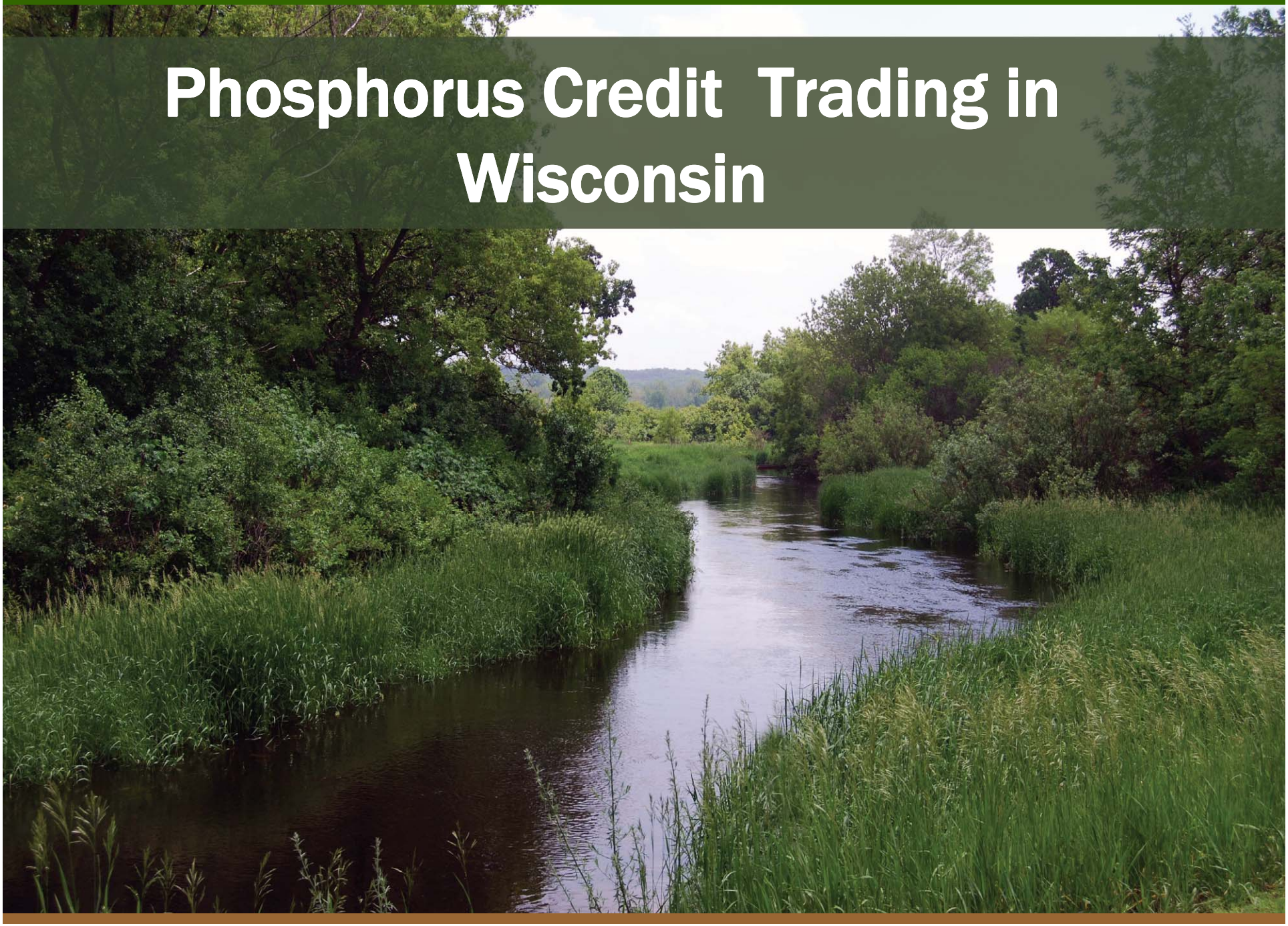
Clean Water Services:

"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 o 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

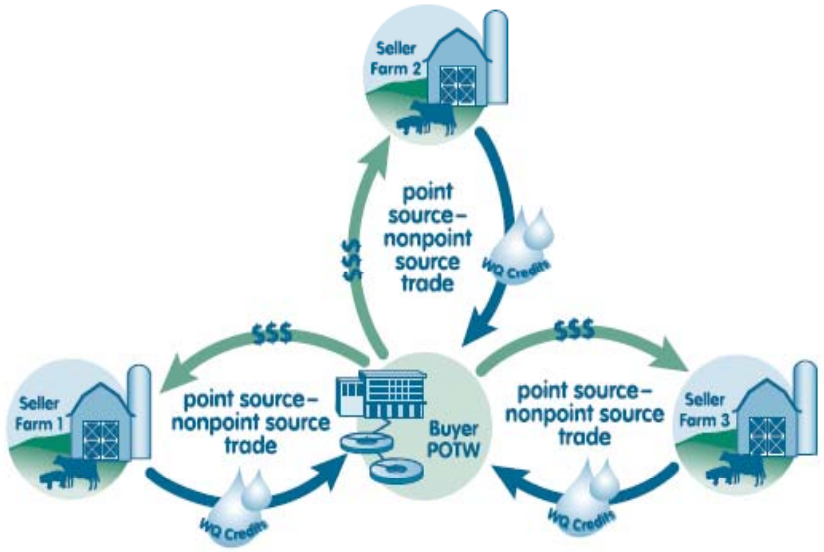


Phosphorus Credit Trading in Wisconsin



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



Wisconsin Draft Trading Framework

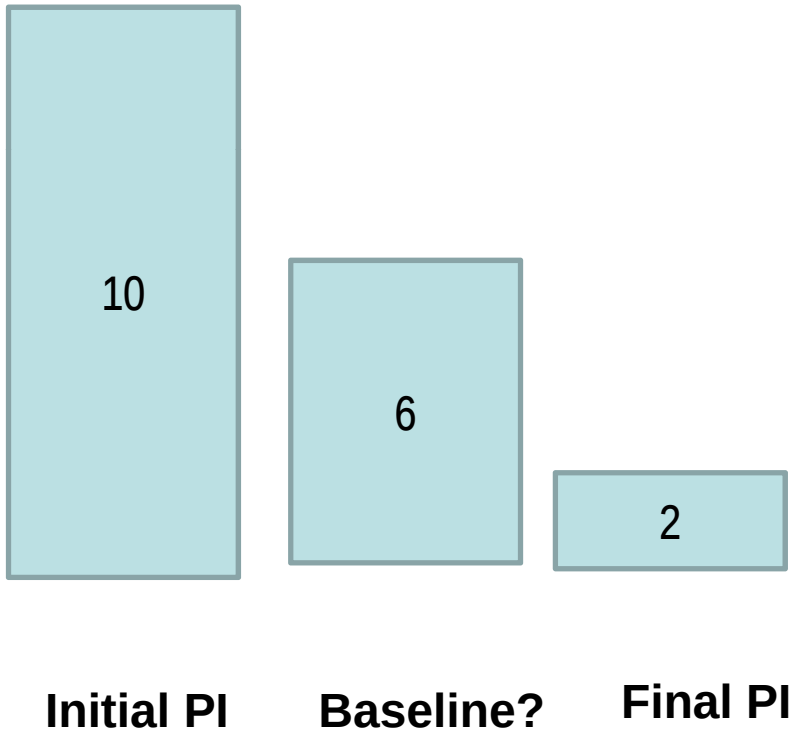
- Some key issues
  - Trade ratios
  - Baseline
  - Geographic scope
  - Permit issues
  - Trade administration-broker
  - WDNR vs. EPA

Trade Ratios

- How are they established?
- Can/should trade ratios be standardized across state?

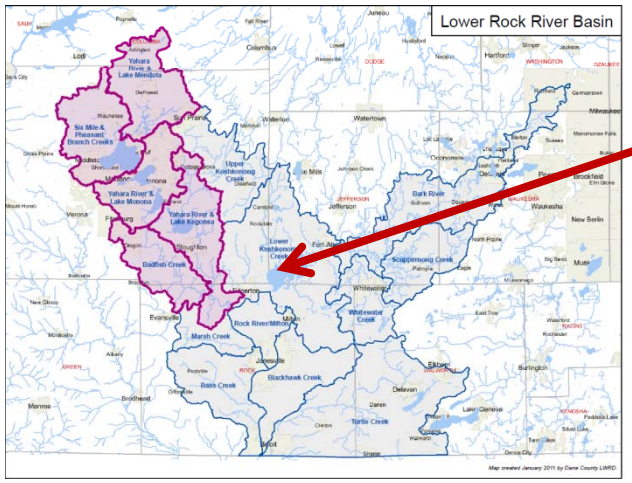
Baseline for Nonpoint/Credit Generation

- 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



Geographic scope

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



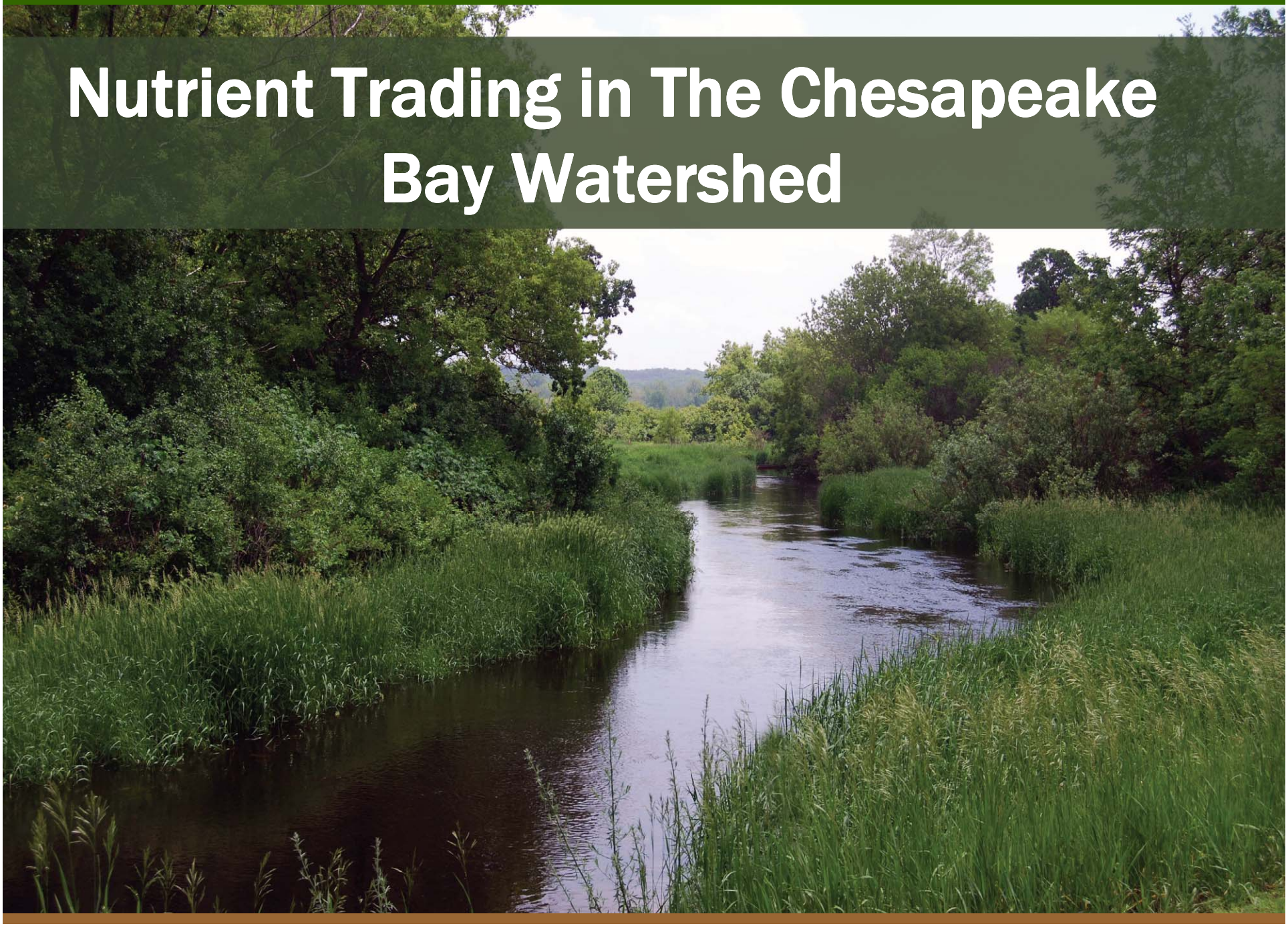
Permit Issues

- 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

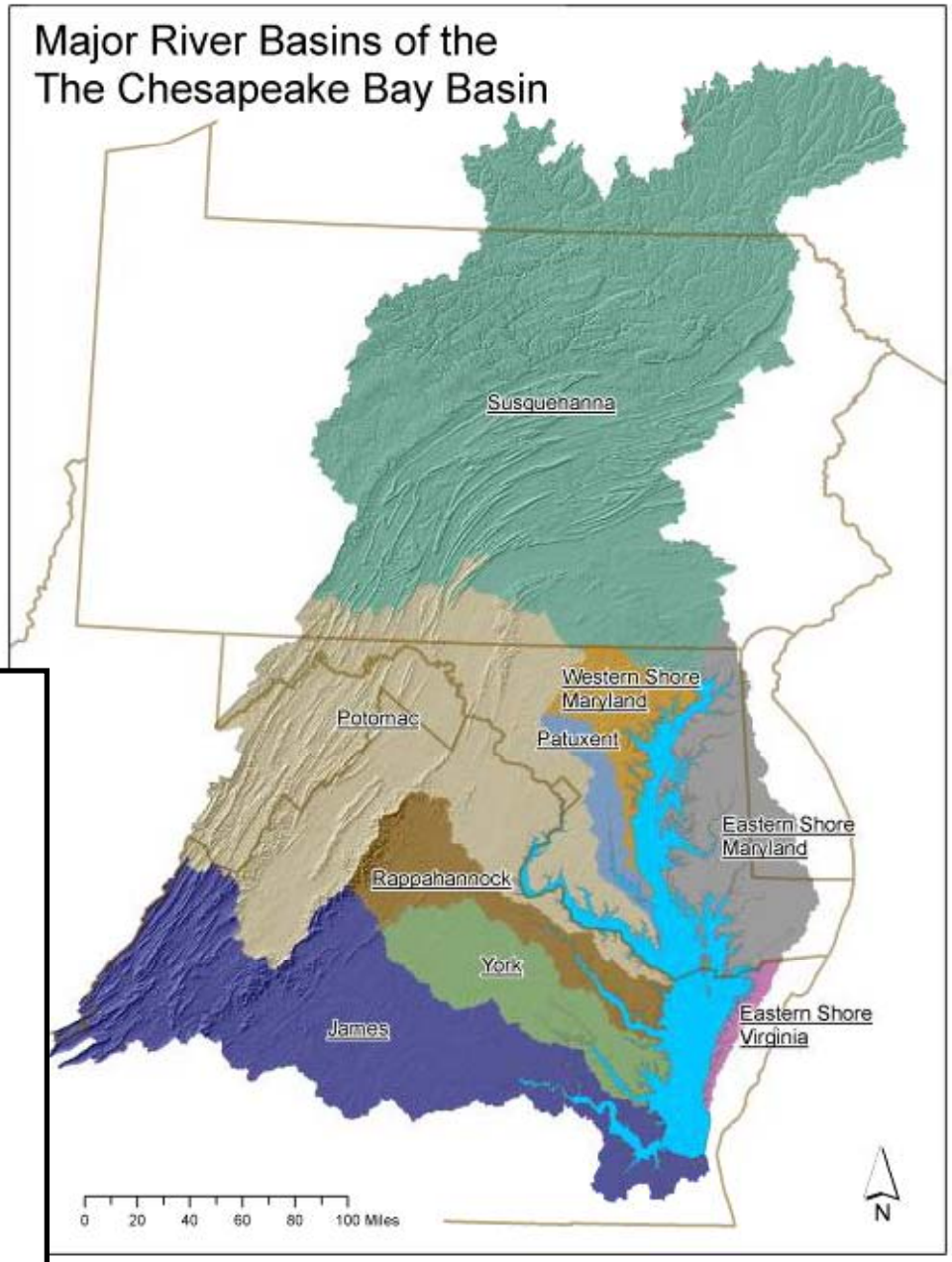
West Virginia

Delaware

Virginia

New York

Washington, D.C.



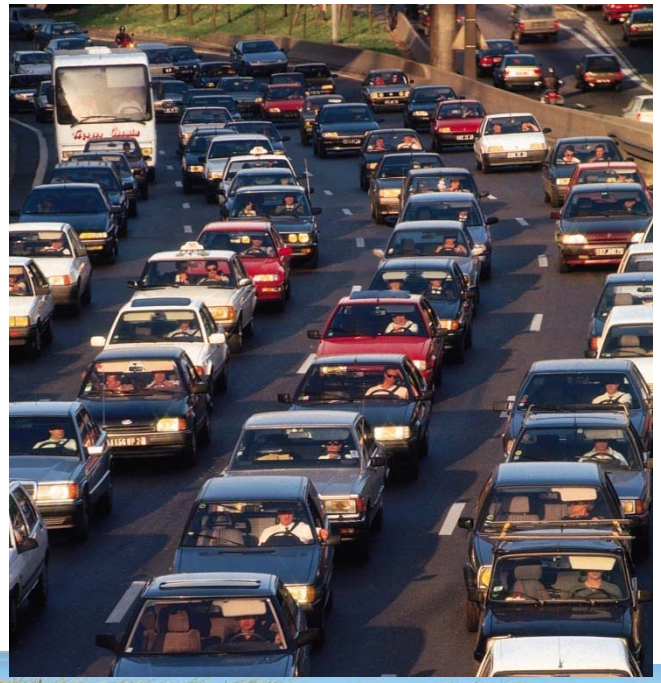
Nitrogen and Phosphorus Sources

Wastewater Treatment Plants

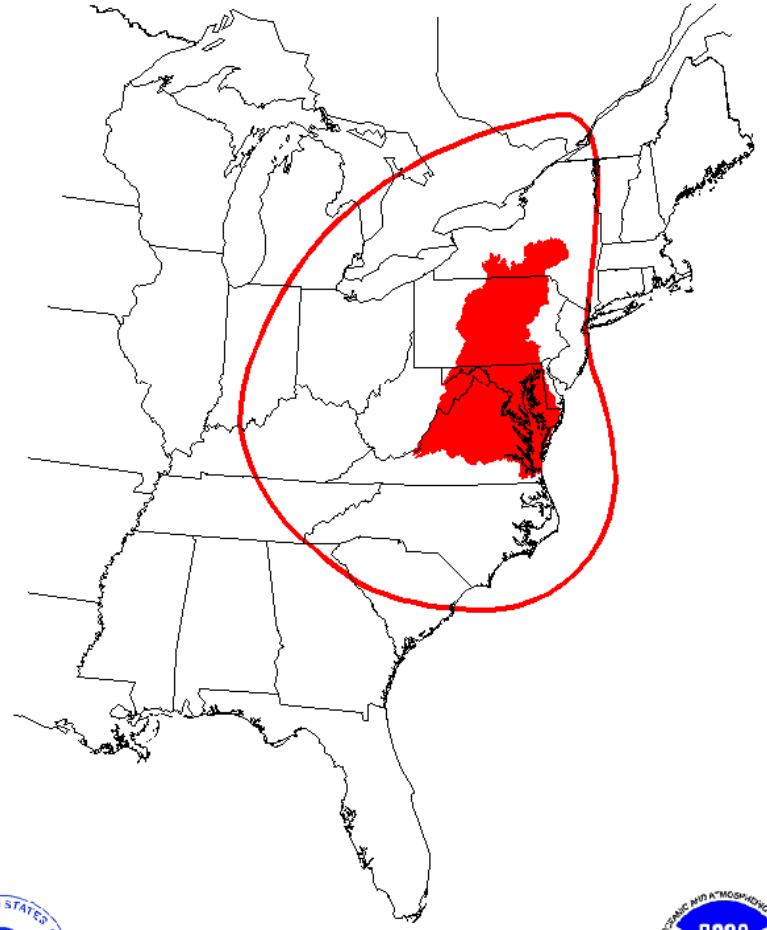
Urban stormwater

Agriculture

Atmospheric Deposition

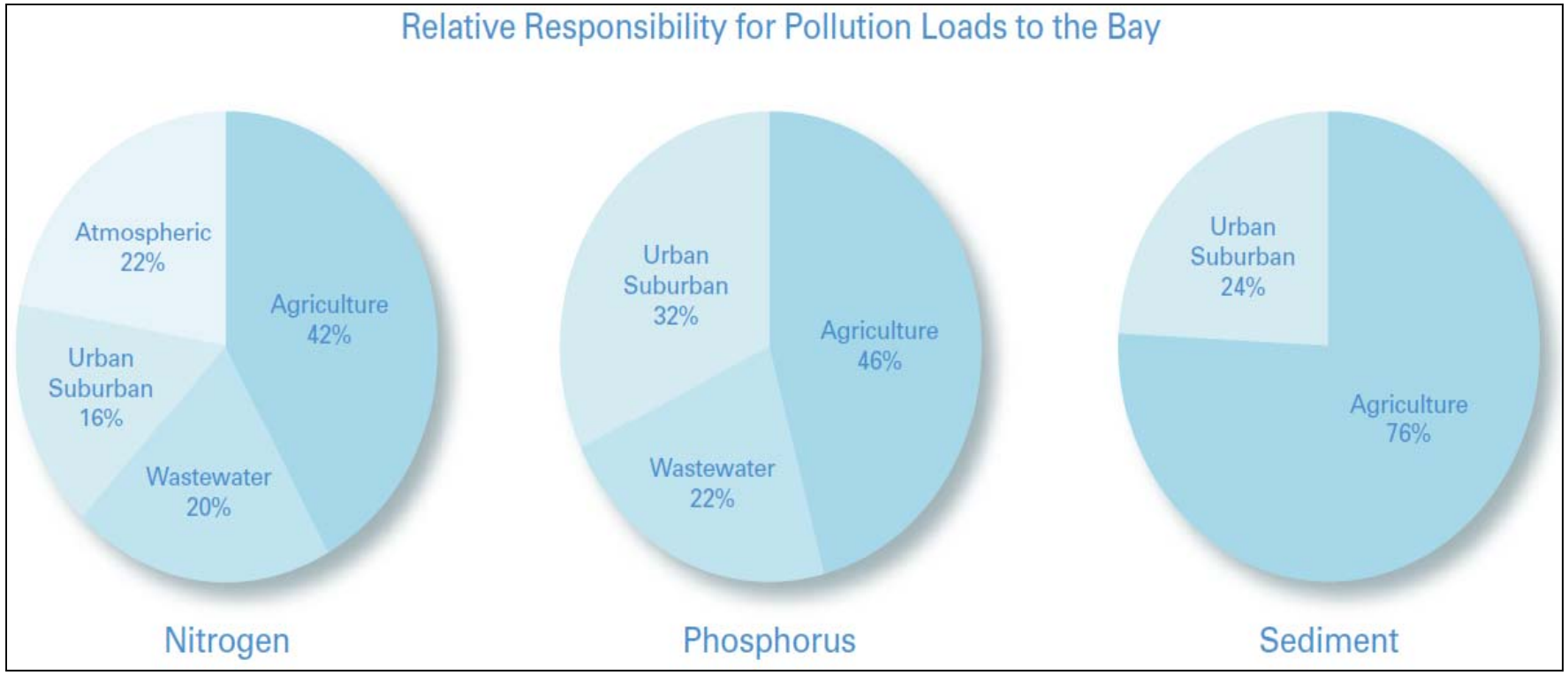


PRINCIPAL OXIDIZED NITROGEN AIRSHED FOR:
CHESAPEAKE BAY



DEVELOPED BY R. DENNIS, ATMOSPHERIC SCIENCES MODELING DIVISION:
ARL, NOAA, and NERL USEPA

Agricultural Land is a Major Source of N, P, and Sediment Loads to Bay

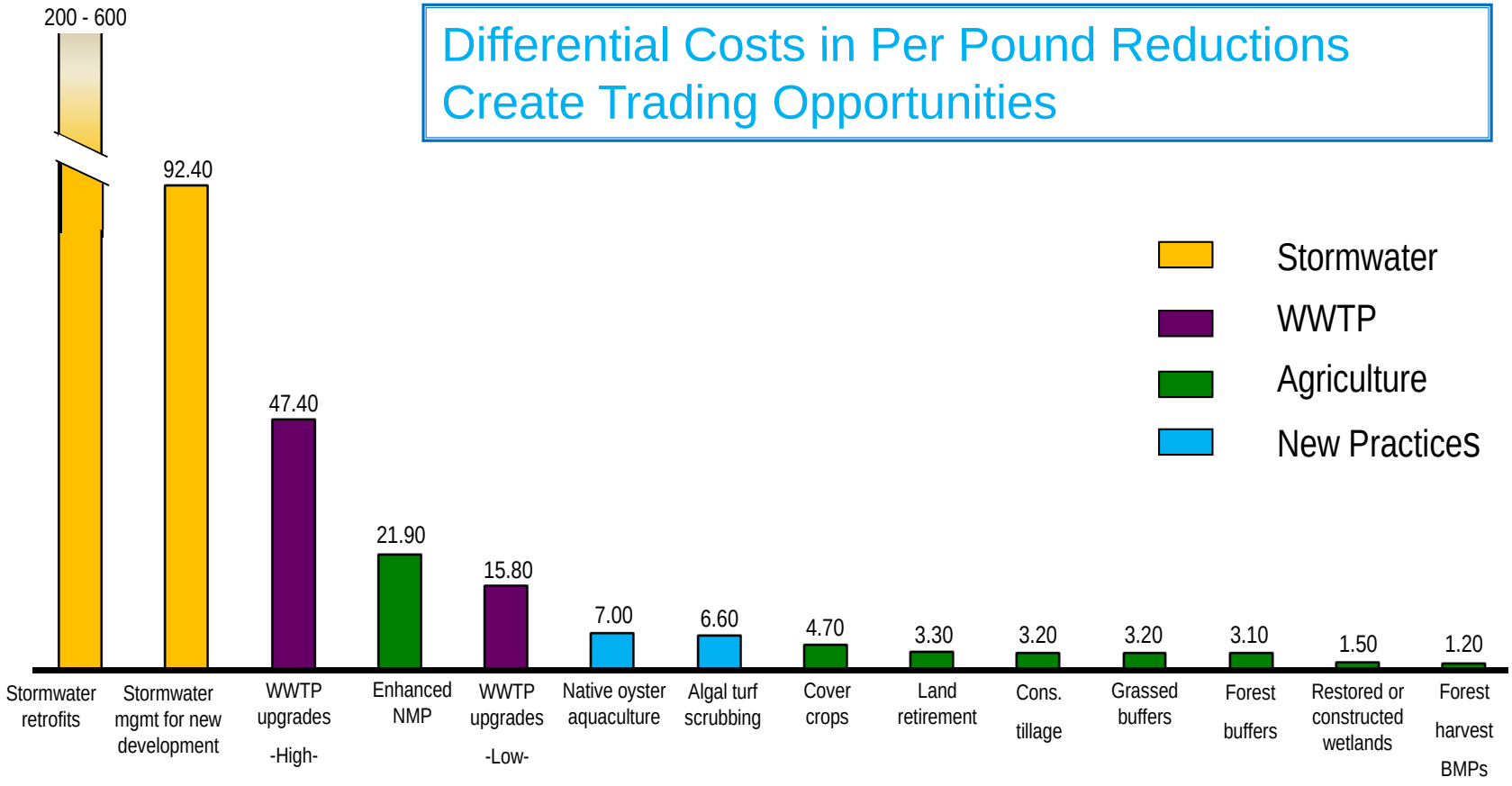


Source: EPA Chesapeake Bay Program. Bay Barometer; A Health and Restoration Assessment of the Chesapeake Bay and Watershed in 2008. March 2009.
http://www.chesapeakebay.net/content/publications/cbp_34915.pdf

Cost of Nitrogen Reduction

Dollars per pound of annual nitrogen reduction

Differential Costs in Per Pound Reductions Create Trading Opportunities



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

Four State Trading Programs in Chesapeake Bay

11 Separate Trading Areas:

Maryland	3
Pennsylvania	2
Virginia	5
West Virginia	1

Data sources: Watershed basins (USGS, 2006), administrative boundaries (ESRI Data and Maps 9.3.1, ESRI, 2008).

A Brief Comparison of State Trading Programs

	PA	VA	MD	WV
Trading Areas	2	5	3	1
NPS Baseline	Legal requirements & 20% (or eq.) reductions	Stipulated set of BMPs, eq. to TS reduction	% reduction from 1985 no-BMP average sub-basin load	% reduction from 1985 no-BMP average sub-basin load
Trade Ratios	Delivery 1.1:1 reserve	Delivery 2:1 uncertainty	Delivery 2:1 uncertainty, 1.05:1 retirement	Delivery 1.7:1 uncertainty 1.3:1 reserve
Liability	Contractual Aggregators True-up period DEP reserve	VNCEA Contractual True-up period DEQ reserve	Contractual Aggregators	Contractual Aggregators True-up period DEP reserve
Platform	NutrientNet	TBD	NutrientNet	NutrientNet

Chesapeake Bay Total Maximum Daily Load

Final issued December 28, 2010

Sorry, but this just ain't like your Mama's TMDL!

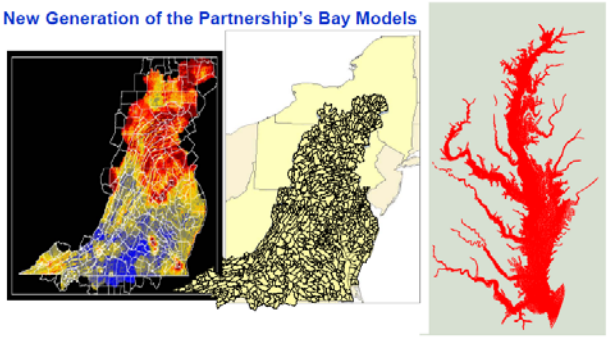
Impaired Segments

- 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

What's the Scope of the Bay TMDL?

- Entire watershed
- Nutrients, sediments
- All sources
- Oxygen, clarity/Bay grasses, algae
- All impaired tidal water segments

New Generation of the Partnership's Bay Models



Airshed Model Watershed Model Estuary Model

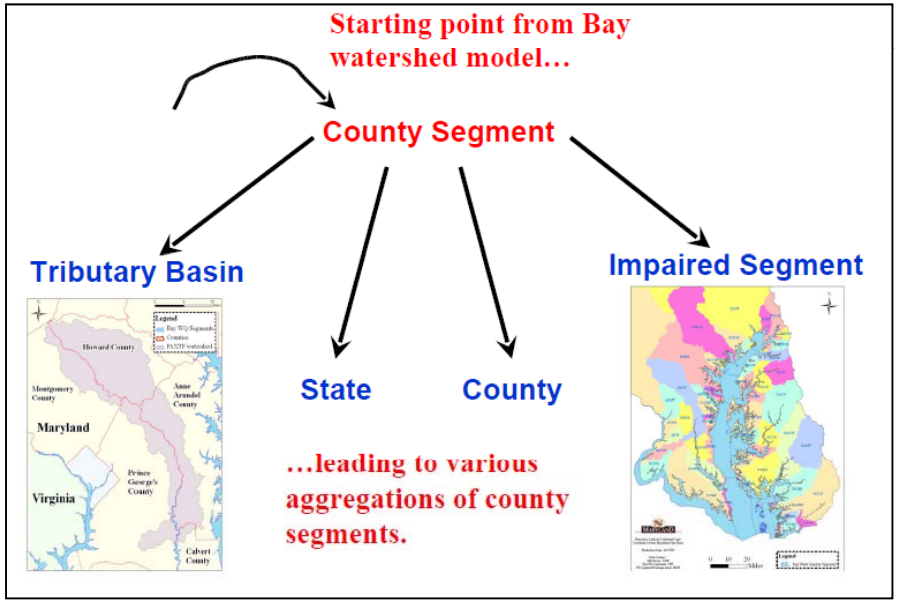
Chesapeake Bay Total Maximum Daily Load

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

The Big Picture

Total projected cost	$18.7 billion
Total projected income	$5.9 billion
Unfunded gap	**$12.8 billion**

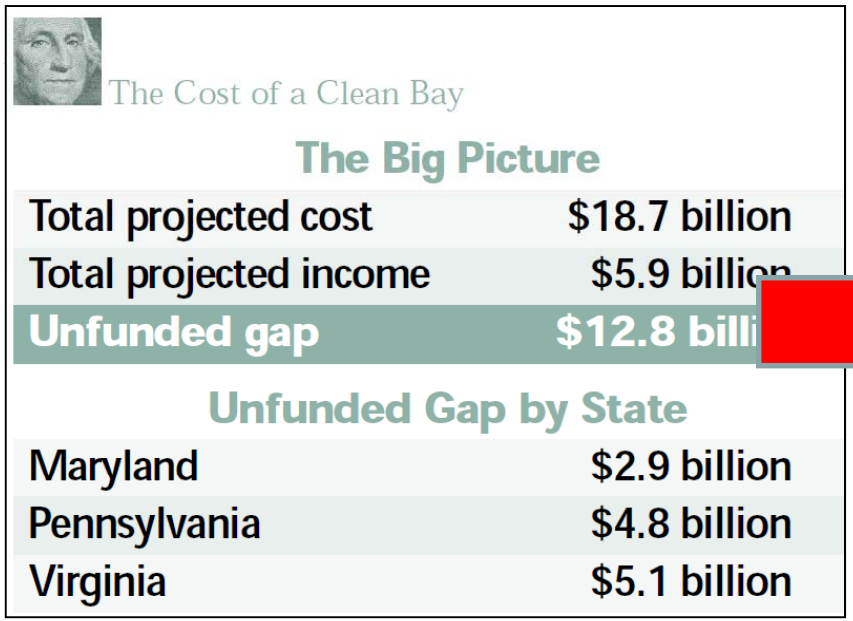
Unfunded Gap by State

Maryland	$2.9 billion
Pennsylvania	$4.8 billion
Virginia	$5.1 billion

Source: Chesapeake Bay Commission. The Cost of a Clean Bay; Assessing Funding Needs Throughout the Watershed. January 2003.

Role of Nutrient Trading in the TMDL

Affordability and Cost-Effectiveness



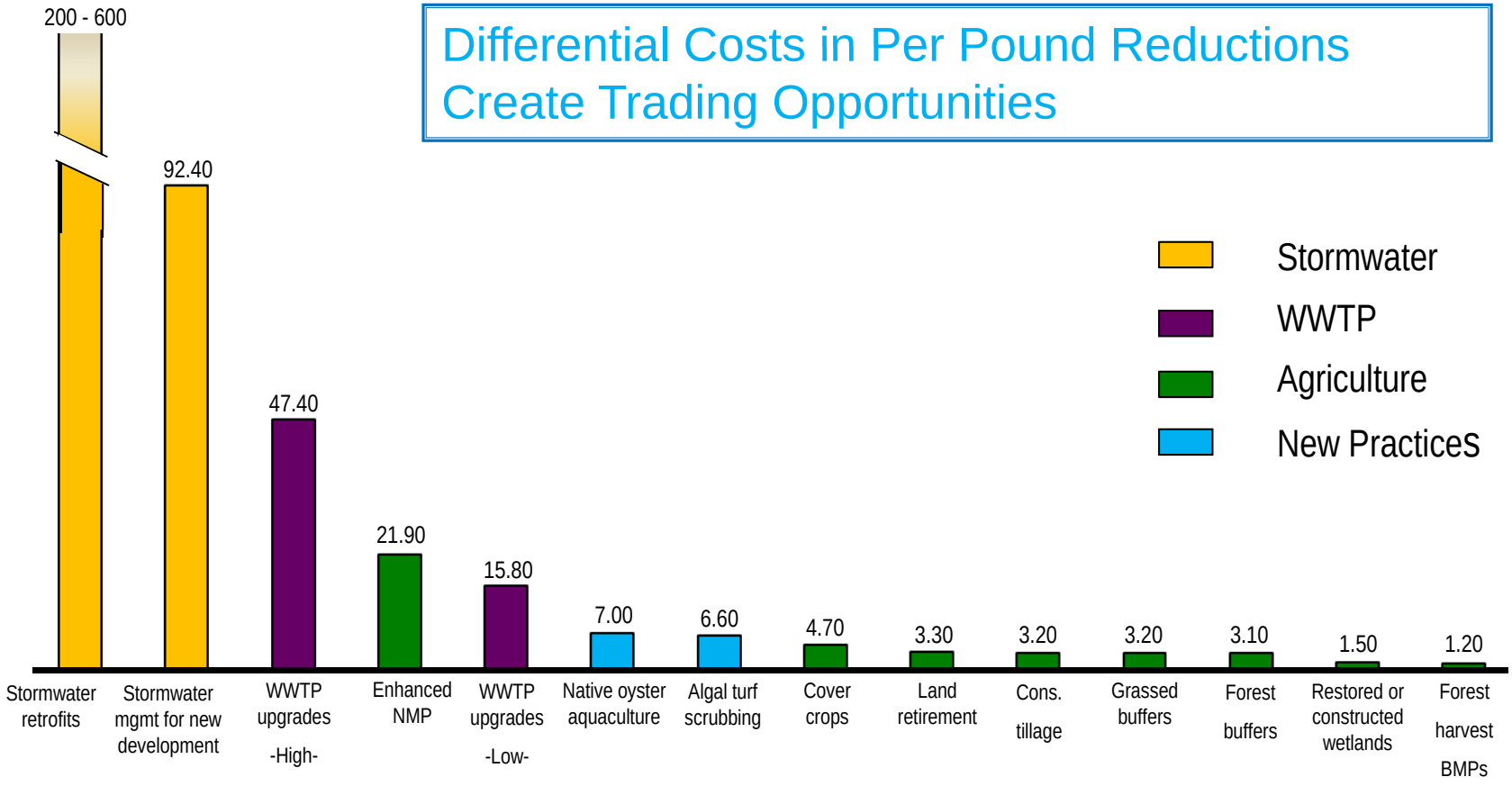
2003 Blue Ribbon Finance Panel: $28 Billion

2012???

Cost of Nitrogen Reduction

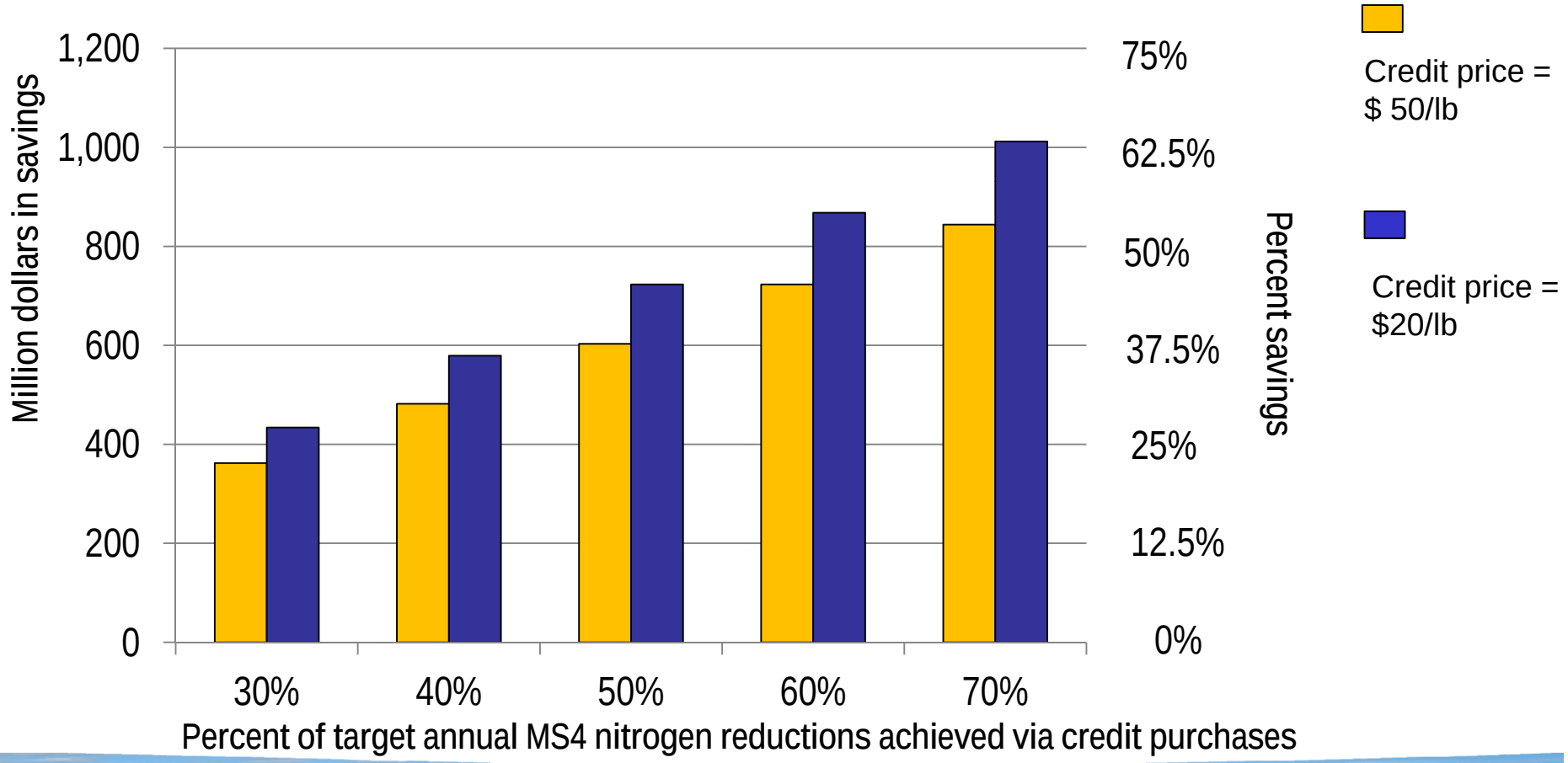
Dollars per pound of annual nitrogen reduction

Differential Costs in Per Pound Reductions Create Trading Opportunities



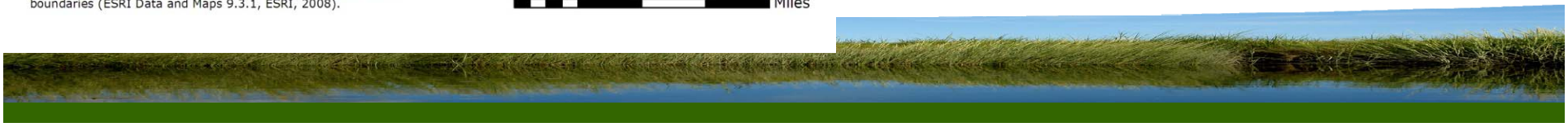
Average Cost of Selected Nitrogen Reduction Measures (*Dollars per pound of annual nitrogen reduction)*

Potential Savings are Immense if MS4s Can Buy Nitrogen Credits



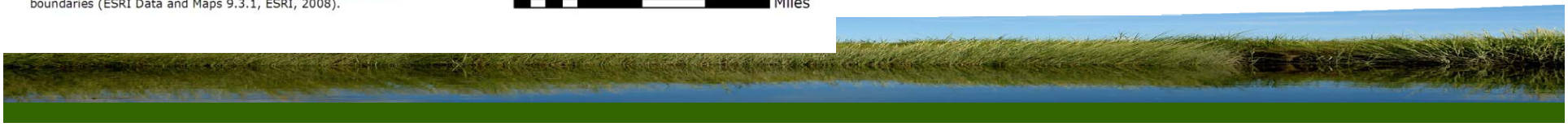
One Market

Interstate-Interbasin Nutrient Trading



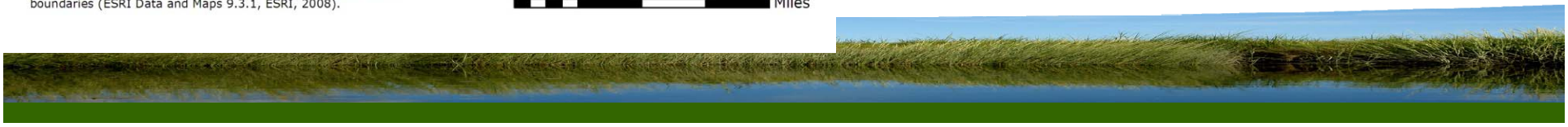
One Market

- 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)
- 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

Key Trading Program Design Elements

- Trading baselines
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- Implementation mechanisms
- Liability
- Risk management
- 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
- Administration costs
- 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

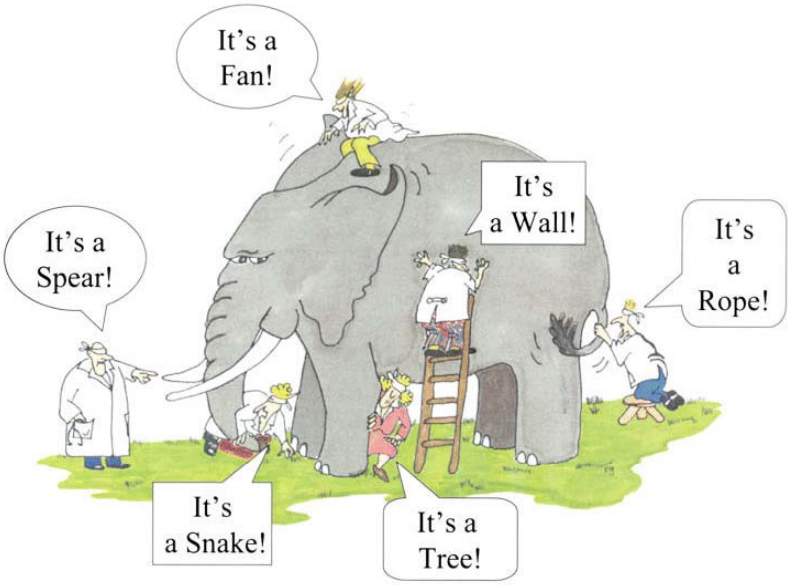
- Quantification of nonpoint source loads
- "We don't have any pollution" attitude
- Mistrust, misconceptions, misrepresentation
- Data limitations
- LOT philosophy
- Driver delayed, weak, absent
- Many NGOs and state permit staff ambivalent, outright negative on trading
- Disagreement among regulatory 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?

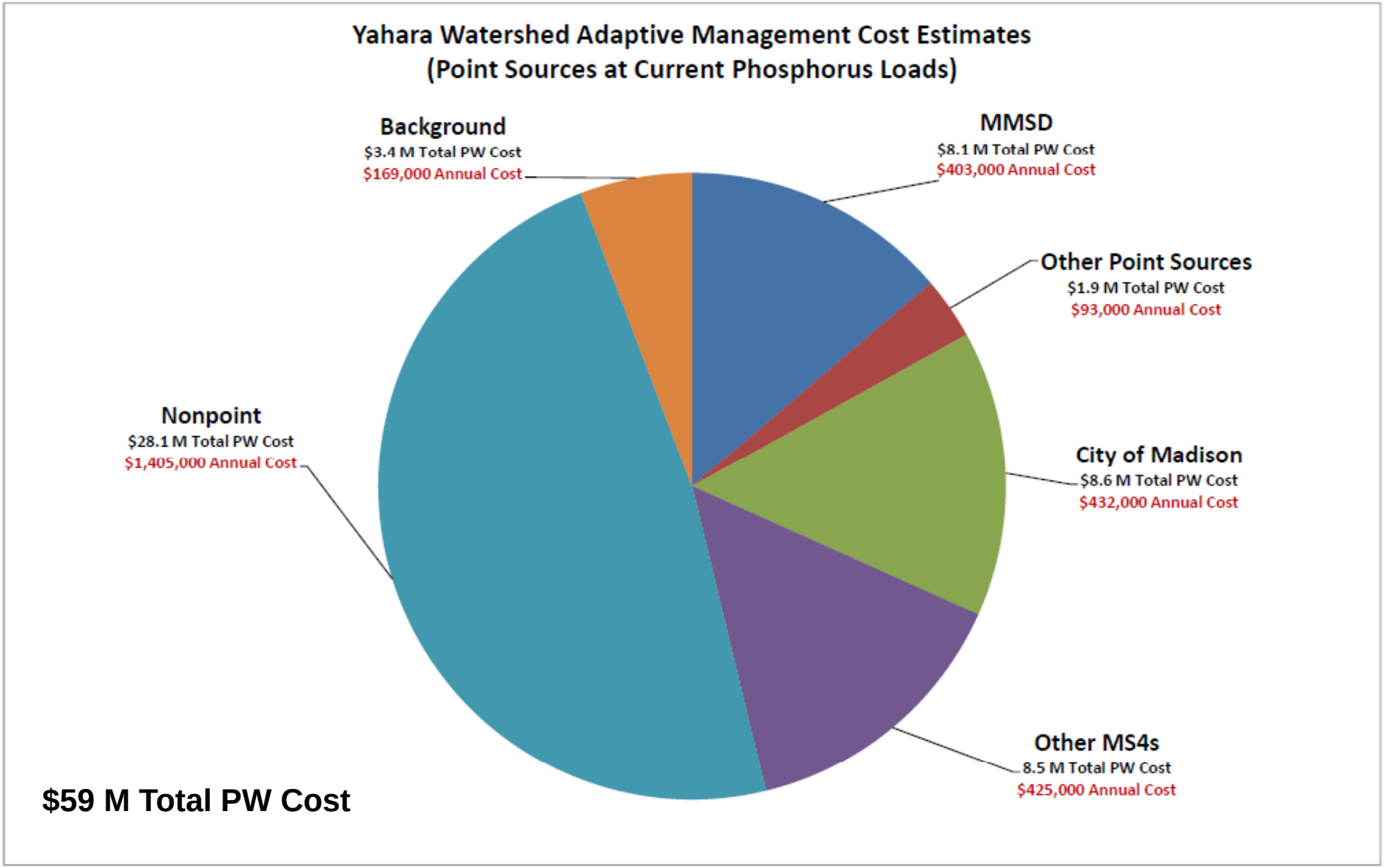
- Application by POTW
- 3 permit terms
- Interim limits for POTWs
- Flexible practices
  - Trading without trading framework
  - Pollution prevention/source reduction measures
  - Local ordinances
  - Etc
- Watershed based permitting?
- Outcomes



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?



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