

# Market Solutions and Restoring the Chesapeake

## *The Economics of Nutrient Trading*

Jack Frye  
Virginia Director  
Chesapeake Bay Commission

May 2012



# Chesapeake Bay Commission



## Tri-State Legislative Commission

- PA, MD, VA

## Legislative Partner of Chesapeake Bay Program

### 7 Members Each (21 total)

- 2 Senate
- 3 House
- Governor or Designee
- Citizen At-Large

32 years of *Policy for the Bay*



**Nutrient and Sediment Impaired Waterbodies  
in the Chesapeake Bay Watershed from  
the 1998 303 (d) List**

**LEGEND**  
**Impaired Waterbodies\***

- Point Events
- Linear Events
- Area Events

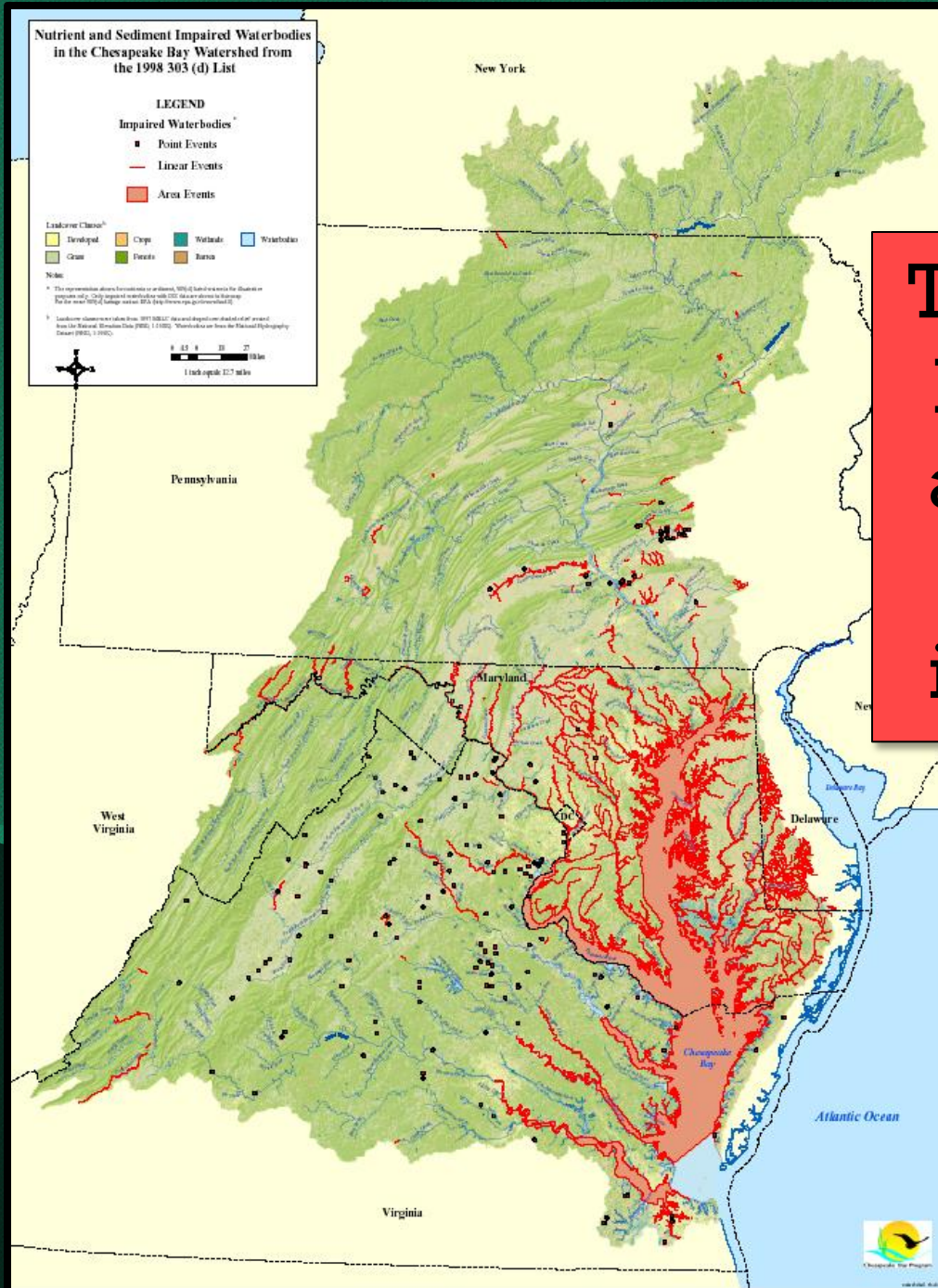
Landcover Class<sup>b</sup>

Developed	Cropland	Wetlands	Waterbodies
Grass	Forest	Barren	

\* The representation shows the location of an event, NOT the actual location for the event or the extent of the event. Only impaired waterbodies with 303 (d) are shown in this map. For the most current 303 (d) list, please refer to the EPA's 303 (d) list website.

<sup>b</sup> Landcover classification from 2011-2012. Data and digital cover data of all years from the National Wetlands Inventory (NWI), 1:250,000. Waterbodies are from the National Hydrography Dataset (NHD), 1:250,000.

0 5 10 15 20  
Miles  
1 inch equals 12.7 miles



**The Chesapeake Bay is impaired and subject to a federally imposed TMDL.**



# Nutrient Trading is One Possible Solution

In our region, 4 states have nutrient trading programs

- ✓ Pennsylvania
- ✓ Maryland
- ✓ Virginia
- ✓ West Virginia



# Our Approach to the Task

- Project Development & Funding



- Economics Analysis, Modeling and Report Preparation



- Project Management, Policy & Technical Expertise



- Transparency, Accuracy & Applicability

*ECONOMICS OF TRADING ADVISORY COUNCIL*



# Purpose of the Study

Is:

- ✓ To investigate the *POTENTIAL* cost savings
- ✓ To estimate how potential savings are affected by different trading scenarios

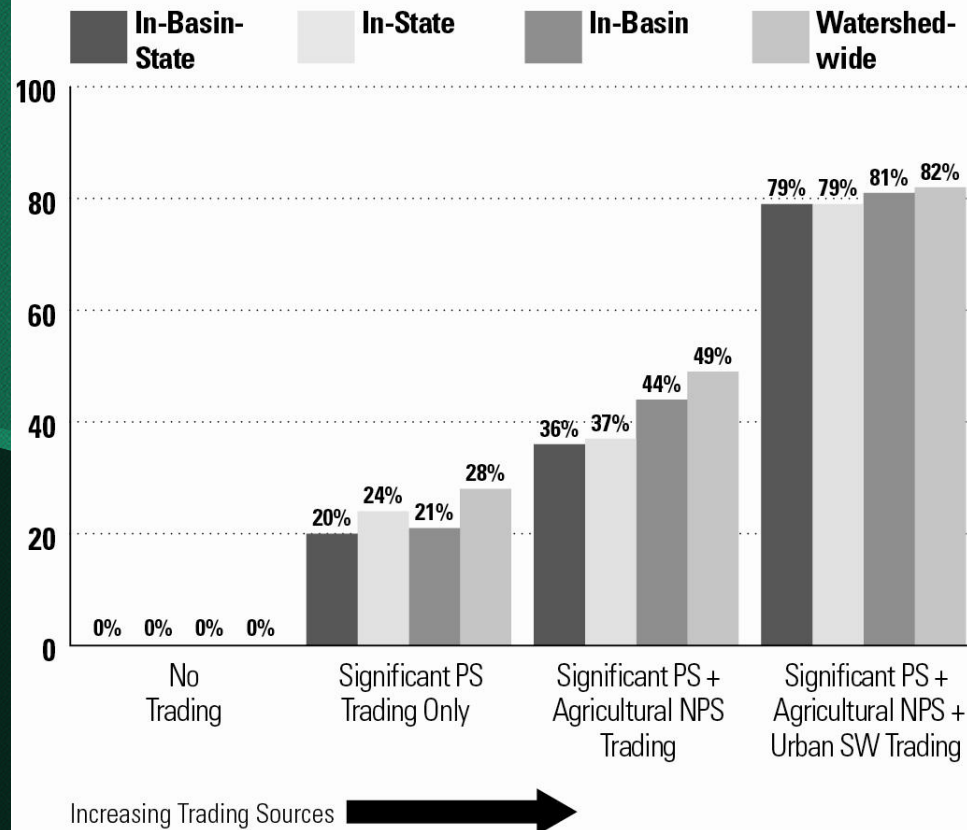
Is *NOT*:

- ✗ To model specific state programs
- ✗ To predict future trading levels

# Summary of Findings

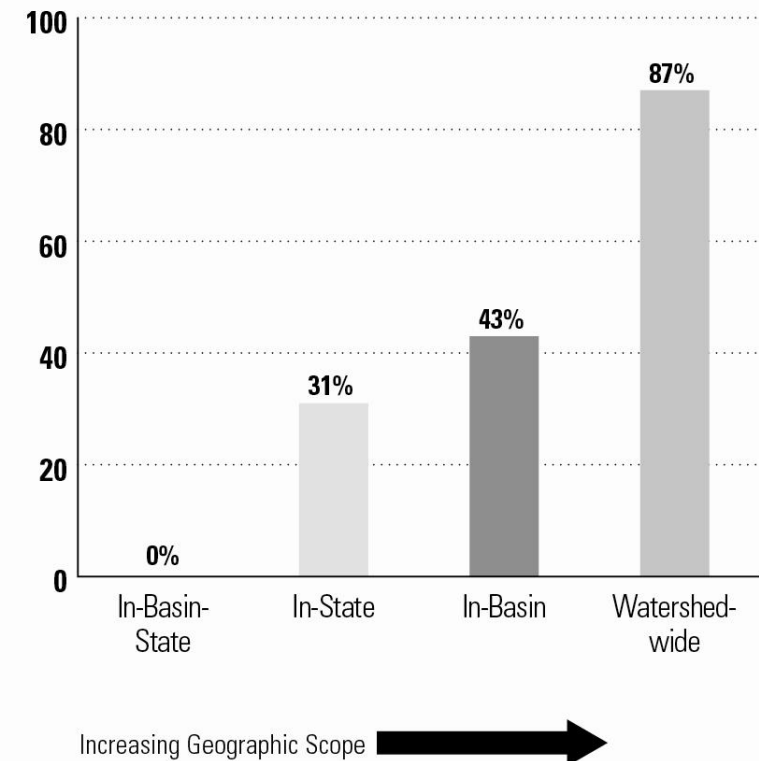
## Potential Cost Savings (%) from Nutrient Credit Trading

Savings expressed as a percent of TMDL compliance costs for significant point sources with no trading, except for the last column, where the savings are expressed as the percent of TMDL compliance costs for significant point sources and urban stormwater sources *combined*.



## Potential Cost Savings (%) from Trading to Offset New Loads

Savings expressed as a percent of costs due to additional treatment capacity at wastewater treatment plants. Does not include costs from land use changes.





# Why *POTENTIAL* Cost Savings?





### A *MARKET* Requires

- ✓ Defined Product
- ✓ Buyer
- ✓ Seller
- ✓ Voluntary Entry

### A *MARKETPLACE* Requires

- ✓ Rules and Boundaries
- ✓ Information
- ✓ Access

In Reality . . .

***MARKETS DO NOT WORK PERFECTLY***

Policymakers must consider factors other than cost

# Market Restrictions

- ✓ **Baseline for Agriculture**  
TMDL implementation
- ✓ **Baseline for Significant Point Sources**  
TMDL WLA or 2010 load
- ✓ **Protection of Local Water Quality**  
Trades limited to 9M lbs N; 200,000 lbs P
- ✓ **Trading Ratio**  
2:1
- ✓ **Transaction Costs**  
38%
- ✓ **Maintain Productive Farmland**  
maximum 25% retirement





# Nutrient Trading Scenarios

## Geography

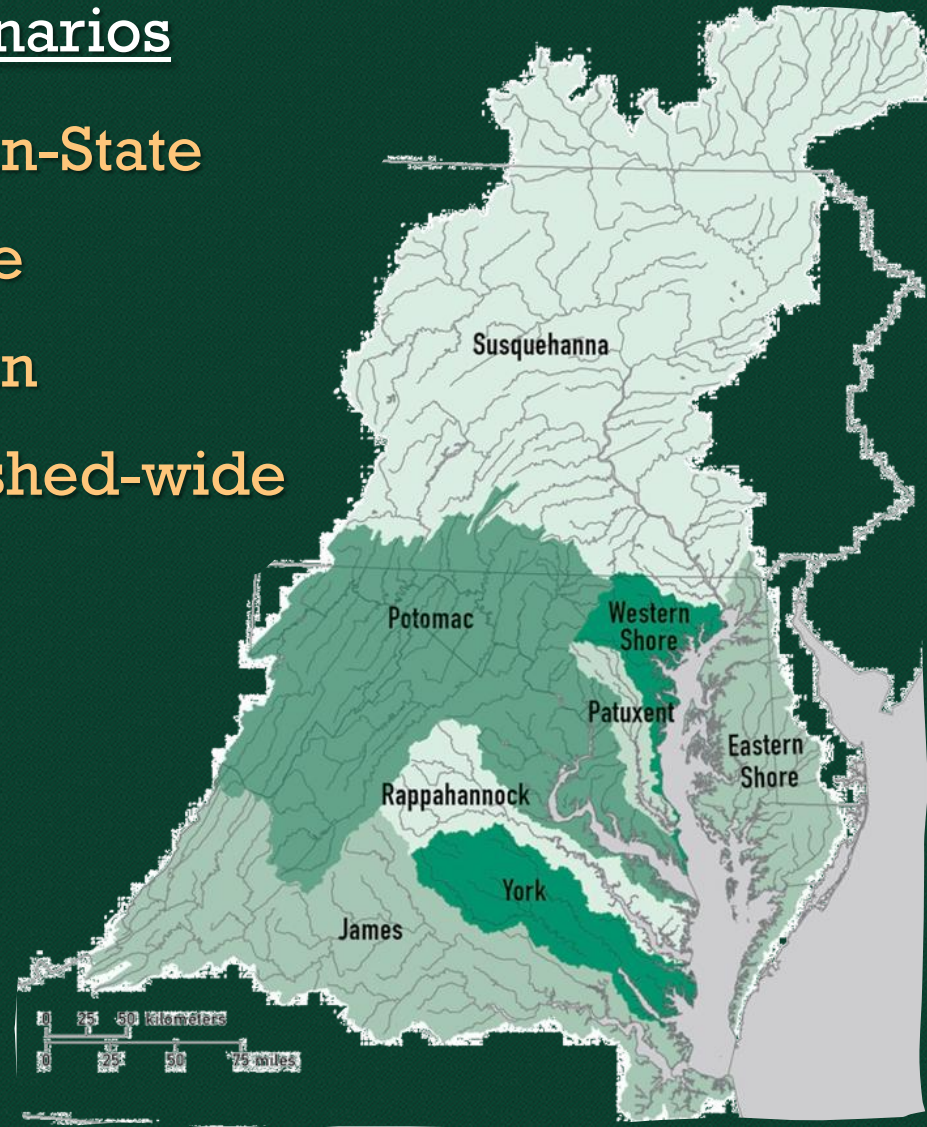
3 scenarios

In-Basin-State

In-State

In-Basin

Watershed-wide



# Nutrient Trading Scenarios

## *Sources*

### 3 short term scenarios

SigPS-Only

SigPS-AgrNPS

SigPS-AgrNPS-Urban

### 1 long term scenario

Offset-Only



# Significant Point Sources (SigPS)

475 municipal and industrial facilities

- 16 tiers of treatment based on:
  - 8, 5 or 3 mg/L N
  - 1, 0.5 or 0.1 mg/L P
- Annualized costs (capital and O&M) based on EPA's ongoing cost analysis

Control Projects,  
Load Reductions  
and Annual Costs





# Agricultural and Urban Stormwater BMPs

- Annualized unit costs (\$/ac/yr)
- Includes land, installation and O&M

Control Projects,  
Load Reductions  
and Annual Costs





## Aligning Our Work

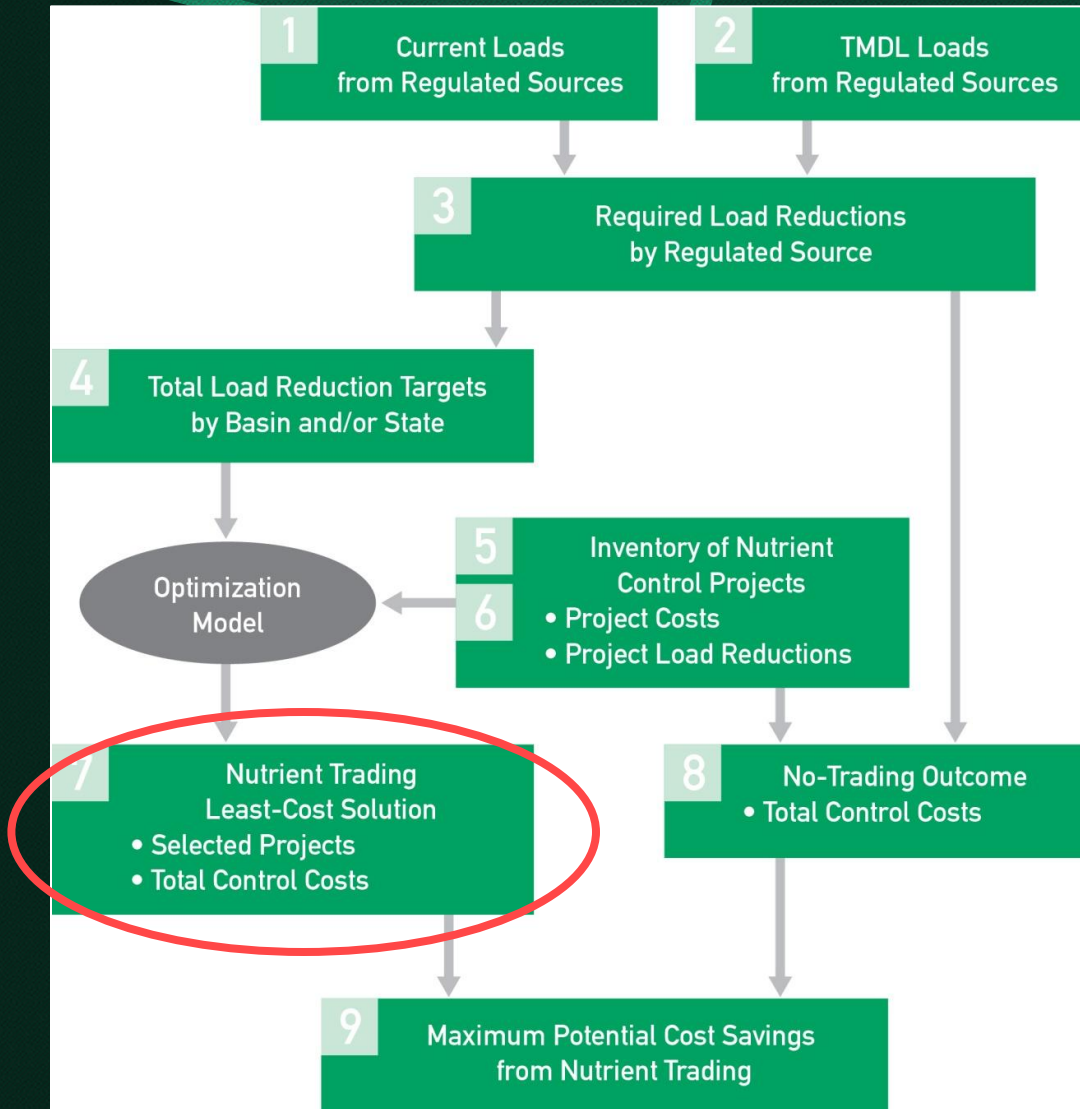
### The Chesapeake Bay Program's *Watershed Model Phase 5.3.2* Provided Key Inputs

- Watershed network and segmentation
- Land use/land cover
- Delivered loads
- BMP nutrient removal rates
- Acres of BMP implementation

# Analytical Framework

**9** step process to identify the least-cost solution (representing the trading outcome)

**O**ptimization model used always seeks least cost BMPs first as available within other constraints (basin, state, local water quality, etc.)



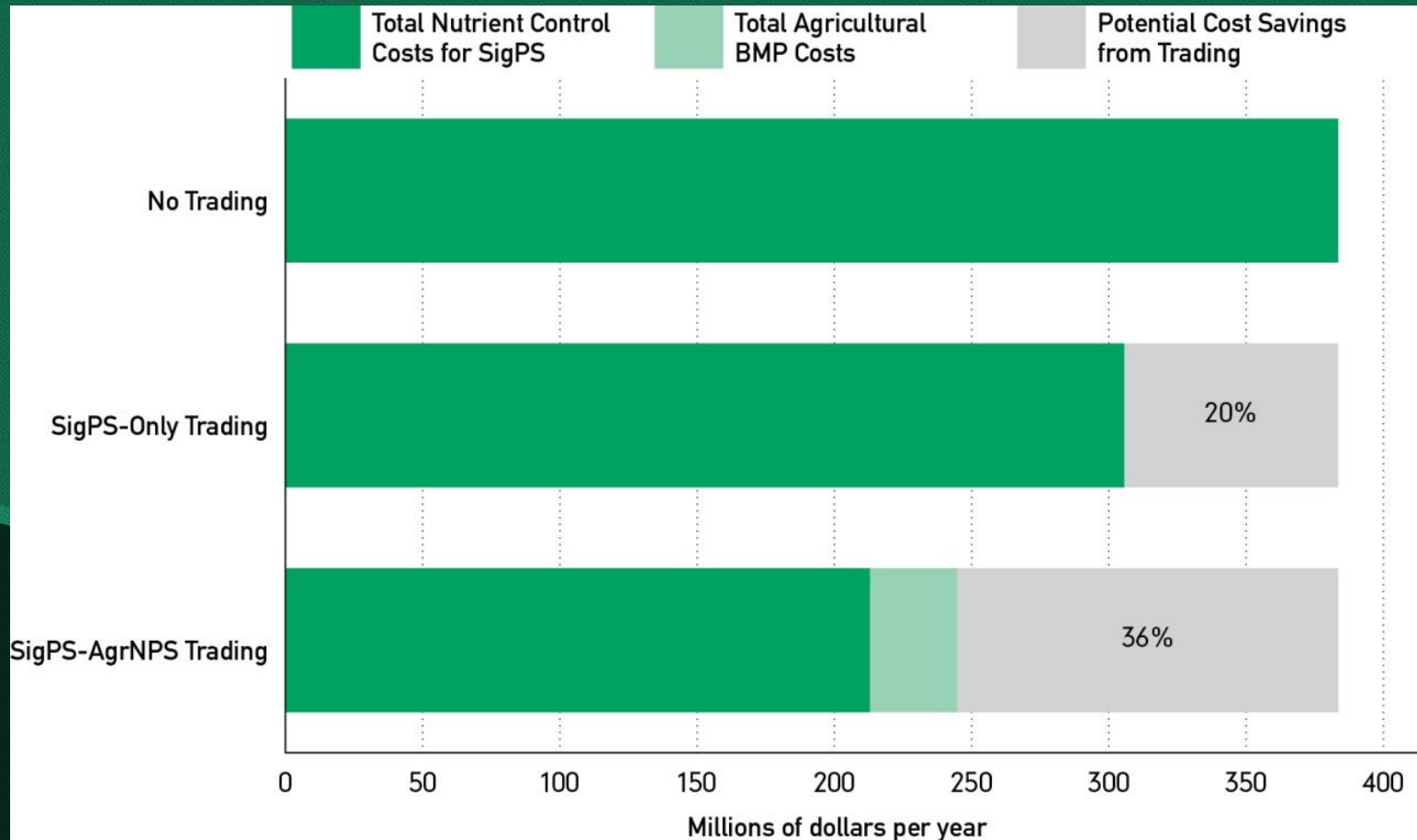


The background of the slide is a dark green color. In the upper left corner, there is a graphic consisting of several overlapping, semi-transparent images of banknotes, likely US dollar bills, showing faces and intricate patterns. These images are layered diagonally. The rest of the slide is a solid dark green, with a few thin, light green lines intersecting at right angles, creating a grid-like structure that frames the central text.

# The Findings

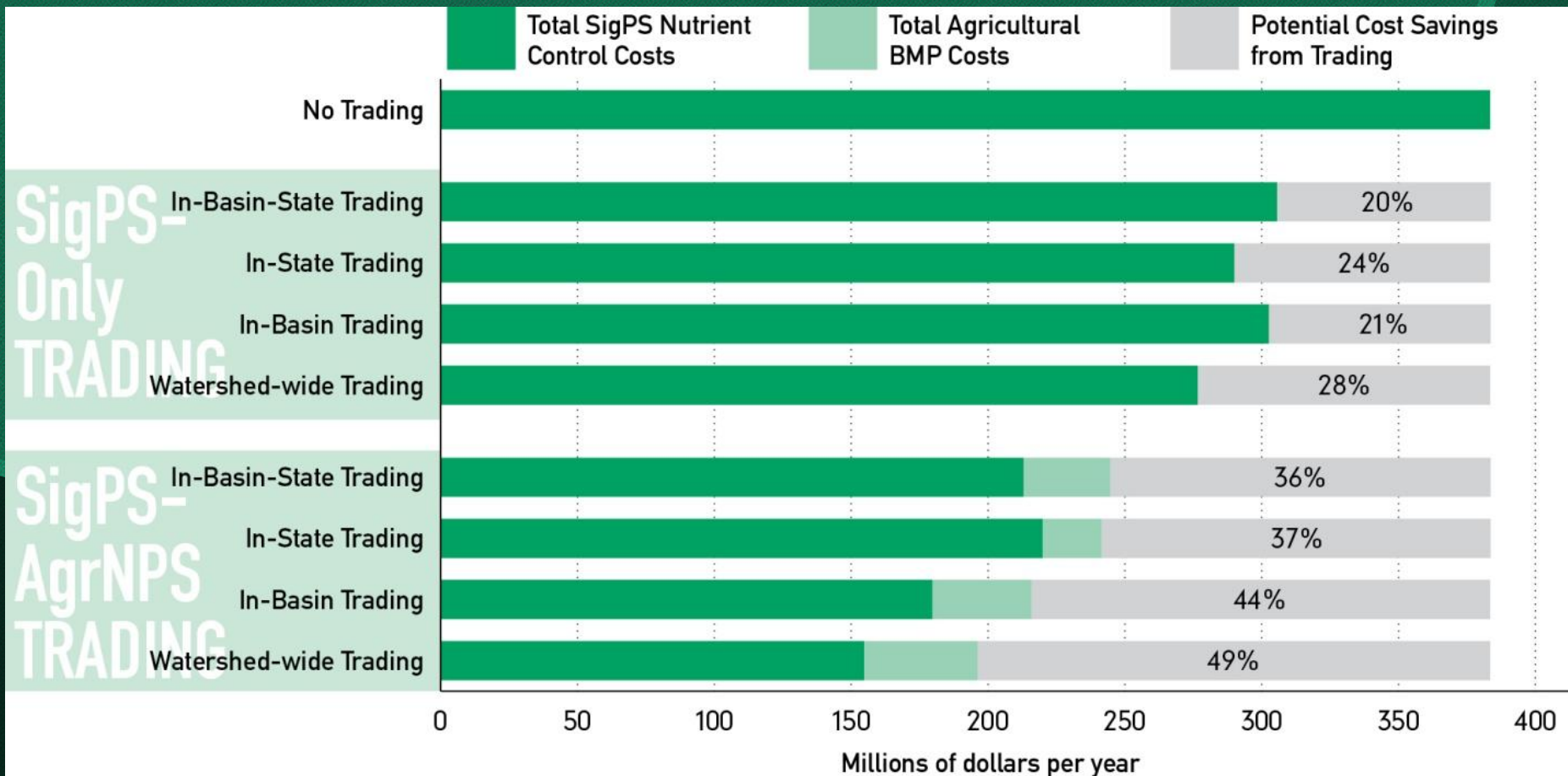
# Cost of Meeting SigPS Load Reduction Targets

## No-Trading v. In-Basin-State Trading

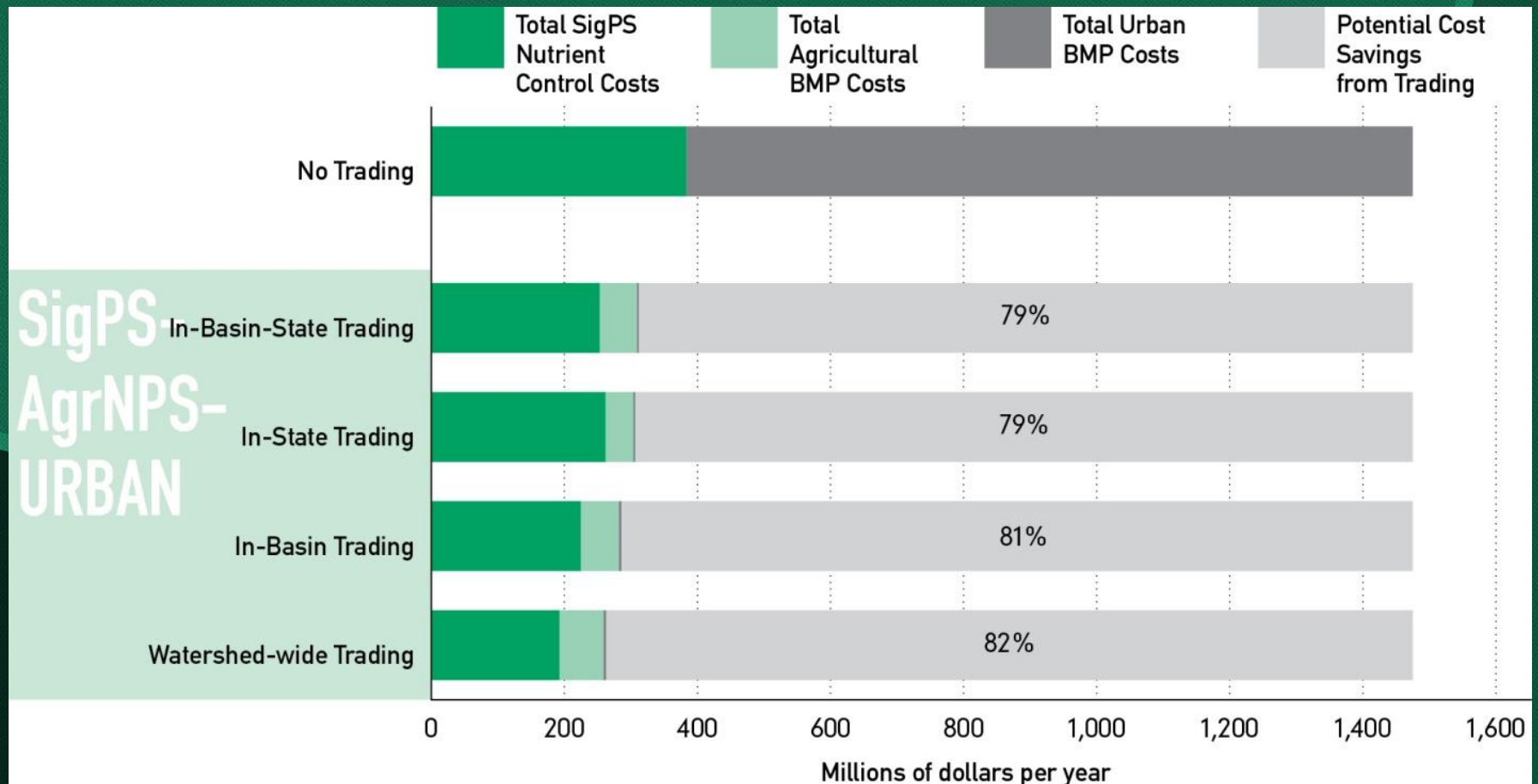




# Cost of Meeting SigPS Load Reduction Targets



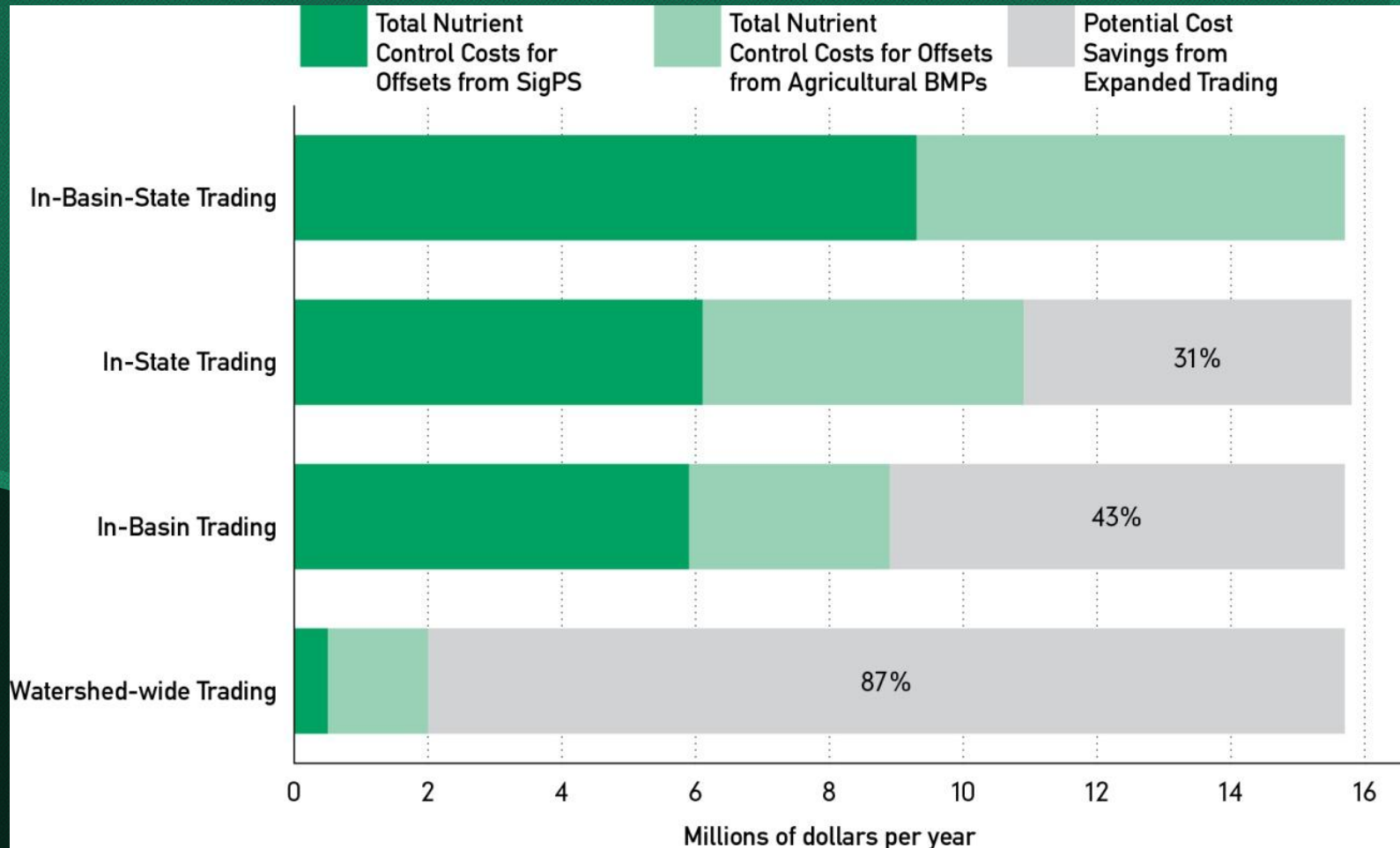
# Cost of Meeting SigPS *AND* Regulated Urban Stormwater Load Reduction Targets





# Cost of Offsets for Added Capacity at Municipal SigPS

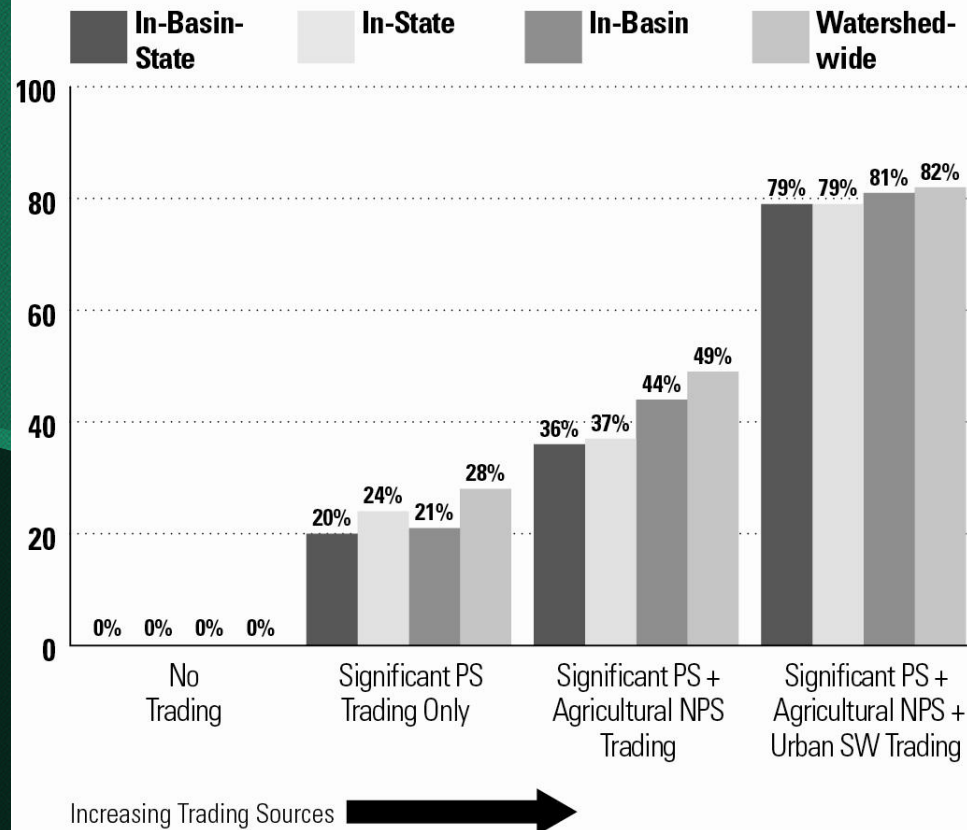
## Long Term Offset-Only Trading Scenarios



# Summary of Findings

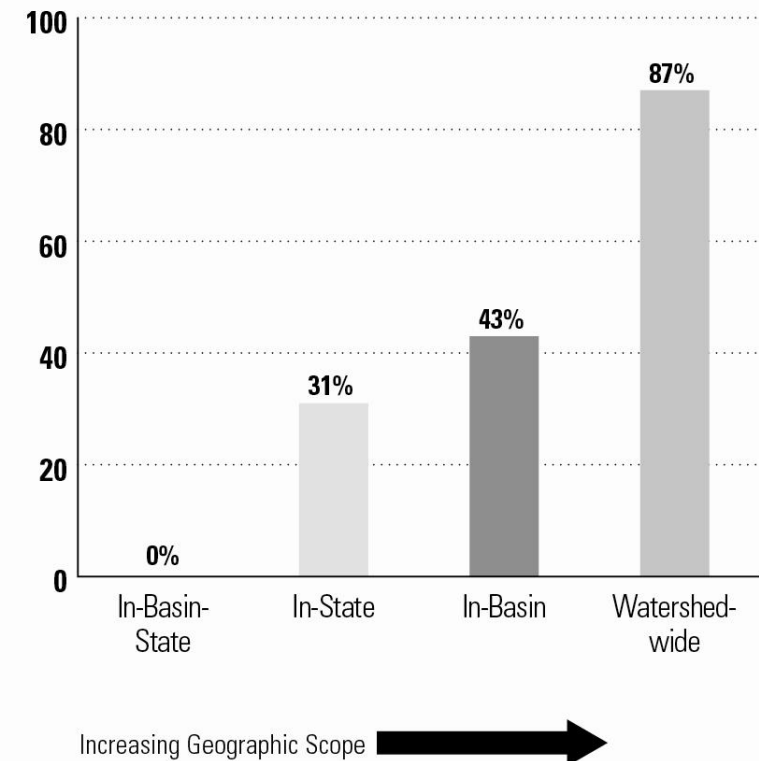
## Potential Cost Savings (%) from Nutrient Credit Trading

Savings expressed as a percent of TMDL compliance costs for significant point sources with no trading, except for the last column, where the savings are expressed as the percent of TMDL compliance costs for significant point sources and urban stormwater sources *combined*.



## Potential Cost Savings (%) from Trading to Offset New Loads

Savings expressed as a percent of costs due to additional treatment capacity at wastewater treatment plants. Does not include costs from land use changes.





 Verification

 Local Water  
Quality Protection

 Measurable and  
Enforceable Cap

# Keys to a Successful Trading Program





# Questions?

Jack Frye  
Virginia Director  
Chesapeake Bay Commission  
804-786-4849  
410-263-3420  
[jfrye@chesbay.us](mailto:jfrye@chesbay.us)  
[www.chesbay.us](http://www.chesbay.us)

