

Ecosystem Service Trading Programs: Lessons from Mid-Atlantic Water Quality Markets

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What Are Ecosystem Services Markets?

- Markets can be a Mechanism to Meet Environmental Objectives
- Markets can be Cost Effective
- Markets Require Institutional Support
 - Rules of the Game

What can be Traded in an Ecosystem Services Market

- Water Quality
 - Water Quantity
 - Carbon
 - Wetlands
 - Wildlife Habitat
 - Biodiversity
 - ...
- 

How Do Markets Work?

- Define the “Good” in Question
- Select the “Players”
- **Create Demand**
- Allow Market to Create Supply

Assess Potential for Markets

- Share of Load from Buyers and Sellers
 - Need Some Balance to Create a Market
 - Supply AND Demand
 - Potential to Reduce Load for Buyers and Sellers

What is “water quality credit trading”?

- Water quality credit trading is one tool
 - To reduce the cost of meeting environmental goals by reducing pollutants that degrade lakes, streams, rivers, and estuaries.

Pollutants like:

- Nutrients (nitrogen and phosphorous): Cause algal blooms and oxygen depletion in water
- Sediments: Diminishes water quality and reduces available habitat for aquatic life

Excessive nutrients and sediments threaten the health of aquatic plant and animal life

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Comparative costs for removal of 2 units of phosphorous

- Cost without trading for removal of 2 units of phosphorous (1 unit from the wastewater treatment plant (\$30) and 1 unit from the farm (\$20))
$$\$30 + \$20 = \$50$$

- Cost with trading for removal of 2 units of phosphorous (both units from the farm)

$$\$20 + \$20 = \$40$$

With trading - a potential \$10 savings

The Water Quality Trading Experience

➤ Many Programs, Many Differences

- Nearly 20 Years Experience
- Renewed Interest
- Still Learning
- Uncertainty
- Specific Conditions
 - Heterogeneity of Environment
 - Heterogeneity of Issues
 - Heterogeneity of Institutions
 - Heterogeneity of Local Politics!!

Water Quality trading programs

- To establish a trading program, participants must consider these key components:
 - Public water quality goal
 - Pollution cap for a watershed
 - Regulated baseline
 - Unregulated baseline for agricultural nonpoint sources
 - Credit and credit price
 - Buyer and seller
 - Trading ratio
 - Regulator

Public water quality goal (Demand)

- Set by federal, state, or local authorities
- Based on public input
- Can be defined in terms of ecosystem restoration, improvement of fish population, public safety, or pollution load reduced

EXAMPLE: The Clean Water Act's "fishable and swimmable" waters



Pollution cap for a watershed (Demand)

- The limit on the total pollution load from all sources to a water body
- Usually, the cap is set for an annual load of specific pollutants
- The size of a cap is based on the public water quality goals

EXAMPLE: a TMDL (total maximum daily load) or a tributary strategy

Regulated baseline (Demand/Supply)

- The level of pollutant load allowed at a particular point in time

EXAMPLE of a **Point Source Baseline**: An NPDES permit defines how much of a particular pollutant a point source can discharge

EXAMPLE of a **Nonpoint Source Baseline**: A TMDL may set allowable pollution limits for nonpoint sources for a particular watershed

Unregulated baseline for agricultural nonpoint sources (Supply)

- A “threshold” – or minimum level of pollution abatement an agricultural operation must achieve to be eligible to participate in a trading program

EXAMPLE: A farm may be required to have a set of BMPs in place that create a minimum level of pollution reduction before a credit can be generated for a trade

Regulator

- Establishes the pollution caps (Demand)
- Approves and administers a state's trading program (Sets Up Market)
- Monitors and enforces the rules (Monitors Market)

EXAMPLE: State, regional,
federal agencies and local
authorities



Why is water quality credit trading being considered in the Mid-Atlantic States?

- States with watersheds that contribute to the Chesapeake Bay
 - The 2000 Chesapeake Bay Agreement obligated the states to reduce nutrient and sediment pollution to help restore the Bay
- Trading is being considered by some states in the Bay watershed as a tool for meeting this obligation

Trading in the Mid-Atlantic

➤ Individual States Responsible for Creating Programs

- States with Existing Trading Programs
 - Pennsylvania
 - Virginia
 - Maryland
- States Creating Trading Programs
 - Maryland
 - West Virginia
 - Delaware

Comparison of Existing State Programs

	Virginia	Pennsylvania	Maryland
Credits	Nitrogen, Phosphorus	Nitrogen, Phosphorus, Sediment	Nitrogen, Phosphorus (Sediment)
Caps for Watershed	Nitrogen, Phosphorus	Nitrogen, Phosphorus, Sediment	Nitrogen, Phosphorus (Sediment)
Participants	Point Sources, Nonpoint Sources, Nutrient Credit Exchange Association of PS, WQIF	Point Sources, Nonpoint Sources, Aggregators, 3 rd Parties	Currently: Point Sources Only Soon: Nonpoint Sources, Aggregators, 3 rd Parties

Comparison of Existing State Programs

	Virginia	Pennsylvania	Maryland
PS Baseline	<p>Existing PS must develop plan to meet allocation. If cannot meet with own plan, trade with other PS. If cannot trade, contribute to WQIF.</p> <p>New PS must meet limit of control. Then must acquire offset from existing PS, acquire offset from NPS @ 2:1.</p>	<p>PS must meet concentration limits in NPDES. Then can trade with other PS or NPS @ 1.1:1.</p>	<p>Existing PS upgrade to BAT. Combine with design capacity to calculate load.</p> <p>New PS have zero load</p>

Comparison of Existing State Programs

	Virginia	Pennsylvania	Maryland
NPS Baseline	Required or funded by federal and state law (Under Development)	Existing state requirements and any one of following: 100-foot setback, 35-foot buffer, or 20% pollution load reduction.	Share of Tributary Strategy NPS Load Allocation
Publicly Funded Credits	No Trading	Can trade most cost-shared credits	No Trading

Mid-Atlantic Market Activity

- Very Little Demand
 - Over Supplied
- Pennsylvania: 1 trade in works
- Virginia: Nothing yet
- Maryland: Designed for future trades

What About Ecosystem Service Markets?

➤ Separate Markets for Separate Services

- Air (Sox, Nox, Carbon,...)
- Water (Nitrogen, Phosphorus, Sediment,...)
- Biota (Wetlands, Forest Buffers,...)

➤ Overlapping Services

- Ammonia reductions (air) benefit water quality
- Wetlands restoration (wildlife) benefits water quality

➤ Stacking

- Conservation tillage benefits water quality and provides carbon sequestration

Stacking vs. Double Counting

One Practice (Cons. Tillage)

Benefit A (WQ)

Benefit B (Carbon)

Payment for
Benefit A (WQ Market)
Benefit B (Carbon Market)

One Practice (Cover Crop)

Benefit A (WQ)

Payment for

Benefit A (Cost Share Program)

Benefit A (WQ Market)

How Do We Integrate Markets?

Production Function (Inputs and Outputs)

- Environmental Services
 - Habitat, Fish, Aesthetics,... (Outputs)
- Many ways to produce same output
 - Trade-Off Inputs to Produce Same Output
 - Wetlands (Input)
 - Reforestation (Input)
 - Pollution Reduction (Input)

Integrating Markets (A *Simple* Example)

Goal: Reduce Eutrophication of a Water Body

Method: Reduce Nitrogen and/or Phosphorus

Challenge: Model Trade-off in N & P?

Limiting Nutrient Can Change!

Answer: “It Depends!”

Lessons for Ecosystem Service Markets

- Heterogeneity Across Ecosystems Implies Heterogeneity of Market Design
- Assess Situation to See if Markets are Right Tool
- All Trading Programs Require Institutional Involvement
- Regulation Necessary to Set Baseline: Create Demand
- Unregulated Players Need Baseline to Ensure Real Environmental Change

