

Nutrient Trading

Restoring and Protecting Coastal Waters
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Agenda

- Background
 - Trading markets
 - Nutrient trading
- Trading in Popponesset Bay
 - Scenarios Conducive to Trading
 - Logistics
- Reverse Auction

Other Trading Markets

- SO₂ – Clean Air Act
 - National market
 - 9,000,000 allowances of 1 ton each
 - Secondary market, futures market
- CO₂ – Kyoto protocol
 - International market
 - Carbon and carbon equivalents
 - \$15 Billion worth of trades in first half of year

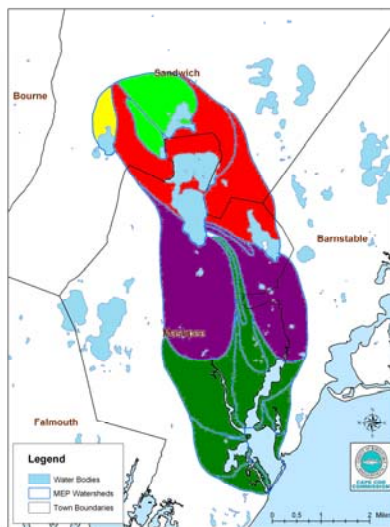
Nutrient Trading

- Typically nitrogen or phosphorous
- Number of programs exist
- Not a lot of completed trades – markets tend to be small
- Required conditions
 - Established targets for reduction
 - Accurate measurement
 - Varying costs of compliance

Trading in Popponesset Bay

- Targets exist
- Load can be measured
- Is there any difference in costs to reduce N load?
 - Reductions mostly from elimination or denitrification of septic systems
 - Presumably costs roughly equivalent across towns; possible infrastructure benefit to towns that eliminate septic systems

Percent of N Load Reaching Bay



- Yellow – 5.95%
- Light green – 17.5%
- Red – 35%
- Purple – 70%
- Dark green – 100%

Trading Scenario

- Reduction targets stated in terms of attenuated load (load reaching bay)
- Actual reduction done in terms of unattenuated load (discharged load)
- Cost will be lower to reduce load in some locations – resulting cost differences may motivate trading

Example

- Assume requirement is to reduce 54% of attenuated load from each town

	Mashpee	Barnstable	Sandwich
Required reduction in attenuated load by town (Kg/yr)	12858	2807	1559
Equivalent reduction in unattenuated load for each town (Kg/yr)	12858	2821	4458
Equivalent reduction in unattenuated load to meet Sandwich requirement (Kg/yr)	1693	2229	

Relative Costs

- Let X be the cost of reducing a Kg of unattenuated load and assume costs are
 - linear in load reduction
 - equivalent across towns
- It would cost Sandwich roughly 4460X to meet their requirement while
 - Barnstable could reduce same load for roughly 2230X
 - Mashpee could reduce same load for roughly 1700X
- Provides potential basis for bilateral agreement

Nutrient Credits


- Town creates credit by reducing N load below requirement
- Credit can be
 - Used to offset additional development (e.g., sold to a developer)
 - Sold to a town that has not met their required reduction
- Credit sold annually? For some longer contract period?

Valuing Credits

- Buyer avoids infrastructure and WWTP costs
- Seller incurs infrastructure cost and marginal WWTP costs, but receives benefit of infrastructure
- Seller can assess property owners for non-recurring infrastructure cost and can charge for recurring WWTP costs
- Need broker/coordinator to work out issues and potentially mediate

But Why Trade in the First Place?

- Goal is to allow market to efficiently allocate costs.
- Entities for whom it is cheaper to reduce load do so and sell credits to those for whom it is more expensive.
- How else can load reduction goals be met at minimal cost?



One Alternative - Reverse Auction

- Identify percentage of total cost to be borne by each municipality
- Load reduction auctioned with winner(s) required to reduce attenuated load by specified amounts for price of winning bids
- Total cost of all winning bids split among municipalities based on cost percentages