

Regional Watershed Permit Implementation Project for Pleasant Bay

Fact Sheet: Nitrogen Trading Pilot Project

Introduction/Project Objective

Looking at the Pleasant Bay watershed in its entirety, one can identify the most cost-effective locations for nitrogen load removal. Nitrogen removed at those optimum locations will not necessarily match the towns' responsibilities for TMDL compliance. That is, without a watershed-wide approach, one or more of the towns in a shared subwatershed may implement projects that are not as cost-effective as projects in other towns. That problem can be overcome through nitrogen trading, in which the town with the low-cost options removes more nitrogen than it is responsible for, and another town removes less. The second town pays the first town for the "extra" nitrogen load that is removed on its behalf. With support from the Southeast New England Program Watershed Grant, the Pleasant Bay Alliance developed the nitrogen trading pilot project to: Survey existing nutrient trading programs; Select the most appropriate type of program for Pleasant Bay; Evaluate and compare the costs for building and operating nitrogen removal technologies to establish the "before-trading" costs; Identify 3 scenarios for Pleasant Bay; Evaluate the scenarios for cost and other factors and estimate potential savings; and Address funding and implementation issues needed to establish a nitrogen trading program

Trading Appropriate for Pleasant Bay

In a two-party program, Town A strikes a deal directly with Town B wherein Town A removes more than its share of nitrogen on behalf of Town B who removes less than its share. In a three-party program, Town A sells credits to a "bank" or clearinghouse, from whom Town B buys credits. There are benefits to the three-party approach, but it is more cumbersome than the two-party program and would take significant time and effort to set up. The two-party approach can be accomplished by way of an Intermunicipal Agreement (IMA), and there is precedent in the region for successful use of this tool. Therefore, this project will assume a two-party approach implemented through a project-specific IMA between the buyer and the seller.

Comparison of Costs by Technology

The four watershed towns have formulated nitrogen removal plans using five technologies; public sewers, golf course fertilization management; on-site denitrification systems, permeable reactive barriers, and shellfish harvesting. This project evaluated the reported costs for constructing and operating these technologies and compared those costs with their expected nitrogen removal capabilities. The result is a "unit cost" in dollars pre pound of nitrogen removed. The unit costs were found to vary widely and fall into three general categories:

- Low cost—golf course fertilizer management and shellfish harvesting



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- Moderate cost—public sewers
- Higher cost—on-site denitrification and permeable reactive barriers

The lowest cost technologies are constrained in the amount of nitrogen they can remove at the designated sites, so they cannot be readily expanded as part of a nitrogen trading program. The other selected technologies offer many opportunities to reduce cost.

Trading Scenarios

Three illustrative scenarios were formulated to study nitrogen trading issues within selected sub-watersheds:

- The River System (seller Orleans and buyer Brewster)—100 kg/yr
- Little Pleasant Bay (seller Brewster and buyer Orleans)—500 kg/yr
- Pleasant Bay Main (seller Harwich and buyer Brewster)—1,000 kg/yr

Based on a “strike price” halfway between the buyer’s and seller’s unit costs, it was determined that the transfers of nitrogen removal responsibility could result in an annual savings of about \$670,000, which is equivalent to about \$11 million in present worth. The savings represent about 14% of the buyers’ expected costs for the more expensive technologies.

Implementation Considerations

To be successful, a nitrogen trading arrangement must address many factors:

- The transfer of nitrogen removal responsibility must be codified in the Watershed Permit.
- A detailed inter-municipal agreement should lay out all of the cost and nonfinancial issues, and would likely be preceded by a series of memoranda of understanding (the report includes an outline for a model IMA).
- There seem to be no major hurdles related to state funding of a project in which the seller removes nitrogen on behalf of the buyer.
- Nitrogen trades that involve more than one sub-watershed must consider the “equivalency factors” that normalize the nitrogen removal to its impact on the Bay.
- The most effective IMA should consider growth in the sub-watershed and the potential for future changes in Bay hydrodynamics.
- If a nitrogen trade involves a non-traditional technology, the DEP-required traditional back-up plan must be adjusted accordingly.
- There must be an effective public consultation program to support the trade, involving citizenry and interest groups in both the buying and selling towns.

Applicability Elsewhere

Nitrogen trading opportunities should exist in other watersheds across the region. Prime opportunities are where:

- A watershed spans multiple towns
- A range of nitrogen removal technologies has been selected, some of which have expansion capabilities
- The technologies have well-documented costs that cover a significant range of unit costs
- Watershed-embayment modeling is available to estimate equivalency factors when trading opportunities exist between sub-embayment.

This information was summarized from the following reports:

Report on Nitrogen Trading Opportunities Among Watershed Towns. 2021. Wright-Pierce

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