

Managing Nitrogen Inputs to Estuaries

Challenge

Nitrogen is required by both plants and animals, but it is usually in short supply and so is considered the “limiting” nutrient in many estuaries. Excessive nitrogen inputs or “loads” therefore can have drastic effects on ecosystems, leading to fish kills and habitat degradation. The goal of this project is to use a nitrogen loading model developed for Waquoit Bay, MA, at several other estuaries to see if it is transportable to systems with different environmental conditions. Other goals include: testing a stable isotopic approach for establishing links between land-derived nitrogen and estuarine organisms; and predicting the effects of increased nitrogen on estuarine plants.



Science

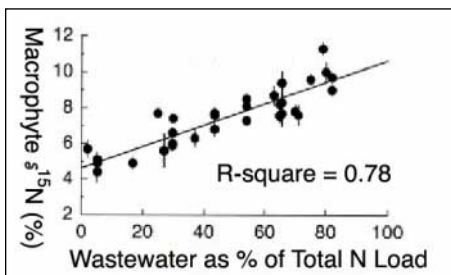
The Nitrogen Loading Model

For the model to work, users plug in information about the watershed, such as: amount of discharge from wastewater treatment plants and septic tanks; acreage of vegetated area versus developed areas. The model then predicts how much nitrogen will actually reach the estuary. By studying the impacts of nitrogen on estuarine plants, researchers hope to go a step further and incorporate potential impacts of certain management decisions on estuarine habitats.

Results

- The nutrient loading model is still in development pending further data. Therefore, it is still unclear how well the model works for estuaries that have different environmental conditions than Waquoit Bay.

- In Waquoit Bay, isotope signatures specific to wastewater were found in estuarine water and plants. The graph to the right shows the strong relationship between the isotopic signatures of plants (macrophytes) and wastewater as a percentage of nitrogen load.



- Also in Waquoit Bay, the effect of increased nitrogen loading was an overall increase in algal biomass, with red and green algae favored over brown algae. In addition, seagrasses were eliminated in all areas but those with the lowest nitrogen loads.

Application

Predicting the Impacts of Nitrogen Management Decisions

With information on both loading and the effects of loading on estuarine habitats, researchers hope to build a model that will enable resource managers to run management scenarios and predict the impact on estuarine systems. For example, “What will be the effect on the estuary if we invest in better septic systems?” “What will happen if we allow the construction of a large development in an area that was previously vegetated?”

Nitrogen Management Workshops

In addition to the construction of a user-friendly model, researchers plan to conduct workshops at involved NERRS facilities to better disseminate new nitrogen management strategies to coastal managers.

Project Essentials

Title: Identification and Assessment of Anthropogenic Eutrophication in Shallow Estuaries

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NERR Reserve(s): Apalachicola Bay, FL • Great Bay, NH • Waquoit Bay, MA • Weeks Bay, AL

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