United States Environmental Protection Agency
Office of Research and Development Washington, DC 20460
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Coastal Communications

Development of Nitrogen Loading-Response Models for Northeast U.S. Estuaries

Background and Goal

Human activities have dramatically changed the quantity, distribution, and movement of nutrients (e.g., nitrogen, phosphorus, silica) entering coastal environments. This has affected both human health and the environment. For example, increased algal levels due to nutrient enrichment are principally responsible for: (1) changes in basic food webs including altered algal communities (e.g., harmful or nuisance algal blooms), which can lead to loss of both commercially important fisheries and overall aquatic biodiversity; (2) loss of natural submerged aquatic vegetation (SAV) habitats, which are important to fish and other biota; and (3) hypoxia (or anoxia) leading to fish kills and/or degraded benthic (bottom) habitats that affect shellfish and other biota.

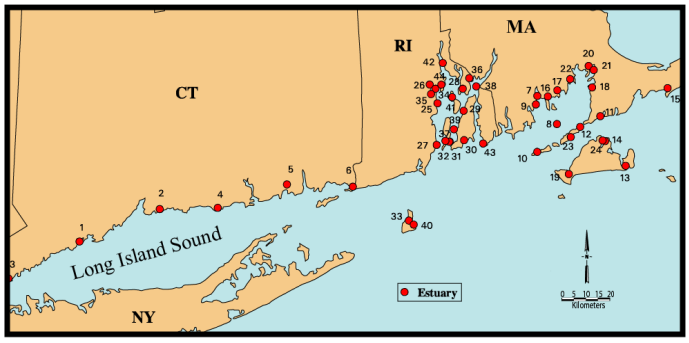

Figure 1 Map showing study systems sampled

Existing models that describe relationships between nutrient loading and environmental effects are available for only a few well-studied systems. There is a need to develop models that predict the adverse effects of nutrient enrichment on systems with limited data. Together with EPA's Gulf, Mid-Continent, and Western Ecology Divisions, the Atlantic Ecology Division (AED) is participating in a multi-year National Aquatic Stressors Research Program to develop regional nutrient loading-response models for estuarine and Great Lakes coastal systems. These models will be available to states and tribes and EPA's Office of Water and Regional Offices to help establish numeric nutrient Water Quality Criteria. These Criteria will be used by the states and tribes to facilitate the establishment of Water Quality Standards to protect designated uses, especially aquatic life uses.

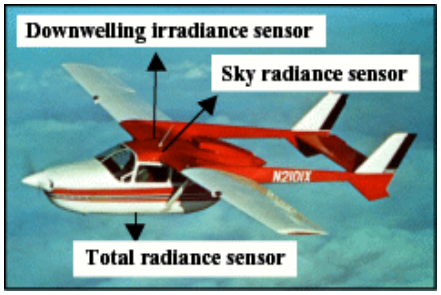

Figure 2. Airplane with sensors

Approach

AED is developing empirical nitrogen loading-response models that will allow environmental managers to formulate regional nitrogen input limits for small embayments in southern New England (e.g., see Figure 1). Novel, efficient methods are being developed and applied to measure aquatic response to different nitrogen loadings (estimated from land use models, etc.). The methods focus on evaluating the effects of nitrogen enrichment on water column, SAV, and benthic habitats. Remotely-sensed chlorophyll-a data are being measured by aircraft (Figure 2) to quantify water column algal (phytoplankton) responses. Aerial photography is being used to measure SAV responses. A sediment profile camera (Figure 3) is also being used to assess the extent and duration of hypoxia/anoxia in deeper waters by determining changes to benthic environments.

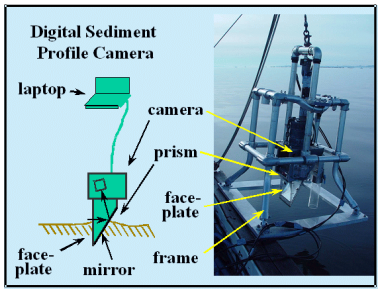

Figure 3. Photo and schematic of sediment profile camera

Further Information

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