Effects of Nitrogen on Seagrass: Results from a Comparative Study

Excess nitrogen from human activities contributes greatly to cultural eutrophication in estuaries. One symptom of excess nitrogen in shallow embayments is the loss of seagrass habitat. Seagrass habitat provides important ecological services including fish and shellfish nursery and refuge, shore-bird feeding grounds, nutrient and carbon cycling, sediment stabilization, and increased biodiversity in tropical and temperate regions throughout the world. Because seagrasses are so sensitive to anthropogenic pressures and have a global distribution, they are excellent biological sentinels for assessments of estuarine condition.

As part of a larger project to evaluate multiple effects of nitrogen loading on shallow coastal embayments in southern New England, scientists at EPA’s Atlantic Ecology Division have shown how spatial extent of eelgrass (Zostera marina, the common seagrass in New England) varies as a function of nitrogen loading.

EPA scientists applied an empirical watershed model, previously verified in coastal bays of Cape Cod, MA to estimate nitrogen loading rates for 74 small- to medium-sized embayment-type estuaries along the CT, RI and MA coasts. These calculated rates were compared with airplane-derived photographic data of eelgrass areal extent from the same estuaries, revealing a pattern between eelgrass extent and nitrogen loading. When nitrogen loading rates exceed 50 kg N ha$^{-1}$ yr$^{-1}$, eelgrass extent declines markedly, with eelgrass generally absent when levels exceed 100 kg N ha$^{-1}$ yr$^{-1}$. These results are consistent with other, much smaller studies, and suggest that 50 kg N ha$^{-1}$ yr$^{-1}$ is a reasonable threshold for the protection of eelgrass habitat.

Papers presenting the results of this study are currently under journal review. For additional information please contact Jim Latimer (latimer.jim@epa.gov).

Eelgrass in Lagoon Pond, MA (photo courtesy of Giancarlo Cicchetti)