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Woods Hole Sea Grant: 1994-1996 Projects

Ecologically-Based Environmental Management

Brian L. Howes and Dale D. Goehringer, Woods Hole Oceanographic Institution

This Sea Grant-supported study is designed to encompass all of the major ecological processes dominating the water quality and productivity of a coastal system, Nantucket Harbor: nutrient conditions, high frequency oxygen monitoring, groundwater inputs, sediment nutrient regeneration, circulation, submerged macrophyte production, and fish, shellfish and infaunal populations. By choosing Nantucket Harbor as the study site--a healthy system which has only recently begun to show signs of nutrient-related stress in some of its associated, smaller water bodies--researchers will have a basis for comparison to the many studies that look at already eutrophied waters. Also, this study represents a new approach to coastal water quality management in that it seeks to manage coastal waters at the ecosystem level, and is designed to represent a model upon which management plans for other coastal communities can be based.

Boundary Mixing in Massachusetts Bay

Wayne R. (Rocky) Geyer and James R. Ledwell, Woods Hole Oceanographic Institution

As a follow-up to a 19921994 Sea Grant-supported study, investigators will:

- determine the rate of vertical mixing across the thermocline in a boundary region of Massachusetts Bay through a controlled dye release;
- determine mechanisms responsible for the mixing; and
- determine the contribution of boundary mixing to the overall vertical exchange rate in the bay.

Completion of these objectives will provide better understanding of nutrient exchanges and enable investigators to quantify the transport of natural and anthropogenic materials across the nearshore zone. Also, this study will add to the understanding of how the controversial Boston Harbor sewage outfall, now under construction, will impact Massachusetts Bay.

Benthic Processing of Sewage Additions: Controls of Denitrification in High Energy Environments

Anne E. Giblin and Charles S. Hopkinson, Jr., Ecosystems Center, Marine Biological Laboratory

Another continuing project taking place in Massachusetts Bay related to the multi-million dollar Boston Harbor sewage outfall project, this study investigates the importance of benthic processing of sewage inputs into coastal waters. By looking at and comparing benthic environments with fine grained and coarse grained sediments--the latter considered a higher energy environment due to more intense mixing and flushing--the project will yield information such as whether different treatment options are more appropriate in some sedimentary environments than others. These results will be of use to coastal communities involved in developing nutrient loading bylaws. In addition, the project will provide information on the basic controls of benthic nutrient regeneration that are essential for further development of a linked hydrodynamic and water quality model for Massachusetts Bay.

Tidal Flat Deposition: Processes and Rheology

David G. Aubrey, Woods Hole Oceanographic Institution

Pollutants are known to accumulate with fine sediments along the coastal zone, within estuaries, in lagoons and along the open coast. The fate of some of these pollutants follows the fate of these fine sediments. Unfortunately, our present ability to predict transport of fine sediments, and therefore certain pollutants, is unsatisfactory. To remedy this problem, researchers will develop a consistent theoretical methodology to examine fine sediment deposition in tidal flats, areas that commonly surround heavily polluted harbors. The approach is to combine divergent methodologies of hydrodynamic modeling (tidal propagation and nonlinear interaction) with improved models of rheology and accurate field observations.

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Mail: Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, MA 02543, USA.
E-Contact: info@whoi.edu; press relations: media@whoi.edu, tel. (508) 457-2000
Problems or questions about the site, please contact webdev@whoi.edu