Office of Science
Involvement in Ongoing Estuarine Research
(FY 2009 - 2011)

I. EPA Funded "Nutrient Criteria" Development Project (Shallow Coastal Bays)

Project Name: **Nutrient and Ecological Histories in Barnegat Bay, New Jersey**
Investigator: Dr. David Velinsky**,** Patrick Center for Environmental Research
Amount: $90,000 (USEPA - PPG FY 08)
Grant Manager: Thomas Belton, NJDEP- DSRT

Project Description: The New Jersey Department of Environmental Protection (NJDEP) is evaluating the appropriate indices to be used to measure the ecosystem health of NJ's shallow, lagoonal estuaries - basically, our coastal bays. Further information is needed for NJDEP to develop water quality management tools; this study is designed to directly assist NJDEP in the development and/or enhancement of its **nutrient criteria**. The primary objective of this proposal is to collect salt march cores from the tidal region of Barnegat Bay and determine the chronology of nutrient changes (Nitrogen and Phosphorus) and associated ecosystem level responses. Changes in various biogeochemical proxies (biogenic Si, stable isotopes of C and N, etc), along with changes in diatom community structure, will be used to infer changes in nutrient loading and land use throughout the watershed. An additional objective of this study will be an assessment of the marsh system's rate of sedimentation over the past 100 yrs or more. With the threat of increased **sea level rise** due to global warming and **greenhouse gas emissions** over the next 20 to 50 years, this information can provide a much-needed baseline to evaluate the impacts of changes in land form and use throughout coastal areas.
Contact: Thomas Belton 3-3866; Division of Science Research and Technology

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II. **NPS Barnegat Bay "Wetlands Assessment Project"**

Project Lead: Robert Mancini, Section Chief, Division of Watershed Management
Science Lead: Thomas Belton, Office of Science

Federal Funding Amount: **$150,000 (USEPA Discretionary 319(h) Grant Award)**
State Match: $100,000 from state in-kind services and/or grants-in-aid to local government partners

Sub-Grantee: Ocean County – Barnegat Bay Estuary Program

PROJECT SUMMARY

The United States Environmental Protection Agency (USEPA), Region II Federal 319(h) grant program received additional 319(h) funds to be distributed between the States of New York and New Jersey. The discretionary funds available to the State of New Jersey total $150,000 and are to be used for the purpose of supporting an integrated wetlands assessment project to ascertain the condition and function of existing and future wetlands in the Barnegat Bay Watershed. Wetlands throughout the Barnegat Bay Watershed have been severely impacted by development; however, they still play a critical role in maintaining existing water quality by functioning as non-point source pollution capture and treatment zones.

The New Jersey Department of Environmental Protection (NJDEP), Division of Watershed Management proposes to administer these funds with a pass-through grant to Ocean County to augment the efforts of the Barnegat Bay National Estuary Program. The project would be designed to facilitate a statewide uniform wetlands assessment and monitoring protocol building upon an approach that the DNREC developed along with the Mid Atlantic Wetlands Work Group. The BBNEP watershed partners and STAC have identified wetlands assessment and integrated monitoring in this estuary as a critical need. This project would also consider climate change and sea level rise adaptation because the project would be designed to provide assessments of those wetlands that are most functional and critical for restoration, protection and preservation thereby providing better long term permitting and restoration decision making.

The project will utilize existing landscape assessments and remote sensing imagery data compiled by the Rutgers University Center for Remote Sensing and Spatial Analysis. A probabilistic “rapid” sampling protocol to determine the condition of wetlands in the watershed will be formulated and utilized to determine the condition and value of wetlands. The protocol will be coordinated and approved by the Department prior to use in any work under the project. Fixed monitoring stations at priority locations will be proposed in wetlands that will be used to assess changes associated with major stressors and shifts in base forcing functions in the estuary (e.g. seal level rise, sediment budgets, temperature).

The critical NJDEP partners that will be directly involved in the design of the project and associated scope of work for undertaking this project are professional staff from within the Department, including Office of Science, Division of Land Use Regulation, Monitoring and Standards Program and Division of Watershed Management, as well as the Delaware Estuary Program.

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III. New England Interstate Water Pollution Control Commission (NEIWPCC) - Request for Proposals (October 24, 2008)

Topic Area: Nutrient Assessment and Management of Shallow Coastal Embayments in New York and New Jersey

Background: Recognizing the need to evaluate water quality in coastal waters, and the data gaps and lack of tools (monitoring, mathematical models) needed to generate scientifically defensible environmental management strategies, the USEPA dedicated leftover FY 2008 monitoring money ($980,000) for coastal research in USEPA Region 2 (New Jersey and New York). To facilitate this process USEPA transferred the money to the New England Interstate Water Pollution Control Commission (NEIWPCC) to put out a Request for Proposals and to use NJDEP and NYDEC scientists to rate and rank the proposals.

Specifically the research must address nutrient over-enrichment of coastal, shallow water embayments in New York and New Jersey leads to eutrophic conditions in those waters. Applicants must develop site-specific nutrient management plans, including the determination of appropriate numeric criteria or endpoints, for one or more coastal bay systems in the New York-New Jersey area. Projects will facilitate the understanding of fate and effects and the implementation of management measures to reach the desired ecological endpoints, and may include loading studies for target nutrients. All projects should be linked to existing federally or state approved management plans and conducted in consultation with management conferences for applicable estuaries and coastal waters. Further, projects should be consistent with state efforts, needs, and priorities for these areas. Projects involving a collaborative team of multiple stakeholders are encouraged.

Projects must be completed in a two-year timeframe. At the completion of all projects, NEIWPCC will host a technology transfer symposium to bring together all of the principal investigators to share results. Other scientists and managers in the region involved with nutrients will also be invited to attend. The symposium will take place in the New York-New Jersey region in September 2011.

Proposal Funded: Over ten proposals were submitted and two selected for funding (one each for NJ and NY). The New Jersey funded proposal is with Rutgers University and builds on research already being managed by NJDEP's Office of Science and Water Monitoring and Standards.

NJ FUNDED PROJECT

Project Title: Assessment of Nutrient Loading and Eutrophication in Barnegat Bay-Little Egg harbor, New Jersey in Support of Nutrient management planning

Principal Investigators: Rutgers - Michael J. Kennish, Richard G. Lathrop Jr.,
JCNERR: Scott M. Haag, **U.S. Geological Survey:** Ronald J. Baker, Robert S. Nicholson and Christine Wieben
Project Cost: $480,562.00
NJDEP Oversight: Thomas Belton, Office of Science

Abstract

The Barnegat Bay-Little Egg Harbor (BB-LEH) estuary, which also includes Manahawkin Bay, has been classified as a highly eutrophic system based on application of NOAA's National Estuarine Eutrophication Assessment (NEEA) model (2007) and Nixon's trophic classification (1995). Nitrogen loading from the BB-LEH watershed and overlying airshed has resulted in shifts in ecosystem structure and function of the estuary reflected by the repeated occurrence of detrimental toxic and nuisance algal blooms, loss of essential seagrass habitat, and declining fisheries. Most of the nitrogen load enters the estuary from watershed surface-water inflow. While nitrogen loading has been modeled in several watersheds dominated by agriculture, the proposed project uses novel methods of modeling nutrient flow to characterize the effects of rapid urbanization and altered land use in the BBLEH watershed. With coastal population growth increasing rapidly in the watershed, it is becoming more important to understand the effects of land use alteration on the BB-LEH estuary. This interdisciplinary research project will integrate models of the coupled watershed-estuary system to estimate levels of nutrient loading and will employ a suite of key water quality, biotic, and habitat indicators for quantifying and characterizing estuarine responses and eutrophic conditions associated with these environmental stressors at local and estuary-wide scales.

Nutrient loading to Barnegat Bay-Little Egg Harbor will be quantified from water-quality data, atmospheric data, and loading models and related to biotic indicators of eutrophication for biotic-index development to define the estuarine ecosystem condition. Results will include thresholds of biotic and numerical loading criteria to support nutrient management planning. Specifically the project will

- Characterize and model how land-use decisions in the BB-LEH watershed impact nutrient fluxes to the BB-LEH estuary.
- Determine whether the biotic response to nutrient enrichment in the estuary represents a stable, continuous gradient or exhibits significant seasonal and interannual variability.
- Quantify to what extent variability in nutrient loading and biotic responses differs among subwatershed areas.
- Develop and apply a eutrophication conceptual model to determine if there has been significant alteration of estuarine ecological structure and function.
- Develop threshold levels of biotic decline and numeric nutrient loading criteria for the estuary with a discussion of how these threshold levels can be integrated into the BBNEP CCMP.