

SPATIALLY AND TEMPORALLY DETAILED MODELING OF WATER QUALITY IN NARRAGANSETT BAY

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ABSTRACT:

Nutrient loading to Narragansett Bay has led to eutrophication, resulting in hypoxia and anoxia, finfish and shellfish kills, loss of seagrass, and reductions in the recreational and economic value of the Bay. We are developing a model that simulates the effects of external nutrient and hydrologic loading on water quality in Narragansett Bay. Extensive field monitoring programs and process studies by the Narragansett Bay Commission, Federal and State agencies, municipalities, and university groups have been measuring physical parameters, nutrient concentrations and other water quality parameters in the Bay and its tributaries, nutrient inputs from wastewater treatment facilities, and process kinetic parameters. We are using data for existing nutrient concentrations, river flow and wastewater treatment facility effluent flow to estimate nutrient loading for non-sampled days using the U.S. Geological Survey's Load Estimator (LOADEST) software. The time-variable data so generated will be used as input to the U.S. Environmental Protection Agency's WASP\EUTRO model linked with a calibrated three-dimensional hydrodynamic model, the Environmental Fluid Dynamics Code (EFDC). The primary objectives of the modeling effort are to simulate the effects of nutrient loading on dissolved oxygen concentrations and chlorophyll-a, an important parameter for water clarity and seagrass viability, to estimate the sensitivity of the Bay to changes in nutrient loading and freshwater inflow, and to explore the potential effects of management actions and other factors such as climate change on these water quality parameters in the Bay.