

REVISED ABSTRACT

A SIMPLE MODEL OF NITROGEN CONCENTRATION, THROUGHPUT, AND DENITRIFICATION IN ESTUARIES.

Edward H. Dettmann, Henry A. Walker. USEPA, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division, 27 Tarzwell Drive, Narragansett, RI 02881.

The Estuary Nitrogen Model (ENM) is a mass balance model that calculates nitrogen losses within bays and estuaries (e.g. denitrification and burial in sediments) as rates that are proportional to system nitrogen content. The model has been used to demonstrate the dependence of throughput and denitrification of nitrogen in bays and estuaries on flushing time. The model also has been successfully used to predict average concentrations of total nitrogen in bays and estuaries based on the rates of nitrogen input from the watershed and direct atmospheric deposition, and across the seaward boundary. The ENM can be used to compare the relative contributions to in-estuary nitrogen concentrations of loading from the watershed and atmosphere with those from loading across the seaward boundary. The ENM can also provide estimates of the sensitivity of in-estuary nitrogen concentrations to changes in loading from the watershed and atmosphere. When riverine loading rates are based on output from USGS SPARROW models, one can estimate contributions of individual source classes, e.g. point, nonpoint and atmospheric inputs, to in-estuary nitrogen concentrations. This is useful in assessing likely consequences of different nitrogen control strategies, including relocation of outfalls, advanced treatment at sewage treatment plants, or changes in air emissions that result in reduced atmospheric deposition.

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Keywords: denitrification; estuaries; mass-balance model; nitrogen; sensitivity analysis; SPARROW Model; throughput; watershed loading

Purpose:

The purpose of this work is to use output from the USGS SPARROW Model to predict annual average concentrations, throughput, and denitrification of total nitrogen in estuaries in support of the development of nutrient criteria.

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Presentation outline:

Describe model assumptions and derivation of model equations.

- Show model Equations.
- Show model application to calculation of nitrogen throughput and denitrification in estuaries.
 - At a minimum, show nitrogen throughput and denitrification as shown in Figs 2 & 3 of my 2001 paper.
 - ***If possible, augment these figures with data for additional estuaries.***
- Show model application to calculation of nitrogen concentrations in estuaries.
 - Narragansett Bay
 - Boston Harbor (2 scenarios)
 - Great Bay, New Hampshire
 - **Other Possibilities:**
 - **Halifax River, Florida**
 - **Other Florida estuaries?**
 - Include discussion of the fraction of the concentration is attributable to loading from the watershed vs. loading across the seaward boundary.
- Show use of model to perform sensitivity analysis to changes in nitrogen loading rate.
 - Boston Harbor (outfall relocation)
 - Narragansett Bay (reduction in STP loads)
- If possible, survey the papers that have referenced my 2001 paper to see how it has been used. Anything worth including here?