Overview of New England SPARROW Nutrient Model

The Need – Tools to Assess the Quality of Our Nation's Waters

Over 40% of our assessed waters still do not meet the water quality standards that states, territories, and authorized tribes have set for them. This amounts to over 20,000 individual river segments, lakes, and estuaries. Many of these "impaired" waters are polluted by excess nutrients, which is one of the top three causes of impairment of surface waters nationwide. (The other two top causes of impairment are sediments and and harmful microorganisms.) Models are needed to address wide-spread problems, such as excess nutrients (nitrogen and phosphorus), so that large amounts of existing information can used together within a scientific framework to predict pollutant concentrations and loads in waterbodies, and to predict the major sources of these loads.

Background of SPARROW

In the 1980s and 1990s, the U.S. Geological Survey (USGS) developed SPARROW models to assist in performing national and regional water-quality assessments (Smith and others, 1993 and 1997). SPARROW, which refers to Spatially Referenced Regressions on Watershed Attributes, uses regression equations to relate measures of water-quality conditions to pollution sources and watershed characteristics. SPARROW has been applied nationally to estimate nutrient concentrations, yields, and transport in watersheds (hydrologic cataloging units) of the conterminous United States. Other regional SPARROW models have been developed for portions of the Mid-Atlantic Region to support restoration efforts of Chesapeake Bay (Preston and others, 1998) and the Delaware River Basin. Development of a New England SPARROW will be used to enhance the ability of USEPA Region I to meet requirements under the Clean Water Act, including development of Total Maximum Daily Load (TMDL) studies for waters impaired by pollutants and development of nutrient criteria.

Information provided by New England SPARROW

The New England SPARROW model will provide the following information:

- Estimated mean annual loads of total nitrogen (TN) and total phosphorus (TP) in all New England stream segments for the mid-1990s time period, including streams with no water-quality data. Estimated mean annual concentrations will also be available.

- Estimated TN and TP loads contributed by pollutant sources in each stream segment and confidence intervals for these source estimates. Sources include major land use types (urban, forest, wetland, and agricultural), point sources, atmospheric deposition (for TN only), agricultural fertilizer and manure applications, and human population.

- Estimated TN and TP loads from individual stream segments to downstream stream TN and TP loads within watersheds and to coastal water, including estimates of how much pollutant load is transported from state to another in interstate waters.

- Information on the impact of watershed characteristics, such as precipitation, soils, presence of reservoirs and lakes, and watershed slope, on pollutant loads.

- Use of SPARROW TN and TP flux estimates in the analysis of Northeastern U.S. estuarine and coastal waters for EPA's National Coastal Condition Report scheduled for completion in 2003.

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