

**APPLICATION OF SPATIALLY REFERENCED REGRESSION MODELING
TO ASSESS WATER-QUALITY CONDITIONS
IN MAJOR REGIONS OF THE UNITED STATES**

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ABSTRACT

To assess status and trends in water-quality conditions throughout the United States, the U.S. Geological Survey (USGS) National Water Quality Assessment (NAWQA) Program has increased its use of modeling in order to make the most efficient use of limited monitoring data. One modeling technique adopted by NAWQA is known as SPATIALLY REFERENCED REGRESSIONS ON WATERSHED attributes (SPARROW). SPARROW is designed to identify relations between the spatial patterns of water-quality data and those of the environmental factors that affect it. It was originally applied at the national scale, but models have now been developed for smaller regions of the country. NAWQA's effort seeks to expand the regional modeling to cover most of the continental U.S., but provide separate regional calibrations that are specific to each region. To assess water-quality conditions in the U.S., NAWQA has divided the country into 8 major regions referred to as "Major River Basins" (MRB's). SPARROW models are being developed for 6 of those regions including ones that cover: 1) the Northeast; 2) the Southeast; 3) the upper Mississippi drainage; 4) the lower Mississippi drainage; 5) the Missouri drainage; and 6) the Pacific Northwest. Data are now being compiled that include historical streamflow and water-quality monitoring data collected by agencies throughout each region. Those data are being used to estimate nutrient loading at each location and the stream-load estimates will serve as calibration data for the SPARROW models. A wide range of spatially detailed (GIS) data sets that document nutrient sources and watershed characteristics are also being compiled. The spatial data sets will be used to develop variables that will be statistically related to water quality to better understand what factors are the primary controls of water quality in each region. Once calibrated, the models can be used to develop a broad range of applications that will provide information to support water-quality management decisions. Examples include: 1) identification of spatial patterns in nutrient loading and in sources of nutrients 2) targeting and prioritizing management actions; and 3) designing future monitoring programs.

KEYWORDS

Water quality, modeling, nutrients, hydrology, streamflow, runoff, GIS, spatial data