

Concentration and Movement of Nitrogen and Other Materials in Selected Reaches and Tributaries of the Upper Mississippi River System

by

Dennis Wasley

ABSTRACT

Nutrient and streamflow data from the Long Term Resource Monitoring Program, the U.S. Geological Survey, and the U.S. Army Corps of Engineers were used to (1) examine patterns in constituent concentrations, (2) estimate tributary loads, and (3) calculate nutrient mass balances for Pools 4, 8, 13, and 26 of the Upper Mississippi River and the La Grange Pool of the Illinois River. Chloride and water mass balances were used to assess the accuracy of mass transport estimates in the pools. Three rating-curve methods and the Beale ratio estimator were used to estimate nutrient loads. Total nitrogen inputs were 95 - 115% of outputs in the five pools. Based on the uncertainty associated with load estimations, total nitrogen mass balances were nearly balanced for the pools. On a larger scale, the total nitrogen load in the Upper Mississippi River increased downstream due to conservative transport and tributary inputs. Inputs for nitrate + nitrite, total ammonia, total phosphorus, soluble reactive phosphorus, total suspended solids, and silicon were 63 - 151% of outputs except for two total suspended solids mass balances. Inputs of total suspended solids in the La Grange Pool and Pool 4 were 176 and 235% of outputs, respectively. Transport of total suspended solids and total phosphorus appeared conservative when cumulative tributary loads were compared with mainstem loads. Retention and export of these constituents were not consistent among the Upper Mississippi River Pools, Tributary basins with large proportions of agricultural and urban land cover and use had the highest nutrient yields; nutrient management programs should be focused in these basins. My study suggests that reducing nutrient delivery to tributaries is the most feasible solution to reducing transport of nitrogen and other materials through the Upper Mississippi River.