Examining Impaired Waters from Different Angles: Multi-Prong Monitoring to Support the Lower Minnesota River Model

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ABSTRACT

The lower 40 miles of the Minnesota River is poised between two large TMDL studies. The first is a completed TMDL study of the upper basin conducted to resolve low dissolved-oxygen concentrations in the lower Minnesota River. Its forerunner was a wasteload allocation (WLA) study of the lower 22 miles that established a 40% reduction goal for oxygen-demanding materials from upstream sources. The second is a current TMDL study of nutrient and turbidity impairments in the Mississippi River and Lake Pepin in which the Minnesota River play a large role. The lower Minnesota River is also poised between contrasting landscapes: intensive row-crop agriculture in the west and rapidly growing metropolitan area in the east. An advanced water-quality model—and data to support the model—were needed to update the WLA study, bridge the two TMDL studies, and provide a tool for facility planning and water resource management.

The Metropolitan Council, which provides planning and wastewater and transit services for the seven-county Twin Cities metropolitan area, coordinated a three-year monitoring program to support a water-quality model of the lower Minnesota River. Several federal, state, local, and private partners joined the effort, which was multi-prong in order to examine the problems of excessive organic matter, nutrients, and sediment from different angles. In 2003 the partners chose the CE-QUAL-W2 model and designed a monitoring program to support it.

At the foundation of the multi-prong effort was a plan to routinely monitor the river, tributaries, and discharges year-round over three years to meet the basic data requirements of the model. For the most part, the plan involved modifying programs already in place. More intensive monitoring was added at low river flows during summer to capture oxygen, phytoplankton, and nutrient dynamics under critical conditions. Finally, special field studies were implemented to support specific model inputs. These included a rapid sediment-bed assessment, mixing-characteristics study, synoptic sonde survey, comprehensive oxygen-dynamics assessment, and research on phosphorus sorption, bioavailability, and fluxes. The monitoring program was completed in 2006, and the Lower Minnesota River Model will be completed in 2008.

KEYWORDS

river monitoring model oxygen nutrients