Minnesota Pollution Control Agency

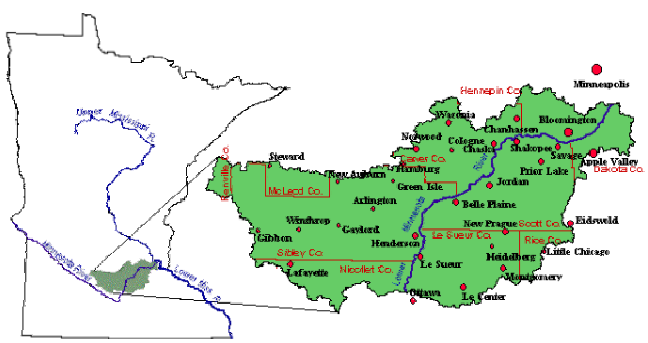
Regional Environmental Management

Impaired Waters Program

# Dissolved oxygen problem in the Lower Minnesota River

Water Quality/Basins #3.04, May 2003

*The Minnesota Pollution Control Agency seeks public input on improving water quality by reducing pollution in the Minnesota River resulting from excess phosphorus. Study results indicate that it is possible to reach the water quality standard in the lower 22 miles for dissolved oxygen, which is related to phosphorus levels. This will improve conditions for fish and aquatic life.*




**Lower Minnesota River watershed communities**

## Introduction

Since the early 1990s, a well- publicized goal for the Minnesota River has been to make it fishable and swimmable. For a river like the Minnesota, meeting that goal is a challenge. How will we know when the river is swimmable and fishable? One way is to meet water quality standards. The federal Clean Water Act requires states to adopt water quality standards to protect the nation's waters. These standards define how much of a pollutant can be in surface or ground water while still allowing it to meet its designated uses, such as drinking water, fishing, or swimming, among others. The Minnesota River is among many of the state's water resources that currently do not meet their designated uses.

## TMDL study required

For each pollutant that causes a water body to fail state water quality standards, the Clean Water Act requires states to conduct a TMDL (Total Maximum Daily Load) study. The study identifies all the sources of each pollutant in an affected water body. Water-quality sampling and computer modeling, together with public input, determine how much each pollutant source must be reduced to assure the standard is met in that water body.

## Minnesota River impairments

A wide variety of pollutants impair water quality in the Minnesota River and its tributaries. Pollutants and their negative effects include low dissolved oxygen levels, turbidity, mercury, fecal coliform bacteria, and ammonia. In the Minnesota River Basin there are more than 80 lakes and 84 river reaches with identified impairments. Among river reaches there are more than 200 separate impairments. (Many reaches have several types of impairments. See map on page 3). Many of these occur during high-flow conditions when runoff transports materials to the river. In the lower 22 miles of the Minnesota, however, the low dissolved oxygen problem occurs only during low-flow conditions.

## The dissolved oxygen problem

The size and complexity of this problem has required it to be completed in phases. In 1985 the Minnesota Pollution Control

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Agency, in a Waste Load Allocation Study, identified the dissolved oxygen problem. At that time the Blue Lake and Seneca municipal wastewater treatment plants (metro-area) were planning to expand. Scientists determined that without pollutant reductions, the lower 22 miles of the Minnesota River would not meet the dissolved oxygen standard during periods of low flow due to high biochemical oxygen demand (BOD). BOD occurs when organic material decays and consumes dissolved oxygen in the process. This high BOD was traced to the nutrient phosphorus, which causes excessive algae growth in the river. When the algae die and decay, bacteria then use the oxygen in the water to decompose the algae. This leaves less oxygen available for aquatic life, possibly causing fish kills.

Phase I of this project developed stringent effluent limitations for the Blue Lake and Seneca plants. In November 1985 the Environmental Protection Agency approved this Waste Load Allocation and set effluent limits for these plants. As a result, the Seneca and Blue Lake plants were upgraded for advanced wastewater treatment. However, the two wastewater treatment facilities are only two sources of phosphorus to the Lower Minnesota River. Other wastewater facilities throughout the basin as well as runoff and drainage from agricultural and urban lands and discharges from failing or nonconforming septic systems also are significant sources of phosphorus. They are not equal contributors at any one time or place in the basin. This is why monitoring and modeling are important in the development of a TMDL.

## Model helps identify phosphorus reductions

For Phase II of the TMDL, the MPCA hired a consultant (Tetra Tech, EMI) to complete a modeling study of the Minnesota River. The model helps to identify the most efficient and practical methods of attaining the phosphorus (and resulting BOD) reductions. It also helps to quantify pollutant contributions by tributary, land use, and pollutant source. As a result, targets in each of the modeled watersheds will be established to reduce phosphorus loading to the Minnesota River.

An overall reduction in phosphorus from all sources is desirable. However, the phosphorus loads during low flow conditions are of primary importance because it is during low flow conditions that the dissolved oxygen standard is violated. To solve this problem, wastewater plants and other direct discharges will need greater reductions because they contribute more phosphorus during this time.

Other sources such as individual sewer systems and urban and agricultural storm-water runoff source contributions are limited **during low flow conditions** due to decreased runoff. It is important to note that the individual sewer systems and runoff sources will also play a role in solving this problem, even at low flow, as no source alone can resolve the problem. During high flow conditions, the sources will change in regard to the role needed in solving problems related to turbidity and fecal coliform bacteria as well as phosphorus in the Minnesota River, the Mississippi River and Lake Pepin. These efforts will be completed in coming years.

## Solving the problem

Results from the study indicate that, with phosphorus reductions, it is possible to meet the dissolved oxygen standard in the Lower Minnesota River during low flow conditions. The MPCA would like input from stakeholders in the Minnesota River Basin on how to achieve these reductions. In the months to come, people will have the opportunity to comment through public meetings and a 30-day comment period. Following the public involvement this summer and fall, a report will be submitted to the U.S. Environmental Protection Agency for approval describing how the problem will be solved.

## For more information

For more information contact Jim Klang, 651-296-8402, or Larry Gunderson, 651-297-3825. On the Web, visit www.pca.state.mn.us/water/tmdl

# Minnesota River Basin

2002 Impaired Waters List
(per Section 303(d) Clean Water Act)