Greater Blue Earth River Basin

Life support: Project aims to clear up water

Introduction

Water clear enough to support fish and other aquatic life is the goal of a project for the Greater Blue Earth River Basin in southern Minnesota and northern Iowa.

Clearer water and improved aquatic life, in turn, provide for recreational and economic opportunities that enhance the quality of life for the regional community.

This project will also play an important role in improving the water quality of downstream lakes and rivers, which include the Minnesota and Mississippi rivers.

Rivers fail to meet water quality standards

Several sections of streams and rivers in the Greater Blue Earth River Basin fail to meet water quality standards for turbidity. The water is too cloudy from suspended sediment consisting of soil and other particles in the water. Turbidity harms aquatic life in several ways, including limiting plant species needed for food, reducing the visibility needed to find food, impeding gill function, and covering spawning areas.

In addition, the amount of sediment from the basin is filling in rivers and lakes downstream.

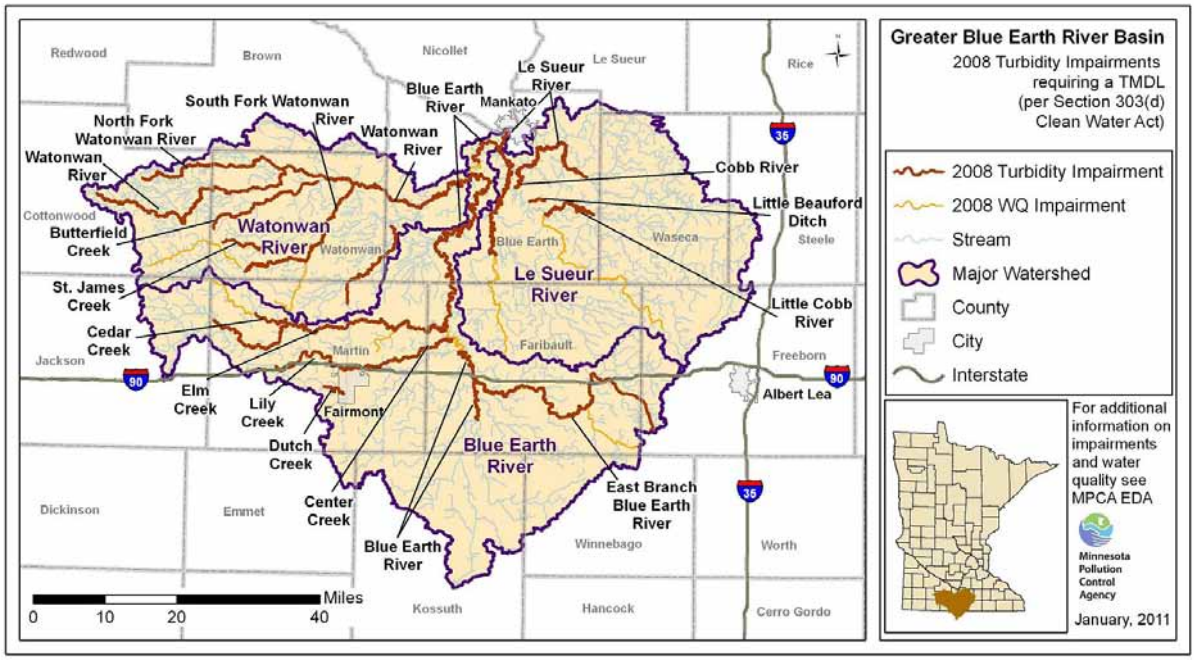
The turbidity of rivers in the basin varies with flow levels. Targeting sediment levels during high flows, such as spring snow melt, will be the key to this project's success. This project aims to identify sediment reductions needed to meet state water quality standards.

TMDLs a process for restoration

Under the federal Clean Water Act, states use a process called Total Maximum Daily Load (TMDL) to determine how much of a pollutant a water body can accept and still meet water quality standards. The Minnesota Pollution Control Agency (MPCA) is using this process to address the water pollution in the Greater Blue Earth River Basin. Along with the TMDL process, this fact sheet will explain:

- **Background of the Greater Blue Earth River Basin;**
- **Project participants;**
- **Sources of sediment; and**
- **The next step – implementation.**

To see the full project report, go to www.pca.state.mn.us and search for "Greater Blue Earth River turbidity."



Thirty-nine sections of rivers and streams in the Greater Blue Earth River Basin fail to meet the state water quality standard for turbidity, meaning the water is too cloudy and affects aquatic life such as fish. (MPCA graphic)

For more information: Contact Paul Davis, project manager for the MPCA, 12 Civic Center Plaza, Suite 2165, Mankato, MN 56001 or paul.a.davis@state.mn.us.

Minnesota Pollution Control Agency

Background on the Greater Blue Earth River Basin

The Greater Blue Earth River Basin in southern Minnesota and northern Iowa includes three major watersheds:

- **Blue Earth River**
- **Le Sueur River**
- **Watonwan River**

The basin covers about 5,540 square miles (2.3 million acres) and includes 11 counties in Minnesota and three in Iowa.

About 92,202 people live in the basin, according to the 2000 census, with 60 percent living in cities and 40 percent in rural areas. The basin includes 51 municipalities, with the primary urban areas being Fairmont, Blue Earth and portions of Mankato.

The main land use is agriculture, with 88 percent of the area planted to crops, mainly corn and soybeans, or used for livestock production, according to the National Land Cover Dataset.

Compared to other watersheds in the basin, the Blue Earth, Le Sueur, and to a lesser extent, the Watonwan rivers contribute disproportionately high amounts of sediment to the Minnesota River, according to water monitoring by several agencies. In other words, these rivers carry more sediment than expected, based on their watershed area and flow.

For example, the Blue Earth and Le Sueur watersheds together may contribute up to half of the sediment to the Minnesota River yet comprise only 20 percent of the drainage area, according to research cited in "Identifying Sediment Sources in the Minnesota River Basin" (MPCA, 2009).

Turbidity: Water made cloudy by total suspended solids (TSS), which are tiny particles of soil and other matter that remain dispersed – or suspended – in water. This cloudiness prevents sunlight from penetrating the water and growing rooted aquatic vegetation, reducing fish and wildlife habitat. The particles also carry nutrients that cause algal blooms.

Addressing these sediment amounts is a priority for both local and state government units, as well as stakeholders in the watersheds.

Project participants

The MPCA contracted the Water Resources Center of Minnesota State University-Mankato to manage the Blue Earth project. The center recruited stakeholders for involvement from urban communities, agricultural communities, special interest groups and government units.

It also compiled and reviewed extensive data from water monitoring along with permits for wastewater discharge and urban stormwater runoff.

In addition, the center compiled and reviewed studies and projects related to turbidity and the project area, including the following sources:

- **Minnesota National Center for Earth Dynamics;**
- **University of Minnesota;**
- **Science Museum of Minnesota St. Croix River Research Center;**
- **Minnesota State University-Mankato;**

Goals of the Greater Blue Earth River TMDL project

1) Measure the health of the rivers

Under state standards, the level of Total Suspended Solids for rivers in the Greater Blue Earth River Basin should be 90 parts per million or less. However, the flow weighted mean concentration for Total Suspended Solids for rivers in the basin ranges from 175 to 675 parts per million, far above the level needed for clear water, according to water monitoring from 2000-2008. ("Flow weighted mean concentration" is a way of measuring the concentration of sediment of all the water moving in the river system.)

Photo courtesy of the Water Resources Center of Minnesota State University-Mankato

2) Identify sources of sediment

Extensive research has identified where sediment leaves the land and enters the river system. Research continues on how artificial drainage, climate change and other factors affect erosion. Best management practices have reduced erosion from farm fields, and now the emphasis needs to turn to bluffs, streambanks and ravines.

MPCA photo

3) Set goals for reducing sediment

Research and computer modeling have determined how much sediment must decrease in order to meet state water quality standards. The TMDL proposes reducing the amount of sediment by zero percent during low flow conditions and by up to 92.7 percent during high flow conditions. Attaining these reductions will take large-scale and long-term changes across the entire basin in all areas and types of land use.

4) Outline action to take

MPCA photo

Reducing the sediment in the Blue Earth, Le Sueur and Watonwan rivers will require Best Management Practices, such as this water retention area in a farm field in the Minnesota River Basin (photo above). Clearing up the water will require changes that range from simple, small-scale fixes to shifts in mindsets when dealing with water and watershed management. After the public notice period and approval by the U.S. Environmental Protection Agency, the MPCA will work with stakeholders to develop a detailed implementation plan.

- **Minnesota Dept. of Agriculture; and**
- **Minnesota Pollution Control Agency (MPCA).**

Sources of sediment

Soil and other sediment particles move into streams and rivers via water, wind or ice from:

- **Urban areas such as parking lots and lawns;**
- **Construction sites;**
- **Agricultural areas such as fields and feedlots;**
- **Bluffs, ravines, and stream and ditch banks.**

Ongoing research shows that sediment in the Greater Blue Earth River Basin comes from four main sources:

- **Farm fields, where rain and wind can carry sediment from land into waterways.**
- **Bluffs, where high stream flows erode the bottom of the bluff, causing the upper banks to eventually slump into waterways.**
- **Ravines, where water flowing off hills can further erode the water's path through ravines to streams and rivers.**
- **Streambanks, where water continually erodes and deposits sediment, changing the streambed.**

The amount of sediment flowing into streams and rivers in the Minnesota River Valley has greatly increased over the last 150 years. The increase derives from the basin's geological history, climate and land use.

Geological history

About 12,000 years ago, melting glaciers flooded south-central and southwest Minnesota, carving a deeper valley for the Minnesota River. Tributaries to the river have been adjusting to this drop ever since, carving their own valleys to the main river. The soil left behind by the glaciers tends to be highly erodible, compounding the problems of erosion in the areas draining to the Minnesota River.

Climate

As spring temperatures rise and snow melts, more water runs across frozen land. At the same time, many fields have exposed soil; stream banks and bluffs are saturated with water, and ravines are flowing with water. As flows increase, turbidity levels also tend to increase.

Water monitoring shows that high turbidity also occurs after high-intensity rain events, regardless of the season.

However, climate is not the only factor contributing to turbidity in these rivers.

Land use

Land use plays a major role in turbidity in rivers and streams. With the development of row-crop agriculture since European settlement of Minnesota in the late 1800s:

- **Drainage ditches now connect more rivers and streams to the Blue Earth, Le Sueur and Watonwan rivers.**

Basin by the numbers:

- 5,540 square miles
- 3,384 miles of streams and rivers
- 2,665 miles of public tile
- 719 miles of public ditches
- 39 sections of rivers are too turbid, or cloudy, to meet state water quality standards and many more suffer from low fish numbers and other problems

- **Many wetlands that once stored water have been drained and converted to cropland.**
- **The changes in plant life, from native prairie to annual crops, also contribute to changes in the water cycle and erosion potential.**

All these changes have led to increased flows in the river system. Simply put, the more water flowing through a river system, the more potential for erosion and movement of sediment downstream.

High water flows are a key factor in high turbidity levels in the Greater Blue Earth River Basin. During high flows, such as spring thaw and intense rain falls, the rivers and streams frequently violate the state water quality standards for turbidity. Reducing the amount of sediment in all three river systems will require reducing the episodes of high water levels and velocity, which scour sediment from ravines and stream banks.

The MPCA proposes reducing the amount of sediment by zero percent during low flow conditions and by up to 92.7 percent during high flow conditions.

Achieving these goals will take large-scale and long-term changes across the entire basin in all areas and types of land use. Reducing the flows – and the amounts of sediment – can be achieved through perennial crop production, controlled drainage, water retention areas and other Best Management Practices (BMPs).

Keeping sediment out of ditches and streams will also benefit the agriculture community. Preventing erosion of top soil will help maintain the soil's productivity. Keeping sediment out of ditches also reduces their maintenance cost.

The next step – implementation

The Blue Earth, Le Sueur and Watonwan rivers are important to the ecological, economic and social health of the region's community. This project's success will depend on additional research and changes made by residents, farmers, businesses, cities and landowners throughout the basin.

This TMDL project is the next step – not the end result – in restoring these rivers to state standards. The TMDL sets goals for reducing the amounts of sediment and outlines the steps for a more detailed implementation plan.

To quote the TMDL project report:

What's a TMDL?

The state of Minnesota addresses impaired waters – those that fail to meet quality standards – through Total Maximum Daily Loads or TMDLs. Under the federal Clean Water Act, states must adopt water quality standards to protect lakes and rivers from pollution. States must also:

- **Assess waters to see if they meet standards.**
- **List waters that fail to meet standards; these waters are called "impaired."**
- **Conduct TMDL studies to determine how to reduce pollutants so waters can meet standards.**

A TMDL is both a formula and a process:

- **As a mathematical formula, it represents the total amount of a pollutant that a water body can accept and still meet standards.**
- **As a process, it includes technical advisers and stakeholders to identify sources of pollutants and recommend ways to reduce pollutant levels.**

Fish survey

The MPCA sampled the fish population in 82 sites in the Le Sueur River watershed in 2008. Researchers found that species tolerant of high turbidity, such as carp, dominated the fish population, though game fish were present in 41 percent of the sites. With a reduction in sediment and other pollutants, the rivers and streams in the watershed could support more species that are sensitive to turbidity, such as smallmouth bass and darter species.

"The changes in the Greater Blue Earth River Basin that have contributed to water quality impairments took place over the course of decades, so it is likely the changes necessary to improve water quality will also take an extended amount of time ... In general, broad changes in existing hydrology and water retention/storage will need to be addressed to meet water quality standards. Any implementation will likely need to be handled in a phased approach, allowing for adjustments in new information, technology and demands on both the landscape and water resources by society."

Minnesota Pollution Control Agency

520 Lafayette Rd. N., St. Paul, MN 55155-4194 • www.pca.state.mn.us
651-296-6300 • 800-657-3864 • TTY 651-282-5332 or 800-657-3864 • Available in alternative formats