WRAPS report summary
Water Restoration and Protection Strategy

Bois de Sioux River Watershed

Watershed approach

Minnesota has adopted a watershed approach to address the state's 80 major watersheds. This approach looks at the drainage area as a whole instead of focusing on lakes and stream sections one at a time, thus increasing effectiveness and efficiency. This watershed approach incorporates the following activities into a 10-year cycle:

- Water quality monitoring and assessment
- Watershed analysis
- Civic engagement
- Planning and implementation
- Measuring results

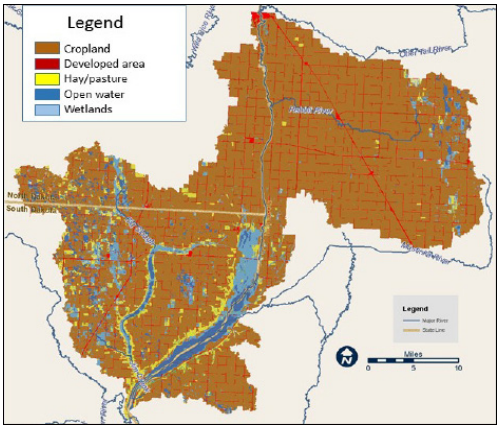
The North Ottawa Impoundment near Tintah provides flood protection as well as habitat for migratory waterfowl.

The Minnesota Pollution Control Agency (MPCA) leads the monitoring and assessment of the waters and works with local partners to develop restoration and protection strategies. Local partners, like the Bois de Sioux Watershed District, implement the strategies to restore and protect water resources, and also engage citizens throughout the process.

The Bois de Sioux Watershed approach began in 2010, and culminated with a Watershed Restoration and Protection Strategies (WRAPS) Report published in April 2018. This document summarizes key findings and recommendations contained in the full Bois de Sioux River WRAPS Report.

Watershed characteristics

- Size: 1,123 square miles or 718,685 acres (361,222 acres in Minnesota)
- Counties: Grant, Wilkin, Otter Tail, Traverse
- Ecoregion(s): Lake Agassiz Plain, Northern Glaciated Plains
- Municipalities: Breckenridge, Browns Valley, Campbell, Tintah, Wahpeton
- Land use: Land use in the watershed is predominantly Agricultural
- Tributary to the Red River of the North
- The 8-digit hydrologic unit code or HUC for the Bois de Sioux River Watershed is 09020101.



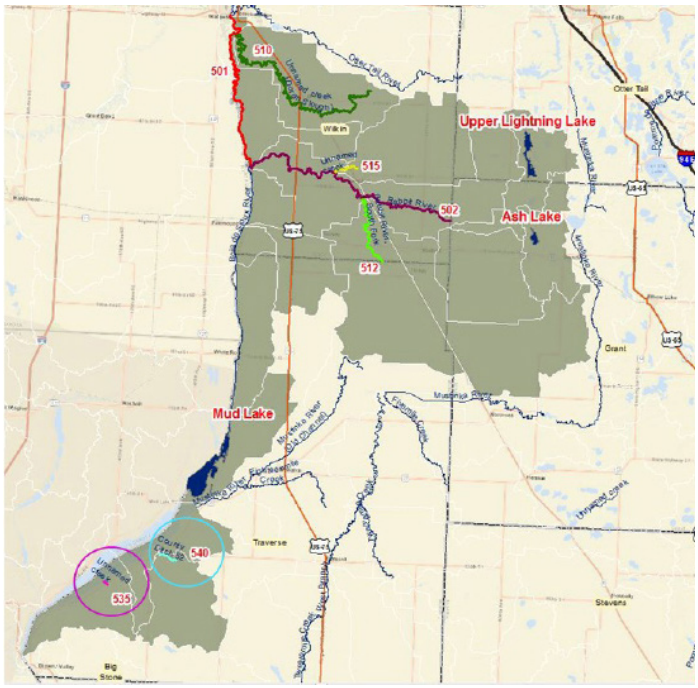
Assessments: Are waters meeting standards and providing beneficial uses?

During the first phase of the watershed approach – intensive watershed monitoring – the MPCA collected data about biology such as fish populations, chemistry such as pollutant levels, and flow to determine if lakes and streams were meeting water quality standards designed to ensure that waters are fishable and swimmable. Waters are "impaired" if they fail to meet standards. The map on the next page shows the impairments found for streams and lakes in the Bois de Sioux River Watershed. Under federal and state laws, impaired waters must have Total Maximum Daily Load (TMDL) studies conducted to determine reductions of pollutants needed to again meet water quality standards.

After assessing streams and lakes, certain stream reaches and lakes were determined to be impaired for aquatic recreation (swimming) or aquatic life (issues affecting fish and aquatic insects/macroinvertebrates). Swimming impairments in lakes are linked to high nutrient levels causing algae blooms. Stream swimming impairments are tied to finding elevated levels of bacteria (*E. coli* and/or fecal coliform). This can indicate sewage or manure in water.

Aquatic life impairments were attributable to several factors:

- Fish and aquatic insect biology: The number and type found are indicators of stream health.
- Dissolved Oxygen (DO): Low levels make it hard to sustain fish and aquatic insect communities.
- Turbidity: Levels of soil and other particles in the water so high they affect fish and aquatic insects.



Bois de Sioux Watershed Impairments

Upper Lightning Lake
Impaired for swimming (excess nutrients/algae blooms)

Ash Lake
Impaired for swimming (excess nutrients/algae blooms)

Unnamed Creek (510)
Impaired for swimming (*E. coli*), aquatic life (low DO)

Rabbit River (502)
Impaired for swimming (*E. coli*), aquatic life (low DO, aquatic insects/fish bioassessments, turbidity)

Rabbit River (512)
Impaired for aquatic life (low DO, fish bioassessments, turbidity)

Bois de Sioux River (501)
Impaired for swimming (*E. coli*), aquatic life (low DO, fish bioassessments, turbidity)

Unnamed Creek (515)
Impaired for aquatic life (low DO, turbidity)

Unnamed creek (535)
Impaired for aquatic life (fish bioassessments)

County Ditch 52 (540)
Impaired for aquatic life (fish bioassessments)

Stressors: What factors are affecting fish and bugs?

To develop strategies for restoring or protecting water bodies with biological impairments, agencies and local partners must first identify the possible causes, or stressors, of the impairments. The table below identifies the predominant stressors to fish and aquatic insects (macroinvertebrates, MI) in the Bois de Sioux Watershed.

Stream	AUID last 3 digits	Reach description	Biological impairment	Impairment category	Stressor							
					Dissolved oxygen	Phosphorus	Sediment/turbidity	Connectivity	Altered hydrology*	Channel alteration	Pesticides	Habitat
Bois de Sioux River	501	Rabbit River to Otter Tail River	Fish	5	●	♦,+	●		♦	◊	?	●
Rabbit River	502	Wilkin County line to Bois de Sioux River	Fish and MI	5	●	♦,+	●		♦	●	?	●
South Fork Rabbit River	512	Wilkin County line to Rabbit River	Fish	5	●	♦,+	●	o	♦		?	●
Unnamed Trib. to Lake Traverse	535	Unnamed Creek to Lake Traverse	Fish	5				♦	♦		?	
Judicial Ditch 52	540	Unnamed Creek to Unnamed Creek	Fish	5			●	♦	♦	♦	?	●

Symbols used in table explained

♦ A "root cause" stressor, which causes other consequences that become the direct stressors.

◊ Possible contributing root cause.

● Determined to be a direct stressor.

o A stressor, but anthropogenic contribution, if any, not quantified. Includes beaver dams as a natural stressor.

+ Based on river nutrient concentration threshold, but not officially assessed and listed for this parameter.

? Inconclusive - not enough is known to make a conclusion either way.

Restoration and Protection Strategies

The following list describes the major water quality concerns and priority implementation strategies in the Bois de Sioux River Watershed based on input from local partners.

Multi-purpose flood control structures, such as North Ottawa (which manages flow, nutrients, and sediment), are needed for water quality because of the fundamental need to manage high-flow periods in the Red River Basin.

Reducing the amount of nutrients applied to fields and the export of nutrients and sediments from fields will improve soil health and increase the effectiveness of downstream best management practices.

Soil health: Soil health is marginal watershed-wide; challenges remain with cover crops due to herbicide residue and short growing seasons. Crop rotation was identified as a potential and feasible way to improve soil health. Needed is education on improving soil health for long-term cropping profitability, and a civic engagement focus on improving land stewardship behaviors using economics instead of regulations.

Agricultural drainage: Past ditching and recent increases in tile drainage have altered watershed runoff patterns and stream flow. Misconceptions exist among farmers about the impact of tiling on nutrients in agricultural runoff.

Dissolved nutrients: Misconceptions exist about the difference between sediment, Total Phosphorous and soluble phosphorus, and the impacts agricultural practices have on the export of these different types of nutrients.

Buffers: There is an overall lack of stream buffers that stabilize stream banks and filter pollutants from runoff; individual counties are in the process of conducting stream surveys to identify priority areas.

Altered hydrology: Stream channelization, loss of wetland storage, grading of farmed-through head water streams, and tiling results in extended periods of stagnant, low-flow conditions which impacts local fish and aquatic insects.

Ditch dredging: Potentially removes and re-deposits sediment and phosphorus on farm fields and/or riparian areas; more research is needed to understand how these activities affect sediment export downstream.

Stream bank erosion: Eroding stream banks export nutrients and sediment downstream.

Wind erosion: Unprotected soils in winter result in extensive wind erosion of soil from fields.

Carp: Their bottom feeding behavior re-suspends sediment, increases turbidity, and destroys habitat.

Impoundments: Lake Traverse/Mud Lake flood control structures limit load management activities in these lakes, such as whole-lake drawdowns and carp control.

Next steps and measuring results

The restoration and protection strategies listed in the WRAPS report will be the basis for developing local implementation plans to restore and protect water resources. The report lays out goals, milestones, and responsible entities to address protection and restoration priorities in the Bois de Sioux Watershed. The targets are intended to provide guidance and “measuring sticks” to assess the watershed’s health and success of actions taken.

Water quality in Minnesota has declined over many decades. While restoration activities continue, new problems develop, such as converting land to intensive cropping that negatively impacts water quality. The perpetual challenge is to make improvements and keep up with new problems. Impacts from other factors such as climate change are still not completely understood. Consequently, it may take decades to fully restore impaired waters.

Key conclusions of first WRAPS cycle

- Water quality conditions in the Bois de Sioux Watershed are generally poor and reflect the intensely cultivated land use, altered watercourses, intensive drainage, and a consistent lack of permanent vegetation (buffers) around many of the wetlands and streams in the watershed. Every subwatershed assessed failed to fully support fish and aquatic insect standards. Most aquatic life impairments were due to low dissolved oxygen and/or excess total suspended sediments (TSS). Only one assessed stream segment fully supported swimming. All impairments for swimming resulted from excessive bacteria (*E. coli*) levels. Lakes with enough data for assessment failed to fully support swimming. All lakes had high total phosphorus levels and most had low transparency.
- The subwatersheds (Bois de Sioux River, Rabbit River, Doran Slough, and Lake Traverse) contain a total of 14 stream impairment listings: three for swimming due to *E. coli* and 11 for fish and aquatic insects due to excess TSS, poor fish and/or aquatic macroinvertebrate bioassessment, and/or low dissolved oxygen (DO). The Total Maximum Daily Load (TMDL) Study for the watershed addresses nine stream impairments: three stream reaches for TSS, three stream reaches for high total phosphorus, and three stream reaches for *E. coli*. (See map on page 2.)
- The watershed has nine lakes larger than 10 acres. Only three (Ash, Upper Lightning, and Mud) had enough data for assessment. Ash and Upper Lightning were assessed as being impaired for swimming and were addressed in the watershed TMDL Study. While Mud Lake was also initially assessed as impaired, the MPCA determined there was not sufficient data to perform a TMDL study and deferred it until the next Bois de Sioux WRAPS cycle.
- Impairments for fish/aquatic insects, and swimming are common in highly modified landscapes, due to several factors, including an overabundance of sediment, excess phosphorus, and excessive bacteria in the water.
- Pollutant reductions needed will require a coordinated, long term, sustained effort to both restore the impaired waters and protect the others from being degraded down to an impaired condition. Required reductions for TSS values range from 25% on the low end to as high as 77% for impaired stream segments. Required reductions for bacteria range from 4% to 88%, depending on stream flow conditions. Required reductions for total phosphorus (TP) values range from 48% to 95%, depending on stream flow conditions. Required Total Phosphorous reductions for Ash Lake and Upper Lightning Lake are 51% and 24% respectively.
- Common stressors that contribute to poor fish and aquatic insect populations include lack of fish passage (connectivity) and altered hydrology. Some examples of connectivity problems include migration barriers that are both human-made (e.g., perched culverts) and, to a lesser extent, naturally occurring (e.g., beaver dams). Examples of the results of altered hydrology include increases in peak flows and reductions in base flows. This is a common occurrence in artificially-drained agricultural areas.

Full report

For the full report, go online and search for “MPCA Bois de Sioux WRAPS report.”

Contact person

- Cary Hernandez, MPCA, at cary.hernandez@state.mn.us, or 218-846-8124.

MINNESOTA POLLUTION CONTROL AGENCY

www.pca.state.mn.us

The Clean Water, Land and Legacy Amendment is funding a large part of the MPCA’s watershed approach.

CLEAN WATER LAND & LEGACY AMENDMENT