

Lake of the Woods 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 cycle repeated on a regular basis:

1. Monitoring water bodies and collecting data over two years on water chemistry and biology. (2012)
2. Assessing the data to determine which waters are impaired, which conditions are stressing water quality, and which factors are fostering healthy waters. (2015)
3. Developing strategies to restore and protect water bodies, and report them in a document called Watershed Restoration and Protection Strategies (WRAPS). (2020)
4. Coordinating with local One Watershed-One Plan efforts for implementation of restoration and protection projects.

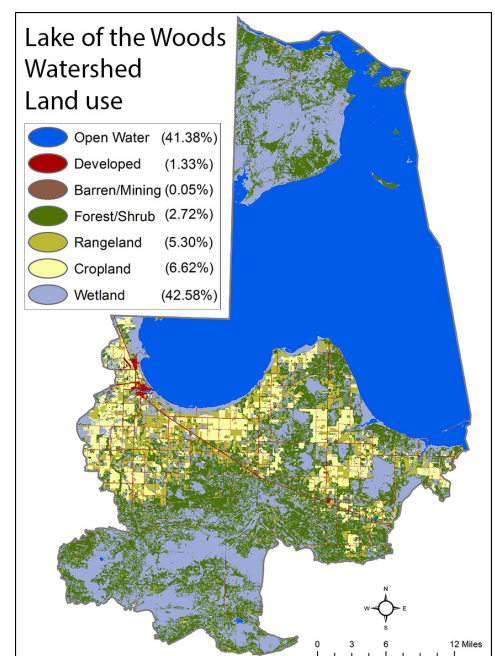
The Minnesota Pollution Control Agency (MPCA) leads the technical work and coordinates and supports strategy development with local and state partners. Watershed partners are leaders in implementing strategies to restore and protect water resources. Their past and current work provides promising opportunities for watershed improvement and will continue to be a critical component to overall water quality. The main purpose of the WRAPS report is to summarize all the technical information so that local partners can use it for planning and implementing the best strategies in prioritized locations.



Watershed characteristics

- Size: 730,000 acres in Minnesota.
- Water: Lake of the Woods is the predominant water resource in the watershed; Rainy River; Warroad River; Willow, Williams, Bostick and Zippel Creeks; extensive wetlands; ditches.
- Counties: Lake of the Woods, Roseau.
- Land use: 84% open water/wetlands, 6.6% cultivated land, 5.3% rangeland, 1.3% developed.
- The 8 digit hydrologic Unit Code (HUC) for the Lake of the Woods Watershed is 09030009.

The watershed is sparsely populated with low levels of development relative to the watershed's size. More than 80% of the watershed is open water or wetland. Roughly 12% of the land is used for agriculture. Recreational fishing brings many tourists year-round.



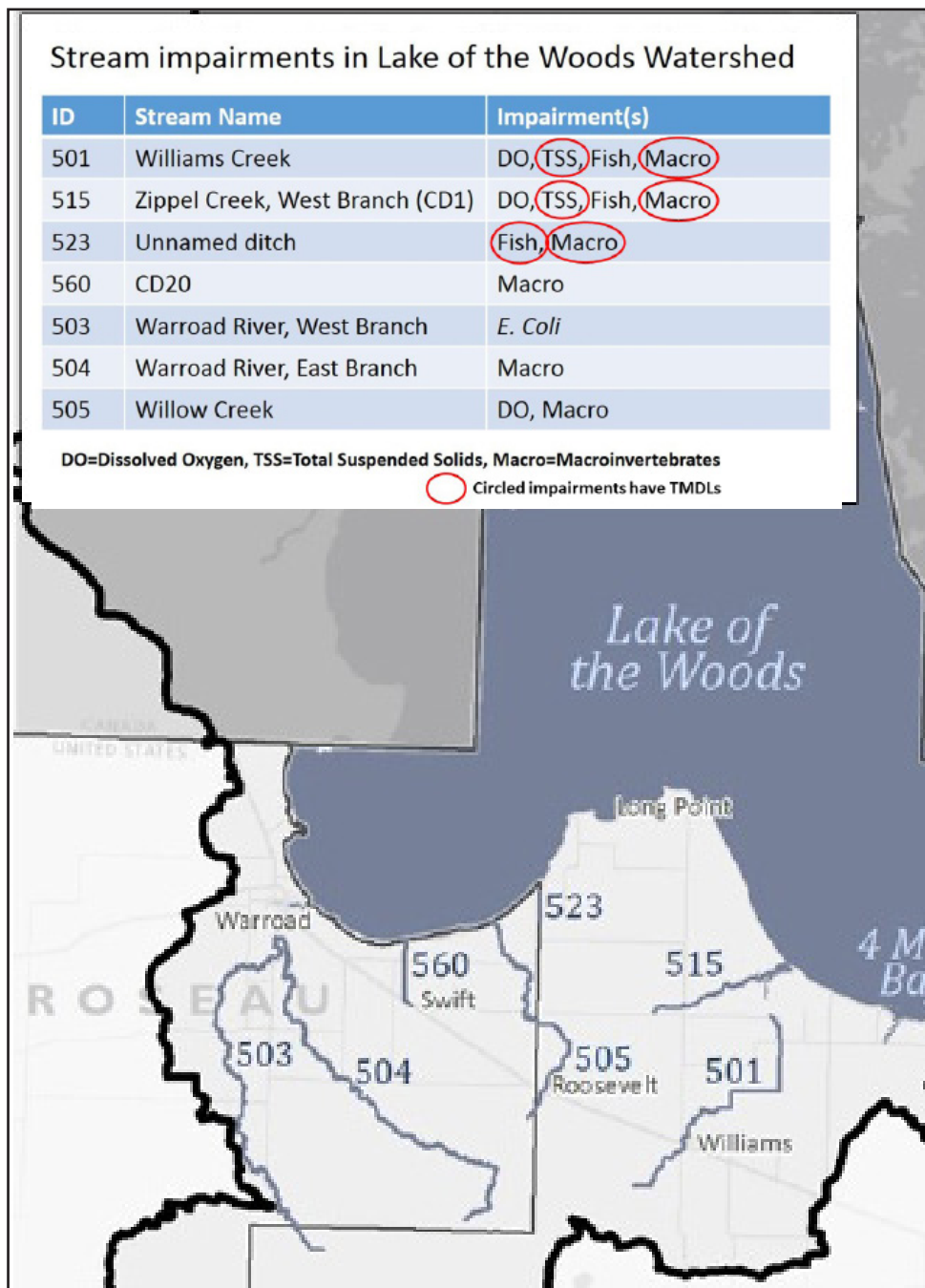
Assessments: Are waters meeting standards?

During the first phase of the watershed approach – intensive watershed monitoring – the Minnesota Pollution Control Agency (MPCA) and local partners collect data about biology such as fish populations, chemistry such as pollutant levels, and flow volumes to determine if lakes and streams are meeting water quality standards. Waters are “impaired” if they fail to meet standards. The map below shows impairments for streams and lakes in the Lake of the Woods Watershed.

The Lake of the Woods Watershed has seven stream segments with a total of 15 impairments on the state’s 2018 impaired waters list. TMDL studies have been done to address 6 of those 15 impairments (circled in red below). The remaining nine impairments are being deferred to a future study when additional data will be available.

The fish and macroinvertebrate community impairments are likely the result of some combination of low dissolved oxygen (DO), total suspended solids, altered hydrology (ditching and channelization), and poor habitat.

The two lake impairments (Lake of the Woods and Fourmile Bay) are impaired due to excess nutrients and algal blooms. These are being addressed under a separate Total Maximum Daily Load (TMDL) study.



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.

This table summarizes the predominant stressors of fish (F-IBI) and/or aquatic insects/macroinvertebrates (M-IBI) in the indicated streams in the watershed.

IBI stands for “index of biological integrity.” The IBI can help watershed managers:

- Gauge the health of a water body
- Identify waterbodies that need further stressor review
- Define approaches to protect/restore fish/aquatic insect communities
- Evaluate the effectiveness of protection and restoration activities

HUC-10 Subwatershed	AUID (Last 3 digits)	Stream	Reach Description	Biological Impairment	Primary Stressor			
					Dissolved Oxygen	TSS	Altered Hydrology	Habitat
Zippel Creek (0903000902)	501	Williams Creek	Headwaters to Zippel Creek	Fish	○		●	
				Macroinvert.	●	●	●	○
	515	Zippel Creek, West Branch (County Ditch 1)	Headwaters to Zippel Bay (Lake of the Woods)	Fish	●		○	
				Macroinvert.	●	●	●	●
Warroad River (0903000903)	504	Warroad River, East Branch	Headwaters to Warroad River	Macroinvert.	○	○	○	○
Muskeg Bay (0903000904)	505	Willow Creek	Headwaters to Lake of the Woods	Fish	●	●	●	●
	523	Unnamed ditch	to Unnamed ditch	Fish	●	○	○	○
				Macroinvert.	○	○	●	●
560	County Ditch 20	Headwaters to Lake of the Woods	Macroinvert.	●	●	●	●	

● = high risk, ○ = medium risk, ○ = low risk

Restoration and protection strategies

Restoration and protection strategies have been developed through collaboration with local and state partners (i.e., SWCDs, the Warroad River Watershed District, MPCA, DNR, and BWSR). Priority concerns include erosion and sedimentation, land use management, sewage treatment systems and other potential sources of water contamination, water quality, and education. Examples of projects completed in the past few years include:

- More than 2,000 linear feet of shoreline stabilization and protection projects in the past five years.
- Six hundred and forty acres of wetland surrounding Graceton Wildlife Management Area preserved through a wetland banking program.
- The Low Income Septic Upgrade Grant Program upgraded over a dozen septic systems over five years at a cost of \$5,000 to \$10,000 per septic system.
- Installation of side water inlets, gully stabilization, and ditch stabilization in areas identified in the Bostic and Zippel Creek Watershed Assessment.
- Judicial Ditch reconstructed using a two stage ditch design at a project expense of \$150,000.
- Installation of rock chutes on Willow Creek and other unnamed ditch sections.
- Numerous future projects are planned for completion by 2025.

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; for example, the Lake of the Woods One Water One Plan which is nearing completion. The report lays out goals, milestones, and responsible entities to address protection and restoration priorities in the 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 some areas 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. For these reasons, it is much more cost-effective to protect clean waters while we can.

Key conclusions of first cycle

- Water quality is generally fair throughout the watershed. The most common issues are turbidity and poor fish and macroinvertebrate (aquatic insect) communities.
- The natural flow conditions of approximately 60% of streams in the watershed have been altered by substantial channelization, ditching, and impoundment of watercourses, in addition to agricultural drainage, resulting in increased and accelerated peak flows, and prolonged periods of low- or no-flow conditions.
- Evidence shows that these stream alterations and “flashy” flow conditions are largely responsible for the degradation of physical habitat, high suspended sediment, and low DO conditions that are limiting the fish and macroinvertebrate communities in the watershed.
- The West Branch of the Warroad River is impaired for recreational use due to excessive levels of *E. coli* bacteria.
- The Lake of the Woods is the main recreational swimming, fishing, and economic resource in the watershed. The lake is impaired due to nutrients and algae. These are being addressed in a separate TMDL study.
- Restoration/protection efforts should focus on river systems, ditch systems, buffers and riparian corridors, sewage treatment systems, and other pollution risks.
- Many impairments in the watershed can be improved by implementing actions that reduce peak flows and/or maintain adequate base flows throughout the year.



Low flow conditions in Willow Creek in June 2006 (left) and even lower/no flow conditions in July 2012 (right). Low flows can cause low dissolved oxygen levels and other conditions that are harmful to fish and aquatic insect communities.

Full report

To view the full report, go online and search for “MPCA Lake of the Woods Watershed WRAPS report.”

Contact person

Cary Hernandez
Minnesota Pollution Control Agency
Cary.Hernandez@state.mn.us
218-846-8124