

Vermilion 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 cycle repeated on a regular basis:

1. Monitoring water bodies and collecting data over two years on water chemistry and biology (2015-2016).
2. Assessing the data to determine which waters are impaired, which conditions are stressing water quality, and which factors are fostering healthy waters (2017-2019).
3. Developing strategies to restore/protect the watershed’s water bodies, and report them in a document called Watershed Restoration and Protection Strategies (WRAPS) (2019-2021).
4. Coordinating with local One Watershed-One Plan efforts for implementation of restoration/protection projects (2021-beyond).

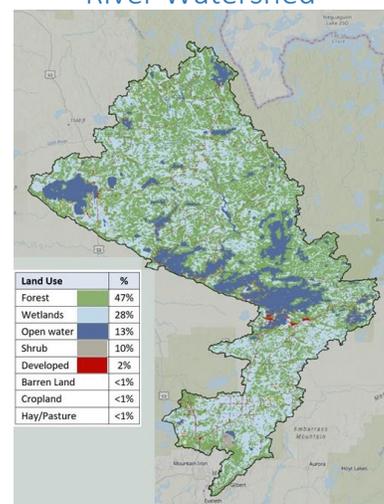


The Minnesota Pollution Control Agency (MPCA) leads the watershed science work and coordinates and supports strategy development with local, state and federal partners. Watershed partners are leaders in local water planning and implementing strategies to restore and protect waters. Their past and current work provides foundation for watershed improvement and will continue to improve overall water quality. The main purpose of the WRAPS report is to summarize all the technical information so that local partners such as soil and water conservation districts can use it for planning and implementing the best strategies in prioritized locations.

Watershed characteristics

- Size: 1,035 square miles
- Counties: Watershed lies fully within St. Louis County
- Ecoregions: Upper two-thirds in Border Lakes sub-ecoregion, lower third in Laurentian Uplands
- Major streams: Vermilion River, Pike River, Sand River, East/West Two Rivers
- Towns: Tower (pop. 496) and Orr (pop. 282). Total watershed pop. 14,423
- Land cover: forests 47%, wetlands 28%, open water 13%, herbaceous/shrub 10%, developed land 2%, remaining uses less than 1% each. Superior National Forest makes up about half the watershed.
- The 8-digit hydrologic unit code (HUC): 09030002

Land use in the Vermilion River Watershed



Assessments: Are waters meeting standards and providing beneficial uses?

Overall, water quality in the Vermilion River Watershed (VRW) is excellent. Using data collected over the past 10 years and during intensive watershed monitoring, the MPCA assessed 21 of 196 stream reaches and 32 of 565 lakes greater than 10 acres in size against aquatic life (fish and aquatic insect communities) and recreational use standards.

Waters are “impaired” if they fail to meet standards. Impaired waters require a study called a Total Maximum Daily Load (TMDL), a federal Clean Water Act requirement. The goal of a TMDL study is to quantify pollutant reductions needed to meet water quality standards.

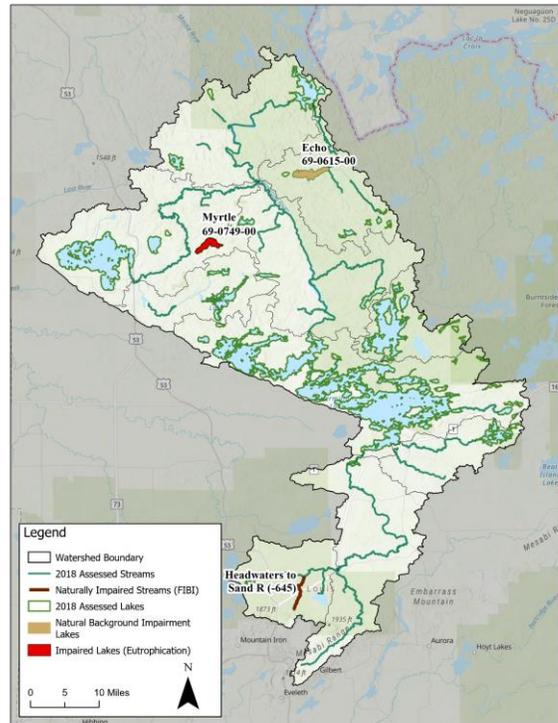
Only two lakes (Myrtle and Echo) and one stream reach (Tributary to Sand River) are listed as impaired, and Echo Lake and the stream reach were determined to be impaired by natural background conditions. Myrtle Lake, impaired by eutrophication, was the only waterbody that required a TMDL study.

Levels of phosphorus in Myrtle Lake are too high, contributing to excessive algae blooms that affect recreation.

The main sources of phosphorus loading to the lake are atmospheric deposition (10%), forestland runoff (21%) and a combination of internal loading and unidentified source(s) (60%). Internal loading is phosphorus collected in bottom sediments that becomes re-suspended in the lake under various conditions.

The TMDL calls for a 10% reduction in phosphorus loading from septic systems, a 15% reduction in watershed sources, and a 41% reduction in phosphorus loading from a combination of internal loading and unidentified sources. Strategies identified to reduce internal loading include alum treatments to cover and keep phosphorus contained in sediment, an updated septic system inventory to prioritize maintenance and upgrades, and collaboration with landowners to promote healthy shoreline practices.

Map of assessments in the VRW



Stressors and pollutants: What factors are affecting fishing and aquatic insects?

Stressor identification work identified potential stressors to fish and aquatic insect (macroinvertebrate) communities in the watershed. This process identified only one likely stressor, low dissolved oxygen (DO), and only one stream reach (Tributary to Sand River) with a biological community impairment affecting the fish community.

Wetlands are prevalent along this stream and its smaller tributaries. Beaver activity is high in the VRW, as it is in many other northern Minnesota watersheds. Their dams can cause water temperature rise, lower downstream DO concentrations, and can be migration barriers for fish. All of these effects from beaver activity are plausibly acting in this stream.

The Pelican River also has low DO, but was not assessed as impaired due to its landscape setting. It is not uncommon for lower gradient streams and rivers in northern Minnesota to exhibit DO levels below the state standard. These often occur when wetlands are abundant along a stream or river, and can be exacerbated by the activity of beavers creating impoundments. The substandard biological communities found in the VRW streams were deemed to be caused by natural conditions.

Conditions stressing fish, aquatic insects in streams

Stream	AUID Last 3 digits	Reach Description	Biological Impairment	Stressor			
				Dissolved Oxygen	Phosphorus	Sediment/Turbidity	Connectivity
Trib. to Sand River	645	At Wouri Road, two miles southeast of Britt	Fish and MI	•			o

- Determined to be a direct stressor.
- o A stressor, but determined to have very little to no anthropogenic cause. Includes natural wetland and/or groundwater inputs, and beaver dams as natural stressors.

Restoration and protection strategies

The WRAPS process includes a means to categorize waterbodies for restoration and varied levels of protection. With minimal impairments in the watershed, the Vermilion River WRAPS is mainly focused on protection strategies.

A Core Team of representatives from local, state, federal, and tribal agencies met throughout the watershed approach process to guide assessment, problem investigation, and strategy development. Several protection-focused strategy types were developed to address key issues identified by Core Team members. They include:

- drinking water protection
- forestry management
- habitat and stream connectivity management
- lake management
- recreational management
- septic system and waste management improvement
- stormwater runoff control, and
- streambank and gully protection.

The Core Team associated various "risks" and "qualities" with each of the strategy types and attributed them to the waterbodies within the watershed. This formed the basis for the protection prioritization and targeting process.

Additionally, the Core Team oversaw the use of computer modeling to determine potential future changes in runoff, sediment, and nutrient loading under increased development, climate change, and increased forest disturbance scenarios. The modeled results show potential impacts on water quality in the future if these scenarios happen without proper management and protection of the landscape. These results were also incorporated into the prioritization and targeting.

Various best management practices (BMPs) were developed for each protection strategy type, some of which apply at a watershed scale (i.e., all waterbodies) while others would be applied in more focused areas.



Since most of the Vermilion River Watershed remains undeveloped and its waters unimpaired, local efforts are focused primarily on identifying and implementing strategies that will protect this pristine region of the state.

Key conclusions of first cycle

- Overall, waters within the VRW are in excellent health. Of 21 streams assessed, 9 were assessed for aquatic recreation, and all 9 met the standards. All but one of the 21 streams met aquatic life standards (fish community).
- The fish community in the Tributary to Sand Creek was found to be impaired based on its [index of biological integrity](#) (IBI) scores and by low DO; however, this impairment was deemed caused by natural factors so no TMDL study was required.
- The Pelican River is not impaired but was investigated due to low DO and data showing a poor fish community. Natural conditions such as extensive wetlands contribute to low oxygen levels in the undeveloped watershed.
- There were 32 lakes assessed. Of these, 19 fully support aquatic recreation use. Two lakes did not meet water quality standards for aquatic recreation use—Myrtle Lake and Echo Lake. Both exceed standards for phosphorous and chlorophyll-a (Chl-a) concentrations. The MPCA determined Echo Lake is naturally impaired. A TMDL study was done for Myrtle Lake. Additionally, 11 lakes did not have enough information to make a determination.

- Biological monitoring of lakes was not completed for the VRW because a Fish IBI for Canadian Shield area lakes has not yet been developed by the Minnesota Department of Natural Resources.
- The largest land use pressures on the watershed come from the timber industry and outdoor recreational use. Additionally, metallic mining companies do own rights within the watershed boundary and mining activities exist in upstream portions of the VRW. Small-scale gravel mining also takes place within the watershed.
- In addition to forest, wetlands are another major landscape feature in the VRW. The large amount of wetlands significantly influences water quality of lakes and streams, affecting, among other things, DO levels.
- A significant portion of the watershed area is used for timber harvesting, which can reduce stream shading and increase erosion. In the late 1800s and early 1900s, there was large-scale removal of forested land in the watershed.
- In general, the leading potential stressors to aquatic life in the VRW are low DO concentrations, excess sediment, altered hydrology, altered geomorphology, habitat loss, connectivity loss, elevated phosphorus, and mining/industrial stressors. Mining and industrial stressors could include toxic chemicals or high conductivity discharges in the watershed. These are considered to be candidate stressors and are the main focus for additional investigation. Of these potential stressors, only low DO was found to be contributing to an aquatic life impairment.
- There are some streams and lakes within the VRW that are either currently impaired or in need of protection so they do not become impaired in the future.

Next steps

The VRW approach began in 2015. The restoration and protection strategies listed in the WRAPS report will be the basis for developing comprehensive local water management plans that include implementation efforts to restore and protect water resources.

Additionally, the U.S. Environmental Protection Agency (EPA) recently proposed adding certain waters to MPCA's impaired waters list based on the wild rice sulfate standard. The proposal is not yet final. It was open for public comment until June 30, 2021. After considering public comments and making appropriate revisions, EPA will transmit the final list to Minnesota. The MPCA will develop the appropriate path forward for these waters once the final list is received.

Full report

To view the full WRAPS report, search "Vermilion River Watershed" on the MPCA website at <https://www.pca.state.mn.us>.

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