The Rainy River Study of the river's health

• From International Falls to Lake of the Woods

A recovering river now in need of protection



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The big picture

Major trends in the Rainy River

International and dominated by water

Forms the border: The Rainy River flows east to west, 86 miles from Rainy Lake to Lake of the Woods. It straddles the U.S./ Canada border, with estimated 41% of the drainage area in the United States (Minnesota) and 59% in Canada.

A wide basin: The basin spans 21,000 square miles, in both the U.S. and Canada, between its headwaters near Lake Superior to its confluence with Lake of the Woods.

Water everywhere: Water dominates the basin, with thousands of streams, rivers, wetlands and lakes. In fact, there is more water than land in some places.

Excellent water quality overall:

The water, assessed as good to excellent when compared to water quality standards, supports a thriving fishing and tourism industry. Lakes and streams also provide drinking water for many communities, including International Falls in Minnesota and Fort Frances in Ontario.

Protected lands, protected waters:

A major reason for the excellent water quality in the river is the expanse of undeveloped land draining to it. The Rainy River Basin includes the Boundary Waters Canoe Area Wilderness, which is 1 million square acres of wilderness within the Superior National Forest, along with Voyageurs National Park on the U.S. side and Quetico Provincial Park, 1.2 million acres of wilderness, on the Canadian side. Ð

Remarkable recovery

Starting in the early 1900s, an industrialist dammed the Rainy River at International Falls to power paper mills on the U.S. side and at Ft. Frances on the Canadian side. The mills provided jobs and fueled the local economies, while supplying world markets with paper products. They also fouled the water with sediment that made it cloudy, toxins that harmed the river life and recreation, and caused low oxygen levels that harmed fish and other creatures.

At the same time, wastewater from the two cities, and other smaller towns, flowed into the river with little or no treatment. The communities also pulled their drinking water from the river, despite its high bacteria levels. Statistics showed a much higher rate of typhoid deaths at Ft. Frances.

Several studies over the decades – by many agencies on both sides of the border – reported the same problems:

- Water unfit for swimming and drinking
- Pulp and paper waste smothering spawning habitat and food for fish

In the 1960s, the International Joint Commission, established in the early 1900s by the U.S. and Canada, reported that the Rainy River downstream of Ft. Frances was a "potential menace to health, unfit for bathing, discourages the development of



Minnesota Health Department researchers in the 1950s had to dig down through paper mill waste clogging the Rainy River to find the water.

water front property, is unsuitable for growth of many forms of aquatic life and unattractive for recreation." The commission called on Canada and the United States to adopt water quality standards, and to require cities and industries to implement measures to meet those standards.

And that's what happened when Canada passed its Environmental Protection Act in 1971 and the U.S. passed its Clean Water Act in 1972.

The big picture



Remarkable recovery (Continued)

It would take several years of new regulations to turn the river around. The cities, paper and lumber mills implemented better wastewater treatment and management practices, and stopped sending their wastes directly to the river.

By the 1980s, pollutants going to the river had dropped dramatically and recovery was well underway. Today the Rainy River fully supports water quality standards for aquatic life and recreation. The river's recovery is a testament to Minnesota adopting standards to protect the quality of its immense water resources. It is also a testament to regulators and industries on both sides of the border working together to control pollutants discharged to lakes and rivers. "Historically, perhaps the most significant demonstration of successful environmental remediation in the region is the long-term recovery of the Rainy River from a state of devastation in the 1950s," is how author Jamie Benidickson describes it in his book, "Leveling the Lake."



A fish community of excellence

Scientists monitored 13 stations for fish and found the populations to be excellent in terms of numbers and species. They found 42 species overall in the Rainy River, with 10 of those considered sensitive to pollution, including sturgeon, longnose dace and smallmouth bass. In fact, the river is a worldclass fishery for both sturgeon and walleye, attracting thousands of anglers every year and supporting many local businesses.

The fish community in the Rainy River from International Falls to Baudette is in excellent condition, which provides a strong signal that the health of the Rainy River, including its water quality and habitat, are also in good condition.

Scientists use a tool called Index of Biological Integrity to assess the biological conditions of water resources. The higher the score, the healthier the community of fish and bugs.





Sturgeon were essentially extinct from the Rainy River—they took refuge in the tributaries—but scientists now find them in every part of the river. Fish are released unharmed back to the river after data collection.

Aquatic insects improve as you move downstream

In addition to fish, scientists monitor macroinvertebrates, creatures like mayflies and dragonflies, to gauge the river's health. The numbers and diversity of aquatic insects indicate a healthy community. In fact, the Rainy River supports some sensitive species, like finger-net caddisflies and common stoneflies, that have almost no tolerance for pollution. The exception is immediately below the dam at International Falls, where stress from fluctuations in flows and temperature, among other factors, hamper their habitat. Their numbers and diversity steadily improve as you move downstream.

Water quality data

Less

Sediment

Current pollution levels

Phosphorus



Phosphorus

Phosphorus levels in the tributaries feeding the Rainy River are among the lowest in Minnesota. The Little Fork River has higher levels than other tributaries, but is still much lower than more developed areas of the state. The higher phosphorus levels in the Little Fork River are likely due to higher sediment levels at times, because phosphorus tends to bind to sediment. This phosphorus may be a problem in Lake of the Woods downstream, which is the subject of a different MPCA study.

Sediment

Except for the Little Fork River, sediment levels in the tributaries to the Rainy River are among the lowest in the state. The low sediment levels are a reflection of the surrounding land use, which is dominated by forests and wetlands that naturally retain, use and filter stormwater. Sediment from the Little Fork River may be negatively affecting the Lake of the Woods downstream and the MPCA is working with local partners to address this challenge.

More

Nitrogen

Nitrogen

Insufficient data

Nitrogen levels in the tributaries feeding the Rainy River are among the lowest in Minnesota. Again, forests and wetlands are the dominant land use, so keeping them in place is essential to keeping nitrogen levels low. Nitrogen levels are higher in other parts of Minnesota, due to runoff and leaching of crop fertilizer in agricultural areas.

Pollutants: What they are and where they come from?



Sediment is soil from runoff and erosion that clouds the water. Sediment makes it hard for aquatic life like fish to breathe, find food, reproduce and avoid predators.



Phosphorus, from wastewater, manure and fertilizer, is a nutrient that causes algae that are detrimental to aquatic life and recreation like fishing and swimming.



Mercury, PCBs, other toxins

can accumulate in fish, leading to limits on how much to eat. They come from burning coal, as well as industrial products and processes.





Bacteria from malfunctioning septic systems and wildlife feces can make water unsafe for swimming and other recreation. Bacteria levels in the Rainy River are low enough that the river fully supports swimming and other contact recreation.

Reach by reach

The Rainy River has been divided into "reaches" or sections for determining if water quality standards are being met. These standards are the benchmarks used to determine the ability of waters to support healthy aquatic life (fish and aquatic insects), aquatic recreation (swimming), and aquatic consumption (eating fish). Supports standards

Fails standards*

? Need more information to determine if meets standards

*Note: It is common for Minnesota lakes and streams to have limits on fish consumption because of mercury levels. The main source is global air emissions from burning coal, with mercury from the emissions depositing on land and water.

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the Woods Baudette Rapid Rive		A International Falls/ Ft. Frances	International Falls/Ft. Frances to Little Fork River	V	~	×	Consumption: Mercury
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		Little	Rapid River to Baudette River	✓	✓	×	Consumption: Mercury
	OTA	^C Fort River	Baudette River to Lake of the Woods	~	✓	×	Consumption: Mercury
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, M	Aquatic life Measuremen water insects that affects t	t of fish and or a pollutant nem.	Aquatic recreation: Measurement of conditions that affect swimming and boating.		Aquatic consumption: Contaminants that affect how much fish people can safely eat. See www.health.state.mn.us/fish		

? Little Fork River

The Little Fork River is one cloudy factor in an otherwise sunny assessment of the Rainy River. The Little Fork tends to carry erodible clay soils that remain suspended in the water. This river tends to be cloudy with sediment in the spring and then clears up as summer progresses. High levels of sediment can make it hard for fish and other aquatic life to breathe, find food, escape predators and perform other life functions. The MPCA is still studying the impact of the Little Fork on the Rainy River, as far as the sources of sediment and impact downstream.



Protection critical

Unlike other basins in Minnesota where many of the lakes and streams need restoration, protection is critical for the Rainy River and its tributaries. That means maintaining wetlands, forests and other conditions that foster healthy water quality. Any major changes in the land draining to the river, such as incentives to expand cropland on the Canadian side and proposals for mining on the U.S. side, will need careful consideration on how to protect the river from any negative impacts.

Wetlands are especially important in the face of climate change because they hold and filter precipitation and runoff. They are needed to help absorb an increase in the frequency and severity of storms.

More than 80% of the pre-settlement wetlands in the basin are still intact in Koochiching and Lake of the Woods counties, the two counties along the Rainy River on the U.S. side.



Partners in protection

The MPCA works with many partners, including Soil and Water Conservation Districts as well as tribal communities, to protect the healthy water in the Rainy River basin. Local partners use the data collected about the condition of the Rainy River to develop protection and restoration plans. The data helps set priorities for where to target funding and efforts.

Protective measures include:

- Keeping headwater streams and springs in excellent condition
- Practice to prevent runoff of contaminants from pastures and developed areas
- Complying with the state buffer law and wetland protection laws
- Implementing sustainable harvest and stewardship plans to preserve and manage forests
- Ensuring that public and private sewer systems function properly to protect surface and groundwater



The four entrance communities to Voyageurs National Park continue to work on proper treatment of wastewater to protect human and environmental health.

Examples of protection projects include the four entrance communities to Voyageurs National Park working to treat their wastewater: Island View installed a collection system that connects to the existing wastewater treatment plant in International Falls; Kabetogama built a wastewater treatment system for a portion of the area on its namesake lake; Crane Lake is upgrading failing on-site sewer systems close to its namesake lake; Ash River is studying its wastewater needs and evaluating treatment options. Funded in part with Legacy Amendment funds, these systems will help maintain the excellent water quality of the Rainy River.

About this study

The MPCA studied pollutant levels and aquatic life of the Rainy River from its origin at International Falls/ Ft. Frances to Lake of the Woods. While the agency has studied the smaller Minnesota watersheds that drain to the Rainy River, this is Minnesota's first comprehensive look at the entire 86 miles of the river as a whole on the U.S. side.

This effort focuses on water quality for recreation, human health, and fish and macroinvertebrates (aquatic insects). The purpose of this study is to collect data that government agencies and citizenled groups can use to plan for protecting the river's excellent water quality.

Monitoring

The MPCA and partners study lakes and streams for:

- Levels of nutrients, sediment, bacteria, toxics, dissolved oxygen, chloride, pH, ammonia
- Communities of fish and macroinvertebrates
- Flow of rivers and streams
- Contaminants in fish such as mercury

Assessment – The MPCA and local partners use the data and determine whether the condition of water bodies meets water quality standards. Water quality standards are the thresholds used to determine the suitability of waters for swimming and boating, and their overall biological health. Water quality standards are not "one size fits all." In many cases they are regionalized for different parts of the state, and tailored to different types of water bodies.

Data – This study includes data spanning 10 years (2007-2016), gathered from 13 monitoring sites along the river. The study also used data from agencies in Minnesota and Canada, as well as partners like the Soil and Water Conservation Districts in Koochiching and Lake of the Woods counties.

Monitoring continues – The MPCA and partners continue to monitor the health of the Rainy River through work by local partners.

More information

www.pca.state.mn.us/rainy-river-study

Questions

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The MPCA and partners monitor water quality in the major watersheds that drain to the Rainy River.

Acknowledgments

Many people have worked to restore the Rainy River and are now working to protect the river's current condition of excellence. Among them are:

- Lake of the Woods County, Koochiching County and Itasca SWCDs, which conduct water quality monitoring.
- The Minnesota Department of Natural Resources-Fisheries and Ontario Ministry of Natural Resources and Forestry, which assisted with the Rainy River fisheries assessments – much of this was historical in nature, including documenting the sturgeon's recovery.
- Staff from Environment and Climate Change Canada; the Ontario Ministry of the Environment, Conservation, and Parks; and Voyageurs National Park for current and historical monitoring in the Rainy River Basin.
- The International Joint Commission that regulates water quality, quantity, and lake levels, in the basin.
- The Rainy River First Nation (tribal community), near Emo, Ontario, which maintains a sturgeon hatchery, and has historically partnered with the MPCA on Rainy River water quality monitoring and protection efforts on the Canadian side of the river.
- The Red Lake Nation Water Resources Program.



