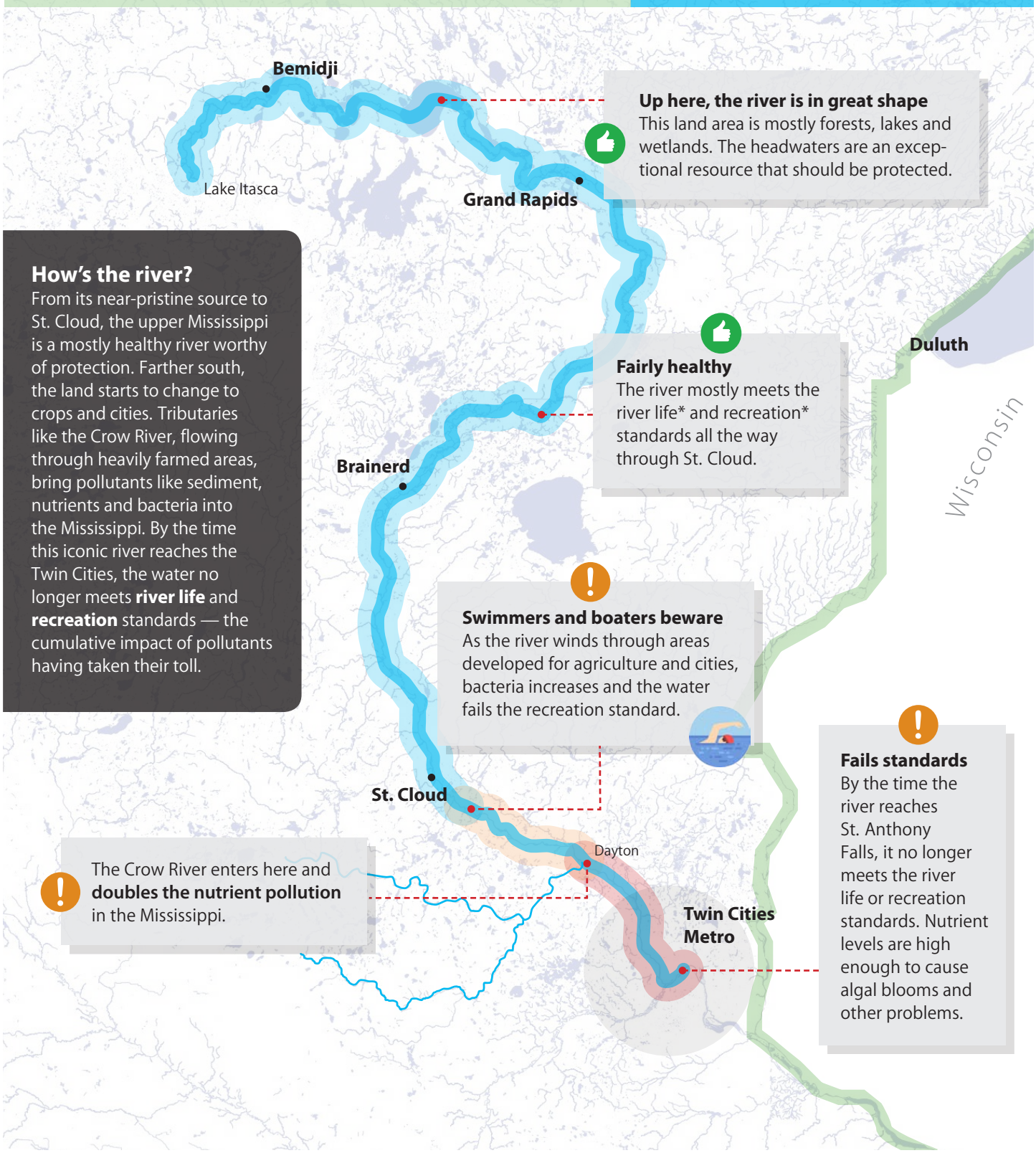
Our upper Mississippi River

Monitoring and assessment study

- From Lake Itasca to downtown Minneapolis
- Evaluating aquatic life and pollutants in the river

What to protect, what to fix



Up here, the river is in great shape
This land area is mostly forests, lakes and wetlands. The headwaters are an exceptional resource that should be protected.

Fairly healthy
The river mostly meets the river life* and recreation* standards all the way through St. Cloud.

Swimmers and boaters beware
As the river winds through areas developed for agriculture and cities, bacteria increases and the water fails the recreation standard.

Fails standards
By the time the river reaches St. Anthony Falls, it no longer meets the river life or recreation standards. Nutrient levels are high enough to cause algal blooms and other problems.

The Crow River enters here and **doubles the nutrient pollution** in the Mississippi.

How's the river?

From its near-pristine source to St. Cloud, the upper Mississippi is a mostly healthy river worthy of protection. Farther south, the land starts to change to crops and cities. Tributaries like the Crow River, flowing through heavily farmed areas, bring pollutants like sediment, nutrients and bacteria into the Mississippi. By the time this iconic river reaches the Twin Cities, the water no longer meets **river life** and **recreation** standards — the cumulative impact of pollutants having taken their toll.

* **River life**: Water quality standard for aquatic life like fish, bugs and other living things
* **Recreation**: Water quality standard for aquatic recreation like swimming, wading and boating

The big picture

The study identifies these as the major trends in the upper Mississippi River.

Northern section needs protection

North of St. Cloud, water quality is great in the upper Mississippi – almost pristine near the headwaters – and the aquatic life is healthy. Minnesota needs protection measures in the watersheds in this region that feed the upper Mississippi. If not addressed, this exceptional resource faces threats from increasing nutrient and sediment levels. The forested and wetland-rich character of the northern portion of the basin (all the land that drains to the river) must be kept as intact as possible.

Land use and tributaries have cumulative effects

Southward, as land use shifts to agriculture and populated areas, tributaries get loaded with sediment and nutrient pollution. This cumulative impact is apparent in the Mississippi:

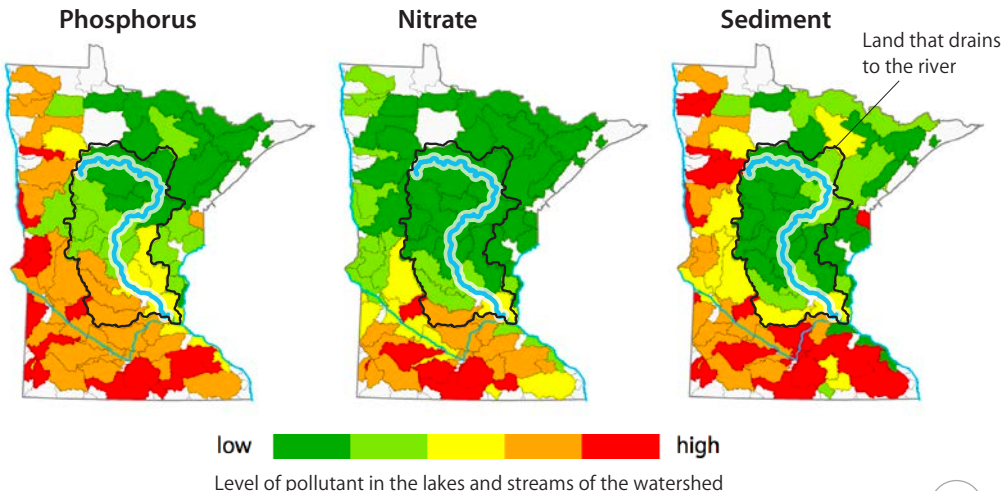
- **Phosphorus** levels increase as the water flows downstream, with a substantial increase happening when the Crow River joins the Mississippi. The Crow is the single largest contributor of nutrient pollution in the upper Mississippi. This is despite the fact that the Crow River is only 15% of the total land draining to the upper Mississippi. Phosphorus levels in the upper Mississippi have declined over time due largely to better wastewater treatment controls, but levels are still a concern, and changes in land management are needed.
- **Nitrate** is a growing concern. MPCA scientists looked at nitrate levels starting at the border of Crow Wing and Morrison counties, because this is where the river needs to meet drinking water standards. Currently, nitrate concentrations meet the drinking water standard. But data show increasing levels over time. Again, protection measures are needed to ensure the river remains safe for communities to use for drinking.

Downstream from St. Cloud needs fixing

South of St. Cloud the upper Mississippi begins to develop significant problems. The rivers and streams entering the Mississippi are the major cause of degradation. The Crow River and others that flow through heavily farmed areas (and higher population areas) bring high loads of sediment and nutrients. To restore water quality here, changes are needed in land practices — optimizing manure and fertilizer use, using cover crops, conservation tillage and other best management practices.

Tributaries and watersheds matter

Streams and rivers that feed into the Mississippi south of St. Cloud bring most of the pollution. These high-polluting watersheds are heavily agricultural. Even land a hundred miles or more from the Mississippi can impact the river.



Protecting the good

The upper Mississippi is in excellent condition due mostly to the current landscape of the region that drains water toward the Mississippi. This valuable shared resource for Minnesota needs protection:

1. **Pay attention to wetlands** to protect pristine waters in northen reaches. They store water and act as filters.

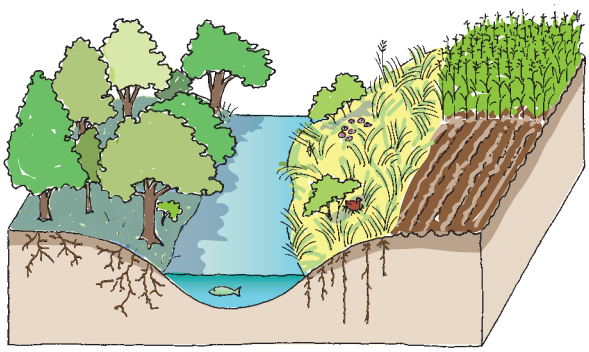
2. **Proceed with caution on development of forested land.** Much of the forested land is in private hands. If a significant portion of this land is cleared and developed for agriculture, the Mississippi could suffer an increase in flow levels and pollution.

3. **Protect drinking water quality.** 1.2 million Minnesotans rely on this river for their drinking water. The primary threat is nitrate pollution, which comes from fertilizer.

Fixing the problems

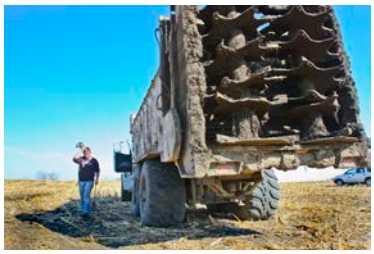
Add buffer strips

- Stops or captures soil runoff.
- Filters water before it gets into drainage ditch or stream.
- Slows the velocity of water entering during heavy rains.



Change crop practices

- Optimize manure use



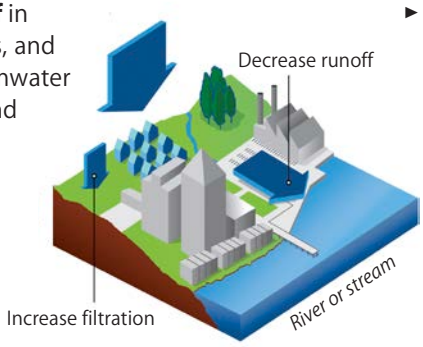
- Add living cover

- Use conservation tillage

- Optimize fertilizer use

Upgrade infrastructure

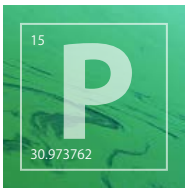
- **Manage runoff** in developed areas, and modernize stormwater infrastructure and practices.



- **Ensure sewage treatment** and home septic systems work and get updated.

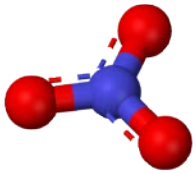
Pollutants in the upper Mississippi

The study identifies these major problems in parts of the river.



Phosphorus, from wastewater, manure, and fertilizer, is a nutrient that causes algal blooms and impacts aquatic life and human recreation. While phosphorus levels are low enough to support the river life and recreation standards in the upper Mississippi, by the time it reaches Minneapolis, the levels from upstream and tributaries lead to algae and related problems.

Bacteria from untreated human and animal waste, carried by field runoff and sewage pipes, can make water unsafe for swimming and other contact recreation. Bacteria levels in the river are ok until just south of St. Cloud. Then levels violate the standard all the way to Minneapolis.

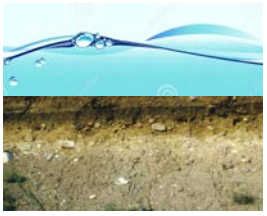


Nitrate, a chemical from cropping practices, can make water unsafe for drinking and toxic to fish and other aquatic life. The upper Mississippi from Morrison County to the Twin Cities is designated as a drinking water source and meets the nitrate standard for drinking at this time. However, nitrate levels are increasing in the river.

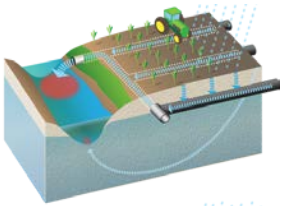
Sediment is soil from runoff and erosion that clouds the water and can harm aquatic life. Some is natural, some is from human activities. Cropfields and unstable streambanks often are the major sources of the soil. Some regions that the river flows through have soils that are more erodable than other regions.

How pollutants get into the river

Increased flow and runoff



Runoff is one way pollutants reach rivers and lakes. As rain and snowmelt run across land, they carry pollutants like sediment and phosphorus into water. The more runoff, the more flow in ditches and streams, and the more power water has to erode soil into water.



Artificial drainage is also a major mover of pollutants into rivers and lakes. Water that drains through field tile lines and city stormwater systems brings nitrate and other pollutants. And higher drainage can lead to more flow in streams and then more erosion.

Runoff is highest south of St. Cloud, where the land is more hilly, there are more cities and cropland, and wetlands have been drained for farming.

Climate change is making the problem worse. Higher-intensity rainfalls in recent years leads to more and faster-moving water. On land, this means more soil and pollutant runoff. In rivers and streams, it means more streambank erosion.

Scientists in the field see decreasing biological health

Monitoring the health of fish and aquatic insects is a more comprehensive way to track water health than simply measuring pollutant levels. These creatures respond to a multitude of stressors — chemicals, low oxygen, and changes in habitat.

The upper Mississippi shows decreasing biological health as it flows downstream and cumulative impacts take their toll. By the time the river reaches the Twin Cities, water quality health, as measured by fish communities, is on the verge of failing the standard.

A closer look at the upper Mississippi River

Location	**Lake Itasca to Grand Rapids**
River life	Meets standards
Recreation	Meets standard
Fish consumption	**Mercury** levels limit how much to eat

Location	**Grand Rapids to Brainerd**
River life	**Fails to meet** standards because of sediment levels in water
Recreation	Meets standard
Fish consumption	**Mercury** levels limit how much to eat

Location	**Brainerd to St. Cloud**
River life	Meets standards
Recreation	Meets standard
Fish consumption	**Mercury** levels limit how much to eat

Location	**St. Cloud to Dayton**
River life	Meets standards
Recreation	**Fails to meet** standard because of bacteria levels in water
Fish consumption	**Mercury and PCB** levels limit how much to eat

Location	**Twin Cities**
River life	**Fails to meet** standards because of phosphorus levels in water
Recreation	**Fails to meet** standard because of bacteria levels in water
Fish consumption	**Mercury and PCB** levels limit how much to eat

- **River life** refers to water quality standards for aquatic life, dissolved oxygen, and nutrient pollution. It's a threshold for gauging the water's health for fish, bugs and other living things in the water.
- **Recreation** refers to water quality standards for aquatic recreation. Likewise, it's a threshold for measuring the water's health for human contact with the water, such as swimming and wading.
- **Fish consumption** refers to water quality standards for eating fish. The Minnesota Dept. of Health uses this standard to set guidelines for how much and what size fish to eat.

About this study

The Minnesota Pollution Control Agency (MPCA) studied pollutant levels and aquatic life of the upper Mississippi River from its origin at Lake Itasca to St. Anthony Falls in Minneapolis. While the agency has intensely studied smaller watersheds that drain to the upper Mississippi, this is a comprehensive look at the entire segment of the river as a whole.

Future
The MPCA also plans to evaluate the Minnesota, Rainy, Red, and St. Croix Rivers.

Monitoring – When the MPCA and partners monitor a lake or stream, it means they study:

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

Assessment – Next, the MPCA takes a look at what the data show, and 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 fishing, 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.

CLEAN WATER LAND & LEGACY AMENDMENT

Data – The study gathered or used data from nearly 200 monitoring sites along the river. This includes data spanning 10 years, gathered by local partners and other state agencies.

Next steps – The practical goal of monitoring and assessment is to provide information that will help protect and restore water quality. The large river monitoring project builds upon the monitoring and assessment conducted on individual major watersheds in the state. Following the monitoring and assessment of each major watershed, restoration and protection strategies are developed to address both impaired and unimpaired waters in the watershed. This product is referred to as Watershed Restoration and Protection Strategies (WRAPS). Individual major watershed WRAPS projects will serve as a vehicle to pass along protection and restoration strategies for the Upper Mississippi River. Local partners use the WRAPS to set priorities and plan their work.

Additional resources – The statements included in this summary document about pollution trends, land use practices, and restoration and protection strategies, come from a variety of sources including work on the major watersheds. Additionally, the *2016 State of the River Report* by National Park Service and Friends of the Mississippi River was a useful resource. The information about pollutant contributions from tributaries, and phosphorus and nitrate levels changing over time, comes from a long-term monitoring network run by the MPCA and local partners. Researchers from the University of Minnesota, the Minnesota Climatology Working Group, and other organizations have described the impacts of artificial drainage and more intense rainfall events. The solutions described come from the major watersheds WRAPS, and from statewide studies such as the Minnesota Nutrient Reduction Strategy.

More information is available here: www.pca.state.mn.us/upper-miss

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