

UPPER PRIOR LAKE: Water Quality Report Card



Quick Facts

Surface Area: 416 acres

Average Depth: 10 feet

Ordinary High Water Level: 903.9 feet

Connectivity to other waterbodies: Water flows into Upper Prior from Spring Lake and into Lower Prior Lake.

Impairment Status: The lake is "impaired" for excess nutrients (learn more on back page).

Watershed Area: 16,038 acres

Maximum Depth: 43 feet

No Wake Zone: 903.9 feet above sea level and within 150 feet of shore

PRIOR LAKE - SPRING LAKE
WATERSHED DISTRICT

Grading System

The District monitors several lake water quality indicators, including four that are shown in the table below. To assess the lake quality on Upper Prior, a letter grade was assigned for each water quality indicator based on how well the parameters met water quality standards over a three-year period. Trends and graphs show how water quality changed over a ten-year period to help determine how well we're improving our lake quality. More information on how these grades and trends were developed can be found on our website: www.plslwd.org.

Water Quality Indicator	Risk to Water Quality	Grade (2014-2016)	10-Year Trends & Goals (2007-2016)		Summary
			Trends	Graph	
PHOSPHORUS	Phosphorus is needed by plants and animals to survive, but can cause algae blooms if there is too much. In some cases, algae can contain a toxin which could cause illness or death in animals if ingested. Some sources of high phosphorus are fertilizer, human and animal waste, and soil erosion.	C	 No Trend		Late summer/early fall samples indicate that phosphorus levels have been consistent.
CHLOROPHYLL-A	Chlorophyll-a is a measurement of the amount of algae in a lake. Some algae can produce dangerous toxins and the decomposition of algae consumes oxygen that would otherwise be used by fish and beneficial organisms. High algal concentrations threaten aquatic life and can impede recreation and enjoyment of the lake.	F	 No Trend		Algae blooms remain high consistently from summer through fall.
CLARITY	Clarity is affected by the amount of algae and sediment in the water. The amount of algae and sediment present is dependent on many factors including nutrients, temperature, wind, rain, and boat traffic. Low clarity means water is more "cloudy" and less sunlight is available for aquatic plants to grow. Low clarity can also negatively impact a lake user's enjoyment and harm aquatic life.	C	 Improving		Clarity improved 32% over a ten-year span. Clarity is still low at times in late-summer and fall.
CHLORIDE	Chlorides can enter lakes through de-icing road salts, water softeners, and human and animal waste. Unnaturally high levels of chloride are toxic to plants and aquatic life. Once in the water, there is no easy or inexpensive way to remove chloride.	A	 No Trend		Samples well below threshold. Additional data needed to determine trend.

Grading Scale: Determined by three-year data analysis (2014-2016).

Excellent	Good	Average	Marginal	Poor
A	B	C	D	F
All or most samples meet the desired threshold.	Many samples meet or are near the desired threshold.	Some samples meet or are near desired threshold.	Many samples do not meet the desired threshold.	Most samples do not meet the desired threshold.

Trend Explanation: Water quality trends over ten years (2007-2016).

Improvement in water quality from indicator over 10-year period.
No significant increase or decrease in data over 10-year period.
Decline in water quality from indicator over 10-year period.

Example graph of average annual departure from threshold (2007-2016)



Upper Prior Lake: Projects

BACKGROUND

Upper Prior Lake is a shallow lake situated between Spring and Lower Prior Lake. Upper Prior receives most of its water from Spring Lake. Upper Prior Lake flows into Lower Prior Lake and from there, the water eventually makes its way through the Prior Lake outlet channel and empties into the Minnesota River.

Upper Prior Lake's water quality is considered "impaired" because it does not meet the state water quality standards for nutrients (phosphorus). As shown on the other side of this report, Upper Prior has high phosphorus and chlorophyll-a concentrations, which can lead to algae blooms. Shallow lakes generally have higher concentrations of phosphorus and water circulates more easily than deep lakes, such as Lower Prior Lake, bringing nutrients from the lake bottom to the surface, where algae grows.

The Prior Lake-Spring Lake Watershed District (PLSLWD) is helping to improve water quality in Upper Prior in many ways. In addition to projects such as raingardens, shoreline restorations, agricultural projects, and public infrastructure partnership projects, a few of PLSLWD's major water quality projects are highlighted on this page.

What is being done to reach the goal?

MANAGING CARP POPULATIONS

PLSLWD has a comprehensive carp management program. Common carp is an invasive species, originally from Eurasia, and very common in Prior and Spring Lake. Carp adversely impact water quality by uprooting aquatic plants and stirring up sediments from the lake bottom which releases phosphorus which can lead to harmful algae blooms.



Carp removal on Upper Prior Lake

Studies estimate the carp population in Upper Prior is approximately 3.5 times higher than the management goal. Ongoing efforts to reduce the carp population include tracking carp movement with radio-tags, installing barriers to block pathways to their prime spawning habitat, and continuing to remove carp using nets. In 2016, over 400 carp were captured in Upper Prior Lake. A small portion were marked with tags, re-released into the lake to help track their movement throughout the lake and connecting channels, and the rest were removed. In 2018, 17 ton of carp were removed, which is estimated to be 20% of the Upper Prior carp population.

REDUCING NUTRIENTS FROM UPSTREAM LAKES



Alum treatment on Spring Lake

SPRING LAKE

Spring Lake typically has high phosphorus levels and flows directly into Upper Prior Lake, thus affecting Upper Prior's water quality. The aluminum sulfate (alum) treatments on Spring Lake reduced phosphorus levels leading to fewer algal blooms. The first of three alum doses on Spring Lake was completed in 2013 and a second dose was done in 2018. After the first alum treatment, phosphorus flowing from Spring Lake was reduced by approximately 72% the first year. Note that following an alum treatment, water

quality initially improves but declines over time. Treatments are a short-term solution, and help to manage the phosphorus level while more permanent solutions are implemented.

ARCTIC LAKE

Arctic Lake flows into Upper Prior Lake at Crystal Bay. The Shakopee Mdewakanton Sioux Community, PLSLWD, Three Rivers Park District, and City of Prior Lake have partnered on several projects to improve water quality in Arctic Lake, including:

- Wetland restoration and installation of an iron-enhanced sand filter which reduces phosphorus going into Arctic Lake
- Aerator installed in Arctic Lake to prevent winter kill of bluegills, which eat carp eggs
- Carp management including installation of a barrier to block carp from spawning, carp tracking, and removal of carp from Arctic Lake
- Erosion problems were corrected, reducing soil and nutrients from entering the lake

MANAGING AQUATIC PLANTS

Aquatic vegetation plays a vital role in water quality. Vegetation holds lake sediments in place, uses phosphorus to grow, and produces oxygen and habitat for aquatic life. Usually lakes with more plants are clearer. Lakes are capable of growing plants in water up to 16 feet deep when clarity is good. In Upper Prior, aquatic plants grow in only about 10% of the potential area. This could be due in part to poor water clarity, carp, or aquatic herbicides. By comparison, plants grow in over 70% of areas less than 16 feet deep in Lower Prior Lake.

PLSLWD also surveys aquatic vegetation. Upper Prior has poor plant diversity with only a third of the number of species as Lower Prior Lake. If non-native vegetation is expected to create a nuisance in an area greater than 150 feet from shore, PLSLWD may choose to treat after obtaining a permit from DNR. Areas less than 150 feet from shore are the lakeshore owners responsibilities. Note that curly-leaf pondweed is treated in early spring to give native plants a chance to grow.



Aquatic plants in Upper Prior Lake