

2013 Water Testing Results for Inlets to Upper South Long Lake

Note: Testing in 2013 involved all 4 inlets to the lake while only inlets 1 and 2 were tested in 2012. For more information on those two inlets, see the attachment titled *2012 Water Testing Results*. An explanation of many of the tests that are being run is also provided (*Water quality test explanations*) for a better understanding of the reasons for those tests and the benchmarks/standards.

Inlet 1: located near Silver Bay Rd. and Rognaldson Rd. on the northern end of the lake

Testing was done on May 8th, July 11th, and September 13th. The metals testing continues to show results well within the benchmarks set by the MPCA for a recycling/salvage yard except for an elevation in iron (higher in September than in July). The LID board decided to add testing of orthophosphates and total phosphorus in order to compare to the other inlets beginning with the testing in July. The total phosphorus reading appears to be elevated (.08 mg/L). The orthophosphate was 3X higher in September than in July but still at an acceptable level while the TSS was 7X higher in September than in July at 20 mg/L.

For the other three inlets:

RMB Labs suggested a mid-summer date **NOT** following a heavy rain event to establish baselines so testing was done on July 11th. Another set of samples were collected on September 13th which was about 3 days after a significant rain. Tests run were: conductivity, orthophosphates, pH, total phosphorus, and total suspended solids (TSS).

Inlet 2: located near Paradise Shores Rd. on the east side of the lake

In July, all tests were in an acceptable range except total phosphorus which was also .08 mg/L. Nothing of concern showed up in the September samples although conductivity was slightly above the acceptable range at 293 umhos/cm.

Inlet 3: located near the end of Rognaldson Rd. on the west side of the lake

The TSS of 6 mg/L in July is considerably higher than for the other inlets as is the conductivity, although that is still in the acceptable range. Both of these readings were even more elevated in the September readings. (conductivity at 420 umhos/cm and TSS at 15 mg/L) Total phosphorus was also above the guidelines in September at this inlet at .102 mg/L.

Inlet 4: the Nokasippi River with samples taken at the culvert on County Rd. 24

All results there are in the acceptable range for both the July and September samples. Conductivity and orthophosphates are at the high end of the range.

Explanation of water quality testing parameters

Upper South Long Lake is considered to be a part of the Northern Lakes and Forests Ecoregion. In terms of its trophic state, it is borderline between a mesotrophic lake and a eutrophic lake.

The LID is currently doing water quality testing at the four main inlets to the lake. One is the Nokasippi River, the others are creeks located near the beginning of Silver Bay Road, near the end of Rognaldson Road, and to the south of Paradise Shores Resort. Explanations here are for most of the types of tests that are being conducted. For many years, testing has been occurring near the deepest point of the lake also. This testing will continue.

pH:

The pH of a lake is important for the survival and reproductive success of the fish and other aquatic life. If the pH is below 5.5, it will limit the growth and reproduction of fish.

The range of pH listed for our ecoregion is 7.2 - 8.3. Anything less than 6.5 may affect fish spawning and the solubility of metals.

Total suspended solids (TSS):

Suspended solids include silt and clay particles, plankton, algae, other fine organic debris and other particles that will not pass through a 2-micron filter. Much of this material would enter the streams by erosion of soil from agricultural or construction sites.

An increase in the TSS can lower a lake's ability to support diverse aquatic life. Suspended solids absorb sunlight and can cause an increase in water temperature. This, in turn, decreases levels of dissolved oxygen being available to aquatic life. These solids also may settle to the bottom smothering some eggs of fish and aquatic insects. Gills (of fish and other aquatic larvae) may become clogged which may inhibit growth and lower resistance to disease.

The MPCA shows the ecoregion range through 2011 to be from less than 1 to 2 mg/L while another figure obtained was a range of 1.8 to 6 mg/L for the years 2007-2008. The recorded average TSS at the Nokasippi River inlet for that time was 3.7 mg/L.

Total Phosphorus:

Although phosphorus is an essential nutrient for aquatic plants and algae, only small amounts are necessary. When too much phosphorus is present, it can lead to eutrophication of a lake. This is a condition that can result in an overabundance of plant and algae growth which, in turn, reduces the amount of dissolved oxygen available for aquatic organisms. Upper South Long is considered phosphorus limited. Available phosphorus will determine plant and algae growth.

Phosphorus is a naturally occurring substance in rocks, soils, and organic materials. Sources of phosphorus entering a lake may include: animal waste, lawn fertilizer, septic systems, road and construction erosion, industrial wastes, natural wetland runoff, and atmospheric deposition.

One would expect phosphorus levels in the streams entering the lake and the Nokasippi River to be higher at times of heavy run-off and also later in the season as plant and algae growth increases in the wetlands etc. surrounding the lake. The phosphorus testing done in the deeper part of the lake should be a truer test of the over-all health of the lake in regards to phosphorus. Sources show that the Environmental Protection Agency in the US has suggested a limit of .025 mg/L for a lake (at our deep spot) and .05 mg/L for streams entering the lake.

The MPCA has set the acceptable range for our ecoregion at .014 - .027 mg/L with .03 mg/L considered impaired. The average range for the Northern Lakes and Forest Ecosystem is .02 - .05 mg/L. (these also would be at the deep area of the lake)

Orthophosphates:

Orthophosphate is a type of inorganic phosphate. These are the types of phosphates used by plants. It can be produced by natural processes, but can indicate other problems. They are used heavily in fertilizers so are frequently introduced by runoff. Poorly treated sewage or leaking septic systems can also elevate these levels.

Further investigation of the safe "numbers" will be necessary, but one source shows borderline healthy aquatic ecosystems with a range of 0.05 - 0.1 mg/L in a river environment. (haven't found anything yet on a lake)

Conductivity:

Conductivity is a measure of the water's ability to carry an electrical current. It is a reflection of the number of ionic particles present. These can be inorganics such as chlorides, nitrates, iron, etc. Conductivity in streams has a high correlation to the geology of the area through which it flows. Acceptable range of numbers is difficult to establish for that reason. Once baselines are established, significant changes in conductivity could then be used to indicate that pollutants have entered the stream.

The MPCA has set 50-250 umhos/cm as the acceptable range for our ecoregion.

High conductivity may be a result of road salting, septic systems, or urban/agricultural runoff. Low conductivity could result from an oil spill.