LOVELL LAKE

2013 SAMPLING HIGHLIGHTS

Sanbornville NH

NEW HAMPSHIRE
LAKES LAY MONITORING

Lovell Lake volunteers collected water quality data between June 16 and October 2, 2013 while a more in depth water quality survey of the Lovell Lake deep sampling stations was conducted by the **Center for Freshwater Biology** on August 2, 2013.

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

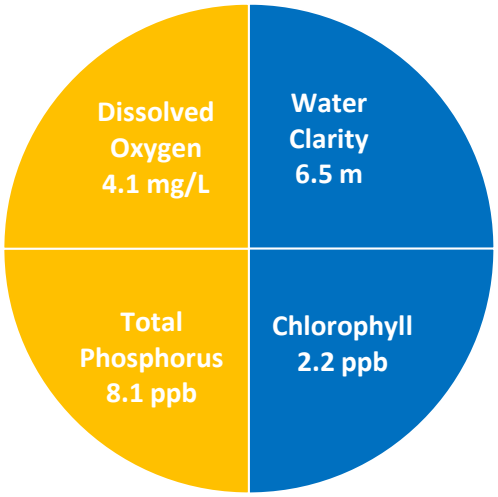


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 6.5 meters (m) in Lovell Lake. The 2013 Lovell Lake water clarity was deeper than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 2.2 parts per billion (ppb) in Lovell Lake. The 2013 Lovell Lake chlorophyll *a* concentration was slightly higher (greener water) than the 2012 level.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters measured 8.1 parts per billion (ppb) and remained well below 10 ppb. A total phosphorus concentration of 10 ppb is considered sufficient to support green water events that are referred to as algal blooms.

DISSOLVED OXYGEN: Dissolved oxygen is important for healthy fisheries. Dissolved oxygen concentrations collected in the deeper waters ranged from 0.6 to 8.1 milligrams per liter (mg/L) on August 2, 2013. Dissolved oxygen concentrations became reduced below 5.0 mg/l near the lake bottom. A dissolved oxygen concentration of 5.0 mg/l is considered the threshold for the growth and reproduction of coldwater fish, such as trout and salmon.

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. The Lovell Lake color averaged 9.9 color units (CPU).

ALKALINITY: Alkalinity measures the resistance the lake has against acid rain. The Lovell Lake alkalinity averaged 14.4 milligrams per liter (mg/L) and indicates a low vulnerability to acid rain. The Lovell Lake **pH**, a measure of lake acidity, measured 7.4 units in the surface waters and remained within the acceptable range for most aquatic organisms on the August 2, 2013 sampling date.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific Conductivity ranged from 102.0 to 128.0 micro-Siemans per centimeter (*u*S/cm) in Lovell Lake. The Lovell Lake specific conductivity indicates moderate to high concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

CYANOBACTERIA: Lovell Lake did not take part in the 2013 cyanobacteria monitoring program. Please refer to the recommendation section for further information.

Note: Site 2 South (see map) was used as the reference point to give an overall representation of the Lovell Lake water quality discussed above. For a more detailed discussion of water quality measurements, please refer to the executive summary within the annual Lovell Lake report.

Table 1. 2013 Lovell Lake Seasonal Average Water Quality Readings and Trophic Level Classification Criteria used by the New Hampshire Lakes Lay Monitoring Program

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Lovell Lake Average (range)	Lovell Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	6.5 meters (range: 5.1 – 7.6)	Oligotrophic
Chlorophyll *a* (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	2.2 ppb (range: 0.9 – 4.3)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	8.1 ppb (single value)	Mesotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	* 4.1 mg/L (range: 0.6 – 8.1)	Mesotrophic
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter (*u*g/l) lake water, and/or 70,000 cyanobacteria cells per milliliter lake water.		The New Hampshire Department of Environmental services posts warnings at State beaches when cyanobacteria cell numbers exceed 70,000 cells per milliliter lake water.		

Dissolved oxygen concentrations are reported for the deep water layer (thermocline). The chlorophyll *a* and total phosphorus trophic Level classification criteria are based on New Hampshire Department of Environmental Services standards.

LONG TERM WATER QUALITY TRENDS

WATER CLARITY: The Lovell Lake water clarity data display a slight trend of increasing water clarity over the past twenty-five years. The trend is not statistically significant.

CHLOROPHYLL: The Lovell Lake chlorophyll *a* data display a trend of decreasing chlorophyll *a* concentrations over the past twenty-five years. The trend is not statistically significant.

COLOR: The Lovell Lake color data display a stable trend over the twenty-years of sampling. The trend is not statistically significant.

TOTAL PHOSPHORUS: The Lovell Lake total phosphorus concentrations have increased over twenty-five years of water quality monitoring. The trend is not statistically significant.

In summary, the long-term Lovell Lake water clarity and chlorophyll data indicate trends of increasing water quality over the past twenty-five years while the total phosphorus concentrations have increased since 1989. The increasing total phosphorus concentrations are a reminder that, while the Lovell Lake water quality is high, increasing phosphorus (nutrient) concentrations remain a long-term threat to Lovell Lake.

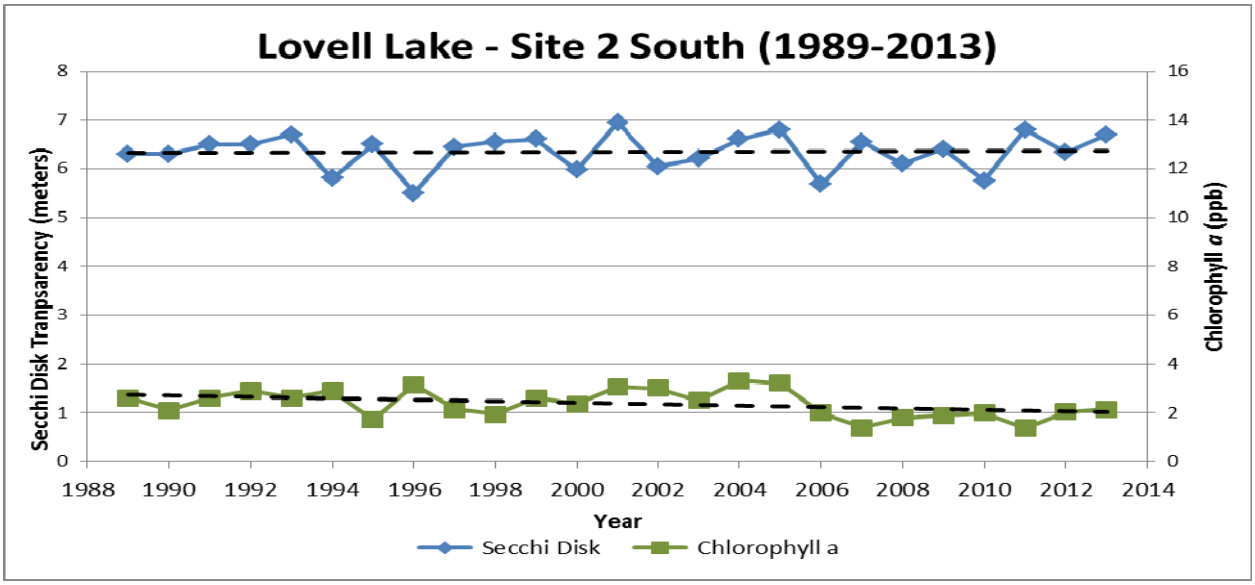


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1989 and 2013 at Site 2 South. The long-term water clarity data indicate a trend of increasing water clarity (dashed line). The long-term algal growth (chlorophyll *a*) indicate a trend of decreasing concentrations (dashed line). Neither trend is statistically significant.

Recommendations:

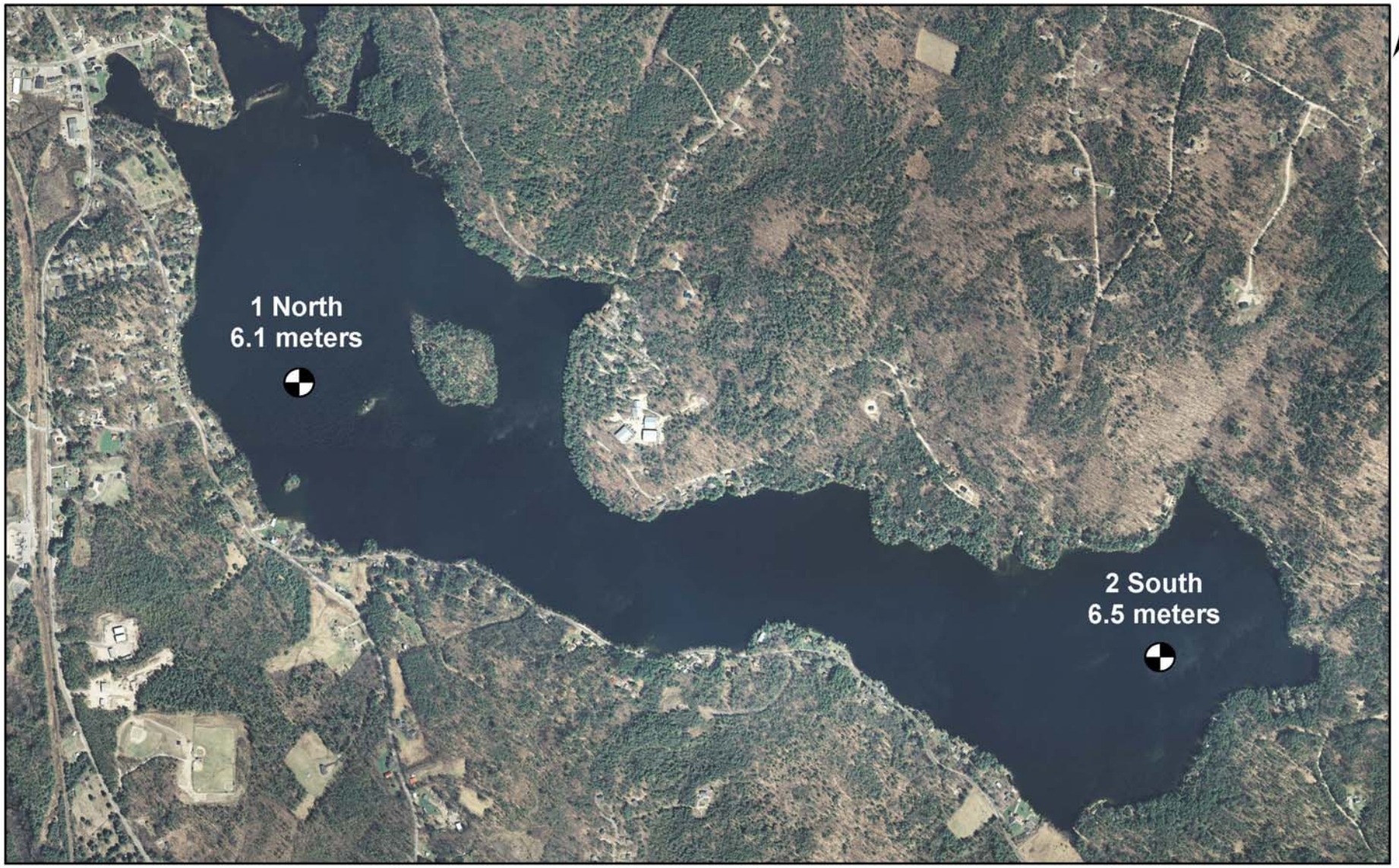
- Implement Best Management Practices within the Lovell Lake watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off. The Acton Wakefield Watershed Alliance also offers technical assistance to help design and implement erosion control project that protect water quality.
    - https://extension.unh.edu/resources/files/Resource001799_Rep2518.pdf
    - http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

- Implement a simple cyanobacteria monitoring routine into the conventional water quality monitoring methods. Cyanobacteria collections throughout the summer and fall months can give insight into how these populations are distributed throughout the seasons and when they are most likely to reach harmful levels. If you are interested in discussing additional water quality monitoring options that would meet your needs please contact Bob Craycraft @ 862-3696 or via email, bob.craycraft@unh.edu

Lovell Lake

Wakefield, NH

Deep water sampling site locations that display the seasonal average water clarity



University of New Hampshire
Cooperative Extension

New Hampshire Lakes Lay Monitoring