SILVER LAKE

2013 SAMPLING HIGHLIGHTS

MADISON, NH

NEW HAMPSHIRE

LAKES LAY MONITORING

Silver Lake volunteers collected water quality data between June 5 and September 25, 2013. A more in depth water quality survey of the Silver Lake deep sampling stations was conducted by the Center for Freshwater Biology on August 14, 2013

Light Blue = Outstanding = Ultraoligotrophic

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

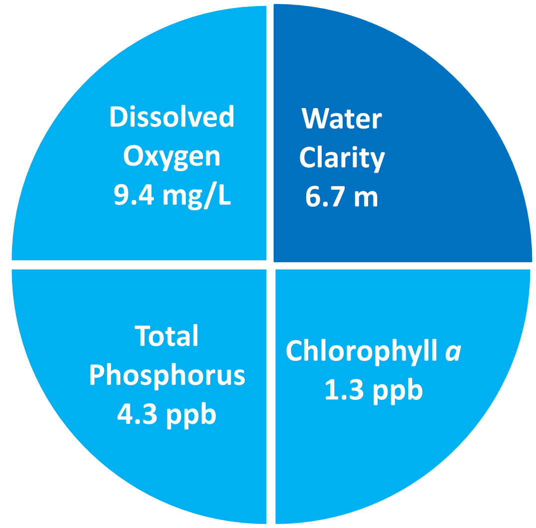


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 6.7 meters (m) in Silver Lake. The 2013 Silver Lake water clarity was deeper than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 1.3 parts per billion (ppb) in Silver Lake. The 2013 Silver Lake chlorophyll *a* concentration was higher (greener water) than the 2012 chlorophyll *a* concentration.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 4.3 part 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 bottom waters ranged from 9.3 to 9.5 milligrams per liter (mg/L) on August 14. Dissolved oxygen concentrations were well above 5.0 mg/l, which 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 Silver Lake color averaged 25.9 color units (CPU).

ALKALINITY: Alkalinity measures the resistance the lake has against acid rain. The Silver Lake alkalinity averaged 4.4 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The Silver Lake **pH**, a measure of lake acidity, ranged from 6.8 to 7.1 units and remained within the acceptable range for most aquatic organisms.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific Conductivity ranged from 37.0 to 39.0 micro-Siemans per centimeter (*u*S/cm). The Silver Lake specific conductivity indicates low to moderate concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

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

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

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

Parameter	Ultraoligotrophic "Outstanding"	Oligo "Excellent"	Meso "Fair"	Eutrophic "Poor"	Silver Lake Average (range)	Silver Lake Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	**6.7** meters (range: 4.8 – 7.9)	Oligotrophic
Chlorophyll *a* (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	**1.3** ppb (range: 0.9 – 1.6)	Ultraoligotrophic
Total Phosphorus (ppb)	< 7.0	7.0 – 15.0	15.0 - 25.0	> 25.0	**4.3** ppb (range: 4.3 – 4.3)	Ultraoligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	**9.4** mg/L (range: 9.3 - 9.5)	Ultraoligotrophic
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter (ug/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 taken from the bottom layer**

LONG TERM TRENDS

WATER CLARITY: Water clarity has decreased approximately 20 centimeters (cm) over the past thirty-one years of sampling. However, the trend is not statistically significant.

CHLOROPHYLL: Chlorophyll *a* has increased approximately 0.5 parts per billion (ppb) between 1983 and 2013. However, the trend is not statistically significant. More recently, data collected between 1998 and 2013 indicate the chlorophyll *a* trend has been stable over the past fifteen years. However, the fifteen year trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus has been relatively stable since 1983. However, the trend is not statistically significant.

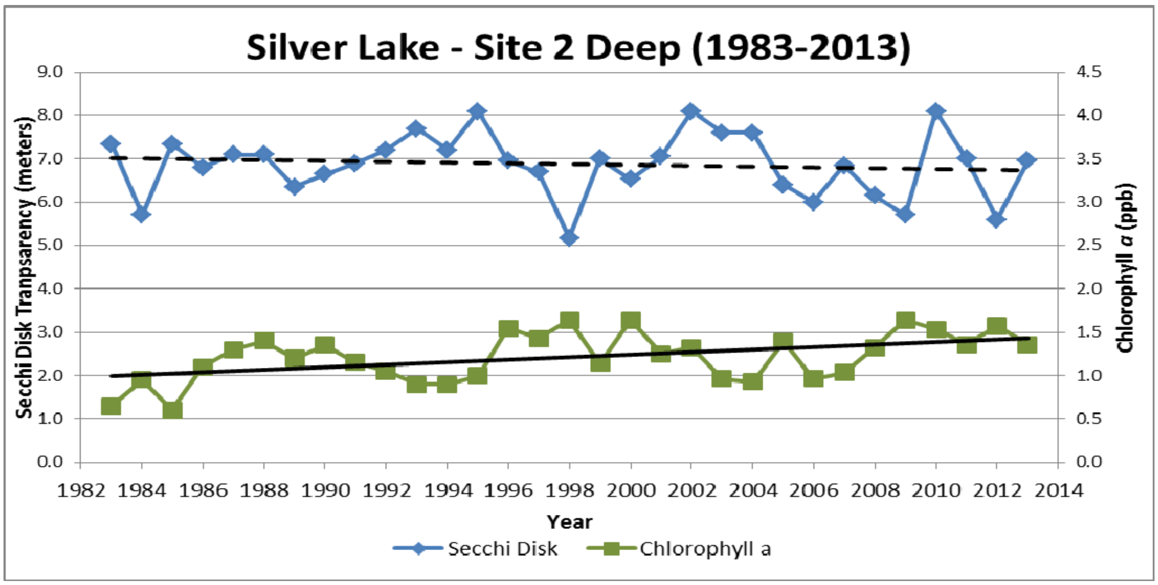


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured from 1983-2013 at Site 2 Deep. There has been a slight declining trend in water clarity since 1983, although not statistically significant (dashed line). Decreasing water clarity is a negative trend for lakes if caused by increased algae or polluted runoff. Algal growth has increased over the thirty one years of sampling and has been significant with time (chlorophyll; solid line).

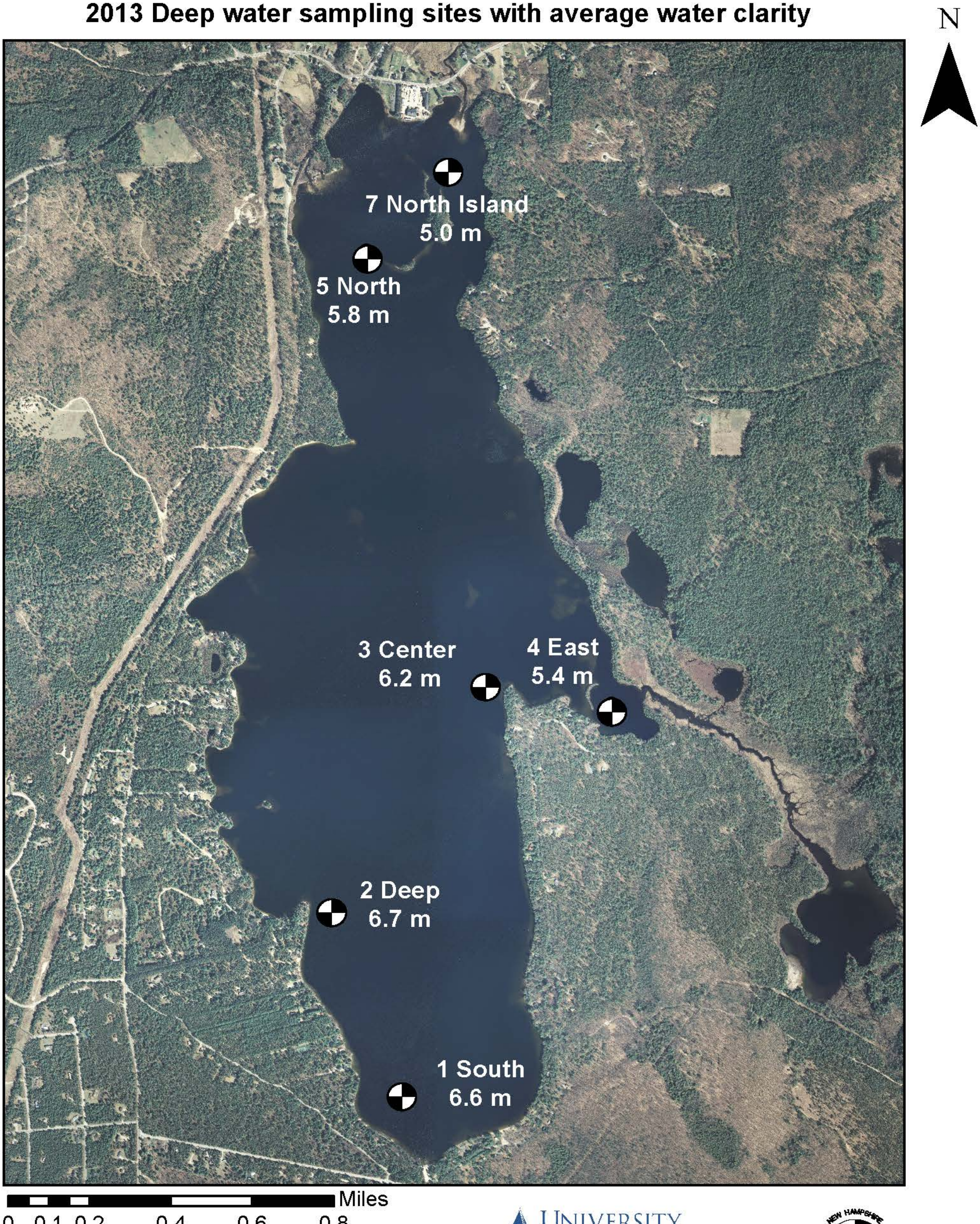
Recommendations:

- Implement Best Management Practices within the Silver 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 guidance on how to improve 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
- Consider adding a simple cyanobacteria monitoring program that uses existing water quality sample collection protocols. Cyanobacteria collections from the spring through fall months can give insight into how these populations are distributed throughout the seasons and when they are most likely to be at 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 bob.craycraft@unh.edu.

Silver Lake

Madison, NH

2013 Deep water sampling sites with average water clarity



University of New Hampshire Cooperative Extension

New Hampshire Lakes Lay Monitoring

Aerial Orthophoto Source: NH GRANIT
Site locations GPS coordinates collected by the UNH Center of Freshwater Biology