SILVER LAKE

2015 SAMPLING HIGHLIGHTS

Station – 2 Deep

Madison, NH

University of New Hampshire Cooperative Extension

Station 2 Deep (Figure 7) was used as a reference point to represent the overall Silver Lake water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the dissolved oxygen data that were collected near the lake bottom.

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

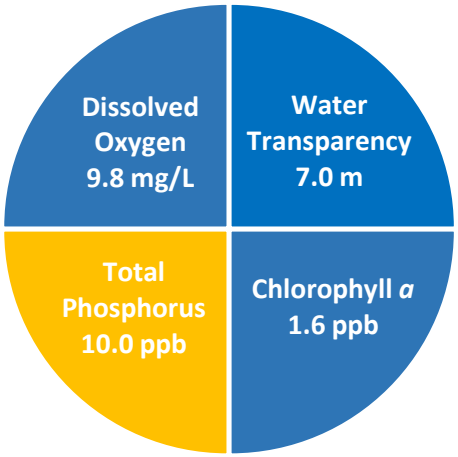


Figure 1. Silver Lake Water Quality (2015)

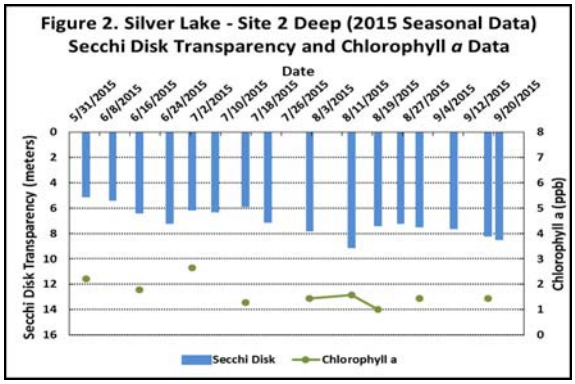
Table 1. 2015 Silver Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Silver Lake – Site 2 Deep Average (range)	Silver Lake – Site 2 Deep Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	**7.0** meters (5.0 – 9.0)	Oligotrophic
Chlorophyll *a* (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**1.6** ppb (1.0 – 2.6)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**10.0** ppb (single sample)	Mesotrophic
Dissolved Oxygen (mg/L)	> 5.0	2.0 – 5.0	<2.0	**9.8** mg/L (9.5 – 10.8)	Oligotrophic

* Dissolved oxygen concentrations were measured on August 13, 2015 between 8.5 and 18.0 meters, in the bottom waters.

Table 2. 2015 Silver Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Silver Lake – Site 2 Deep Average (range)	Silver Lake – Site 2 Deep Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**20.7** color units (17.2 – 24.5)	Lightly tea colored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	**4.6** mg/L (4.3 – 5.4)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**7.1** standard units (range: 7.0 – 7.1)	Optimal range for fish growth and reproduction
Specific Conductivity (*u*S/cm)	< 50 *u*S/cm Characteristic of minimally impacted NH lakes		50-100 *u*S/cm Lakes with some human influence	> 100 *u*S/cm Characteristic of lakes experiencing human disturbances		**43.0** *u*S/cm (range: 43.0 – 43.2)	Characteristic of minimally impacted NH Lakes



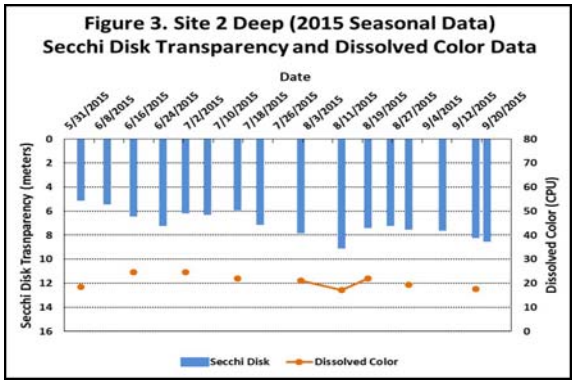


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

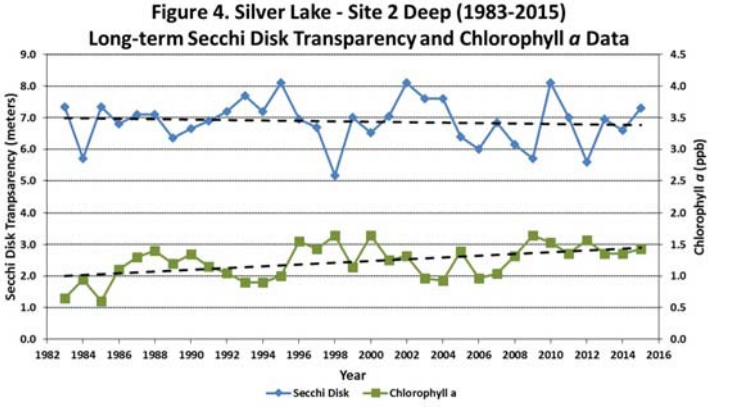
LONG-TERM TRENDS

WATER CLARITY: The Silver Lake water clarity measurements, measured as Secchi Disk transparency, display a trend of decreasing water clarity over thirty-three years of water quality monitoring conducted between 1983 and 2015 (Figure 4).

CHLOROPHYLL: The Silver Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations over thirty-three years of water quality monitoring conducted between 1983 and 2015 (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Silver Lake total phosphorus concentrations display a relatively stable trend over the thirty-one years of water quality monitoring conducted between 1983 and 2015 (Figure 5).

COLOR: The Silver Lake color data, the result of naturally occurring "tea" color substances from the breakdown of soils and plant materials, display a trend of decreasing concentrations over the thirty –one years of water quality monitoring conducted between 1985 and 2015 (Figure 5).



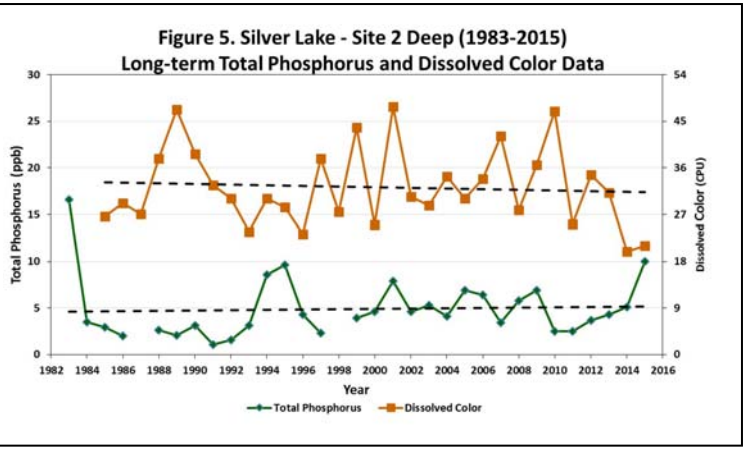


Table 3. Silver Lake Seasonal Average Water Quality Inter-Site Comparison (2015)

Sampling Station	Average (range) Water Clarity (meters)	Average (range) Total Phosphorus (ppb)	Average (range) Chlorophyll *a* (ppb)	Average (range) Dissolved Oxygen (mg/L)
1 South	**7.3** m (range: 5.7 -10.0)	**7.7** ppb (single value)	**1.6** ppb (range: 0.9 – 2.2)	--------
2 Deep	**7.0** m (range: 5.0 – 9.0)	**10.0** ppb (single value)	**1.6** ppb (range: 1.0 – 2.6)	**9.8** mg/L (range: 9.5 – 10.8)
3 Center	**6.9** m (range: 4.5 – 8.8)	**7.2** ppb (single value)	**1.6** ppb (range: 1.1 – 2.4)	--------
4 East	**5.3** m (range: 4.1 – 6.0)	**7.5** ppb (single value)	**1.7** ppb (range: 1.1 – 2.1)	--------
5 North	**6.4** m (range: 5.2 – 7.8)	**7.5** ppb (single value)	**1.8** ppb (range: 1.2 – 2.1)	**9.2** mg/L (range: 8.9 – 9.6)
7 North Island	**5.9** m (range: 4.8 – 7.4)	**7.3** ppb (single value)	**1.9** ppb (range: 1.4 – 2.3)	**2.0** mg/L (range: 0.3 – 5.6)

- Dissolved oxygen concentrations measured in the bottom waters (hypolimnion)
- Dashed line indicates there was not a bottom water (hypolimnion) layer due to the shallowness of the sampling location.

Figures 4 and 5. Changes in the Silver Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 1983 and 2015. **These data illustrate the relationship among plant growth, water color and water clarity. Total phosppshorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

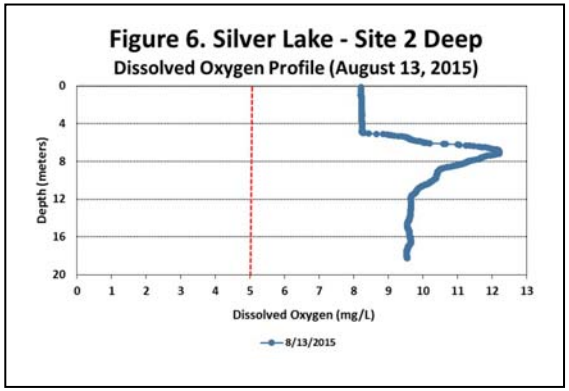


Figure 6. Silver Lake dissolved oxygen profile collected on August 13, 2015. The vertical red line indicates the dissolved oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish such as trout and salmon. *Notice the high dissolved oxygen concentrations near the lake bottom.*

Reccomendations

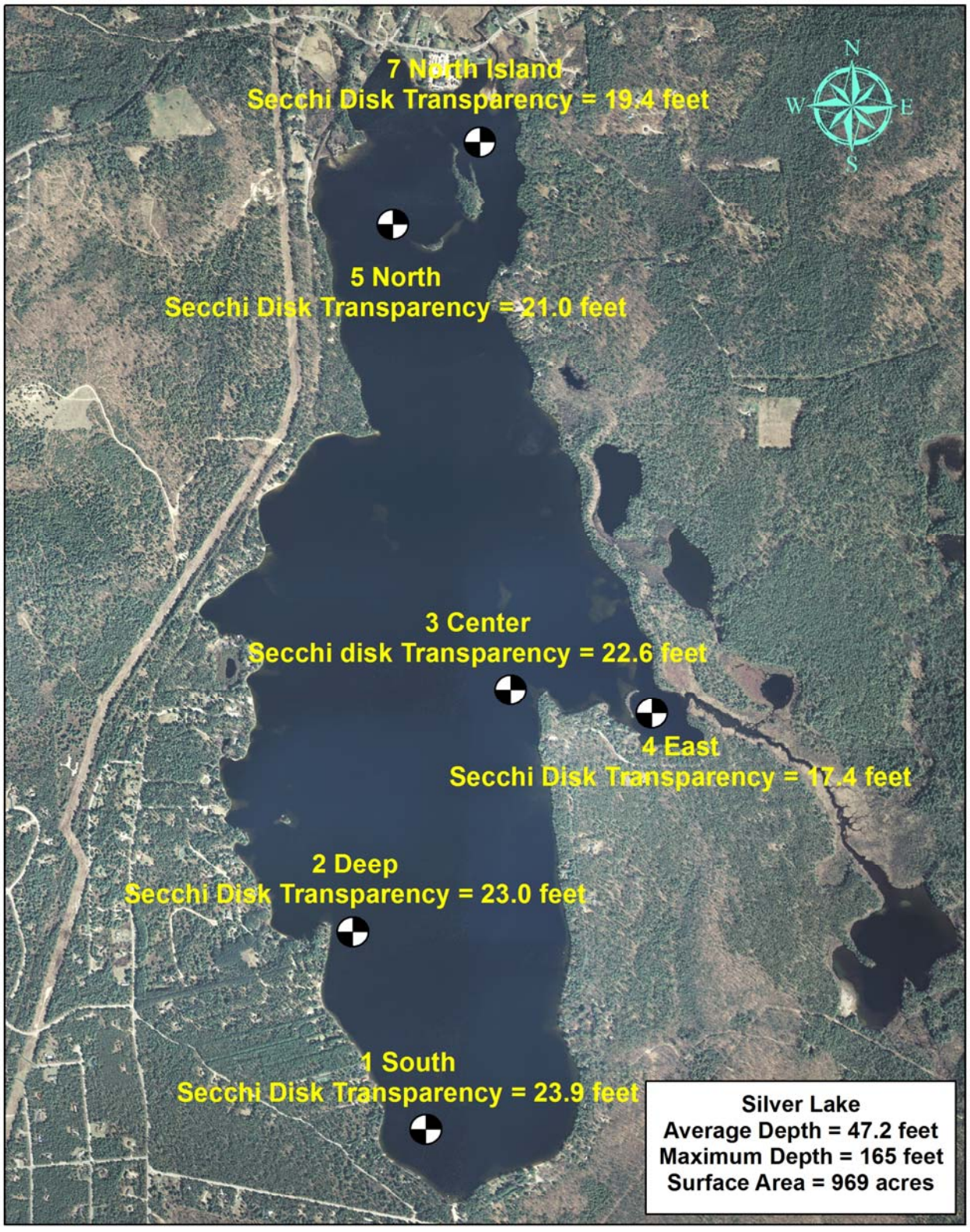
Implement Best Management Practices within the Silver Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Silver Lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

Figure 9. Silver Lake

Madison, NH

2015 Deep water sampling sites with seasonal average water clarity



Miles
0 0.2 0.4 0.6 0.8

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