

PROVINCE LAKE

2014 SAMPLING HIGHLIGHTS

Station – 1 Deep

Wakefield, NH and Parsonsfield, ME



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

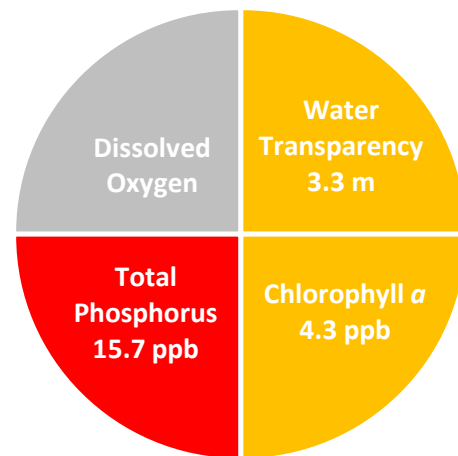


Figure 1. Province Lake Water Quality (2014)

Station 1 Deep (Figure 7) was used as a reference point to represent the overall Province Lake water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements.

Table 1. 2014 Province Lake Seasonal Averages and NH DES Trophic Level Classification Criteria

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Province Lake Average (range)	Province Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	3.3 meters (2.8 – 3.8)	Mesotrophic
Chlorophyll <i>a</i> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	4.3 ppb (3.2 – 6.7)	Mesotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	15.7 ppb (12.8 – 19.6)	Eutrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	N/A	N/A

* Dissolved oxygen criteria not assessed due to the lack of a deep cold water layer in Province Lake.

Table 2. 2014 Province Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Province Lake Average (range)	Province Lake Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	29.2 color units (25.0 – 36.3)	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	7.3 mg/L (7.0 – 7.7)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			6.7 standard units (range: 6.3 – 7.1)	Optimal range for fish growth and reproduction
Specific Conductivity (uS/cm)	< 50 uS/cm Characteristic of minimally impacted NH lakes		50-100 uS/cm Lakes with some human influence	> 100 uS/cm Characteristic of lakes experiencing human disturbances		48.5 uS/cm (range: 45.7 – 49.7)	Characteristic of minimally impacted NH lakes

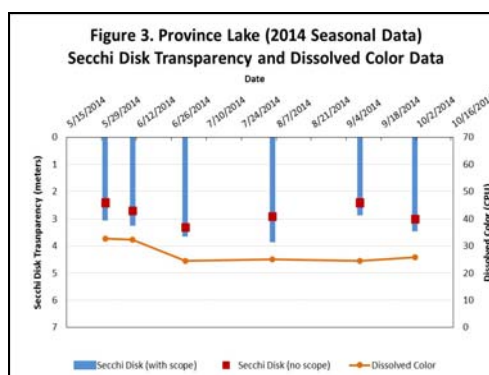
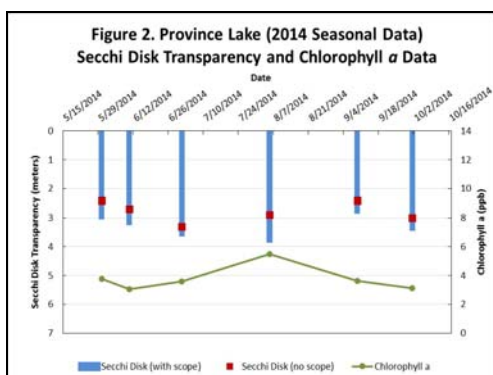


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations. Secchi Disk transparency data are reported for measurements collected with and without a viewing scope.

LONG-TERM TRENDS

WATER CLARITY: The Province Lake water clarity data, measured as Secchi Disk transparency, display a trend of decreasing water clarity over the past twenty-six years of water quality monitoring (Figure 4). The long-term water clarity trend is based on the Secchi Disk transparency measurements that have been collected without a view scope.

CHLOROPHYLL: The Province Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of decreasing concentrations over the past twenty-five years of water quality monitoring (Figure 4).

TOTAL PHOSPHORUS: The Province Lake total phosphorus concentrations, the nutrient most responsible for microscopic plant growth, display a trend of increasing nutrient concentrations over the past twenty-six years of water quality monitoring (Figure 5).

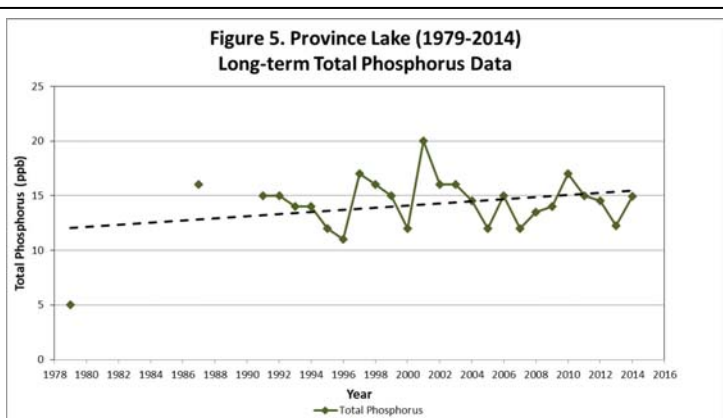
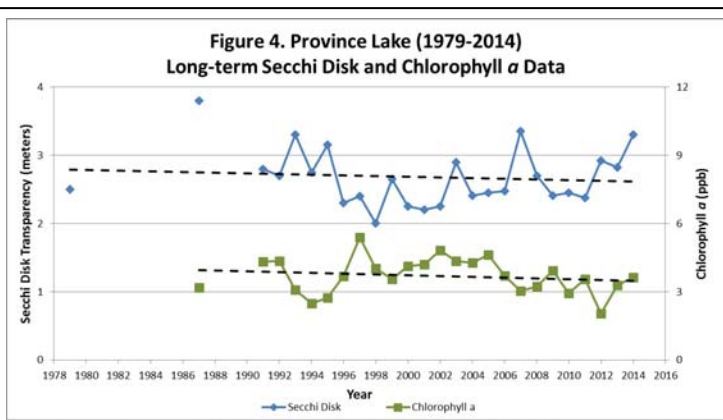
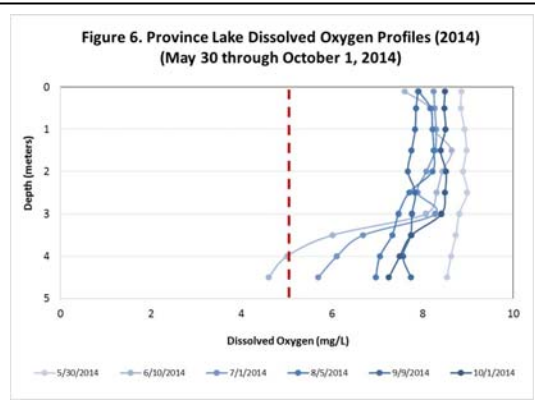


Table 3. Province Lake Steam Inlet and Outlet Seasonal Average Water Quality Inter-Site Comparison (2014)

Site Name	Average (range) Total Phosphorus (ppb)	Average (range) Specific Conductivity (uS/cm)	Average (range) Alkalinity (mg/L)	Average (range) pH (standard units)
Campground Inlet PROEFFC	8.9 ppb (6.4 – 12.1)	34.7 uS/cm (27.6 – 41.4)	8.7 mg/L (4.7 – 11.6)	6.2 units (5.7 – 6.6)
Golf Course PROEFFGC	60.5 ppb (18.9 – 102.0)	48.7 uS/cm (single value)	12.8 mg/L (10.3 – 15.3)	6.4 units (single value)
Island Inlet PROEFFI	18.1 ppb (7.3 – 35.1)	49.8 uS/cm (38.5 – 57.0)	14.7 mg/L (10.8 – 16.5)	6.1 units (5.9 – 6.3)
Outlet PROEFFO	15.2 ppb (12.2 – 18.9)	48.5 uS/cm (45.0 – 50.4)	7.0 mg/L (6.2 – 7.7)	6.8 units (6.0 – 7.1)
Rt. 153 Inlet PROEFFR	18.8 ppb (13.7 – 25.0)	40.0 uS/cm (35.5 – 43.7)	8.3 mg/L (4.2 – 11.8)	5.7 units (5.4 – 6.0)

Figures 4 and 5. Changes in the Province Lake water clarity (Secchi Disk depth), chlorophyll *a* and total phosphorus concentrations measured between 1979 and 2014. **These data illustrate the relationship between plant growth and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

Figure 6. Monthly Province Lake dissolved oxygen profiles collected between May 30 and October 1, 2014. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish such as trout and salmon.



Recommendations

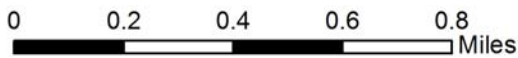
Implement Best Management Practices within the Province Lake watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater 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 projects that protect and improve the water quality.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- <http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf>
- <http://awwatersheds.org/healthy-lakes/conservation-practices-for-homeowners/>

Figure 7. Province Lake

Wakefield, NH and Parsonsfield, ME

2014 Lake and Stream sampling locations with seasonal average water clarity



University of New Hampshire
Cooperative Extension



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