

BOW LAKE

2015 SAMPLING HIGHLIGHTS

Station 1 Ledges

Barrington and Northwood, NH



University of New Hampshire
Cooperative Extension

Blue = Excellent =
Oligotrophic

Yellow = Fair =
Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

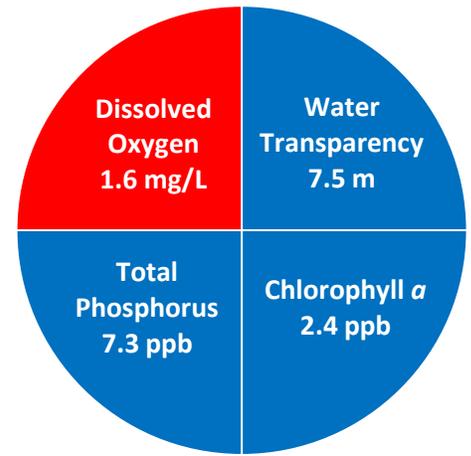


Figure 1. Bow Lake Water Quality (2015)

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. Refer to the 2015 Bow Lake Annual Report for additional information.

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

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Bow Lake – 1 Ledges Average (range)	Bow Lake – 1 Ledges Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	7.5 meters (6.8 – 8.9)	Oligotrophic
Chlorophyll a (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	2.4 ppb (1.6 – 4.0)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	7.3 ppb (5.4 – 8.8)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	1.6 mg/L (1.1 – 2.5)	Eutrophic

* Dissolved oxygen concentrations were measured on September 25, 2015 between 10.5 and 19 meters, in the bottom water layer.

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

Parameter	Assessment Criteria					Bow Lake – 1 Ledges Average (range)	Bow Lake – 1 Ledges Classification
	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored		
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	14.8 color units (8.8 – 19.3)	Slightly 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	4.0 mg/L (3.5 – 4.3)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			7.5 standard units (7.4 – 7.8)	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		56.1 uS/cm (56.1 – 56.1)	Lakes with some human influences

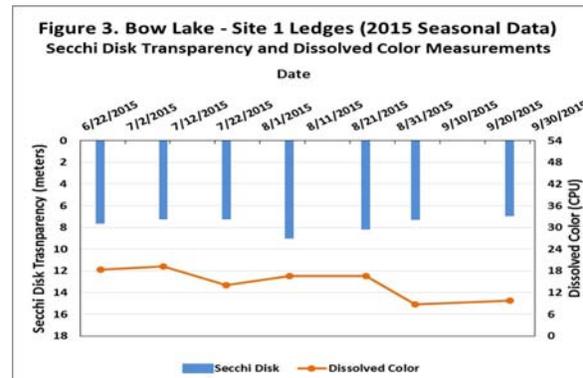
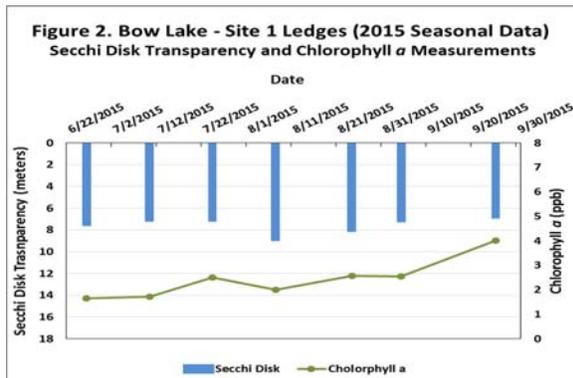


Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll a changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll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

LONG-TERM TRENDS

WATER CLARITY: The Bow Lake water clarity measurements, measured as Secchi Disk transparency, have oscillated among years but do not display a trend of increasing or decreasing water clarity over the thirty-one years of water quality monitoring conducted between 1984 and 2015 (Figure 4).

CHLOROPHYLL: The Bow Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations over thirty-one years of water quality monitoring conducted between 1984 and 2015 (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Bow Lake total phosphorus concentrations display a trend of decreasing concentrations over twenty-six years of water quality monitoring conducted between 1984 and 2015 (Figure 5).

COLOR: The Bow Lake color data, the result of naturally occurring “tea” color substances from the breakdown of soils and plant materials, display a trend of increasing concentrations over twenty-seven years of water quality monitoring conducted between 1984 and 2015 (Figure 5).

Figure 4. Bow Lake - Site 1 Ledges (1984-2015)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data

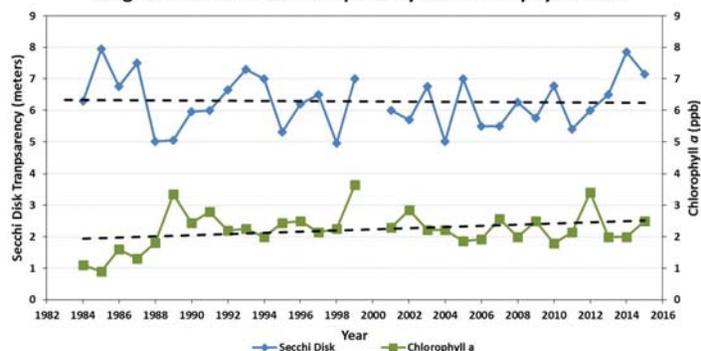


Figure 5. Bow Lake - Site 1 Ledges (1984-2015)
Long-term Total Phosphorus and Dissolved Color Data

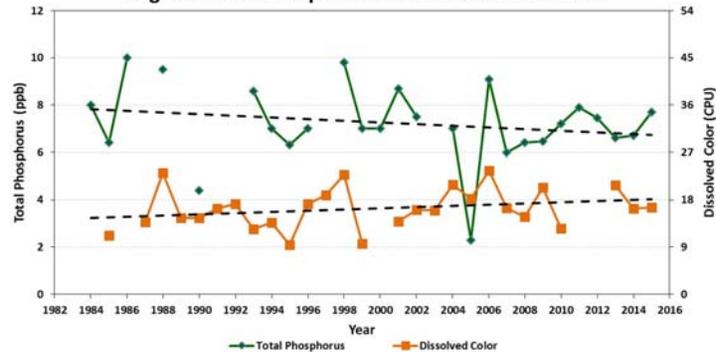


Table 3. Bow Lake Seasonal Average Water Quality Inter-site Comparison (2015)

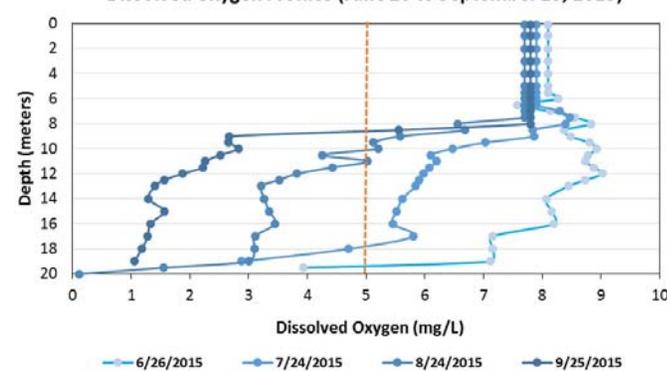
Site	Average Secchi Disk Transparency (meters)	Average Chlorophyll <i>a</i> (ppb)	Average Total Phosphorus (ppb)	Average Dissolved Oxygen (ppm)
1 Ledges	7.5 (range: 6.8-8.9)	2.4 (range: 1.6-4.0)	7.3 (range: 5.4-8.8)	1.6 (range: 1.1 - 2.5)
3 Bennett	7.6 (range: 6.8-8.9)	2.3 (range: 1.4-3.1)	7.5 (range: 6.1-8.7)	1.1 (range: 0.7 - 1.5)

• Dissolved oxygen data were measured on September 25, 2015 in the bottom water layer (hypolimnion).

Figures 4 and 5. Changes in the Bow Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 1984 and 2015. These data illustrate the relationship among plant growth, water color and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.

Figure 6. Bow Lake dissolved oxygen concentrations collected between June 26 and September 25, 2015. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish. Notice the decreasing dissolved oxygen concentrations near the lake bottom between June and September.

Figure 6. Bow Lake- Site 1 Ledges
Dissolved Oxygen Profiles (June 26 to September 25, 2015)



Recommendations

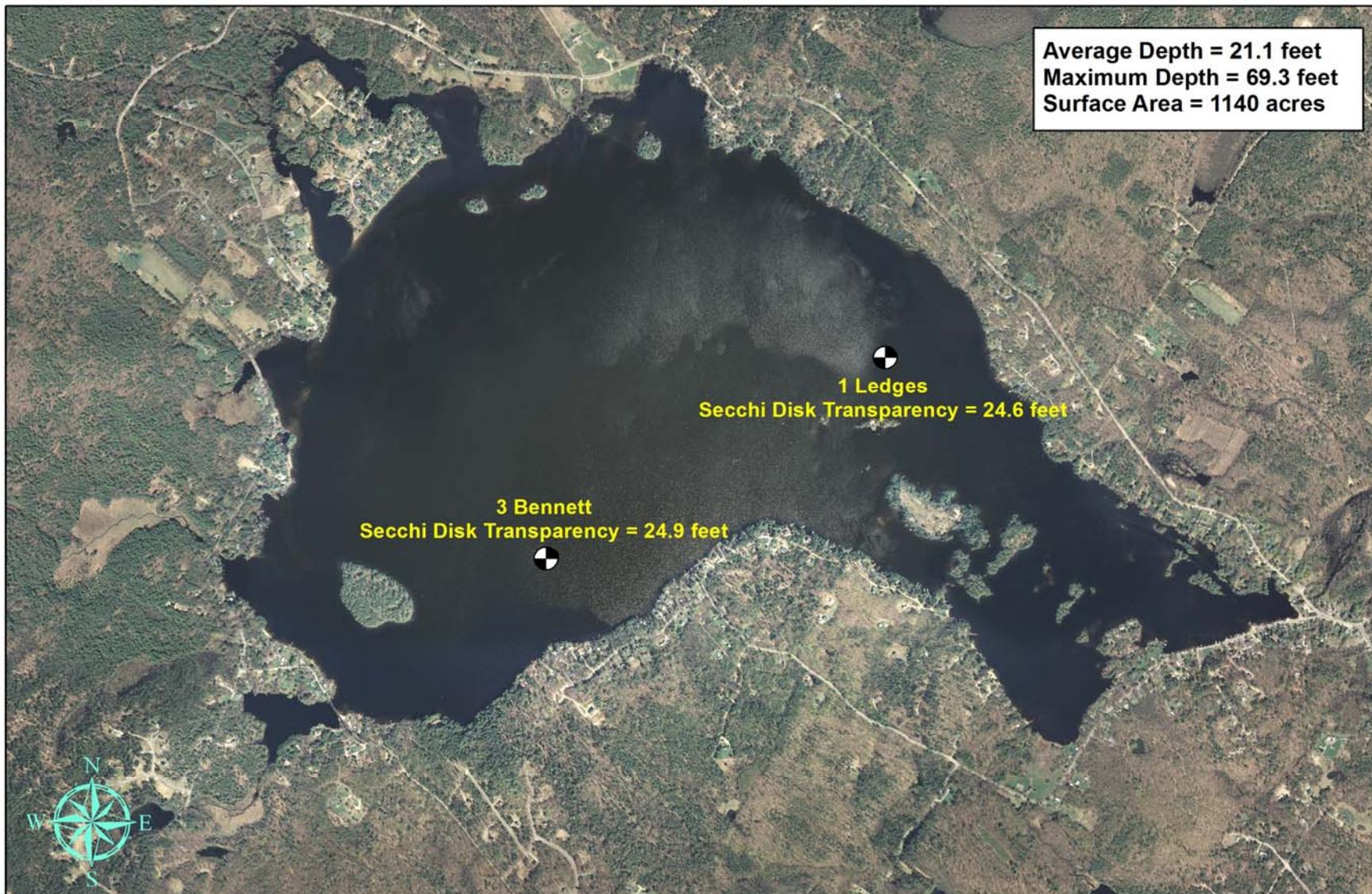
Implement Best Management Practices within the Bow Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Bow Lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions 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 7. Bow Lake

Strafford & Northwood, NH

2015 Deep water sampling site locations with seasonal average water clarity



0 0.2 0.4 0.6 0.8 Miles

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

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