

BOW LAKE

2019 SAMPLING HIGHLIGHTS

Station 1 Ledges

Barrington and Northwood, NH



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

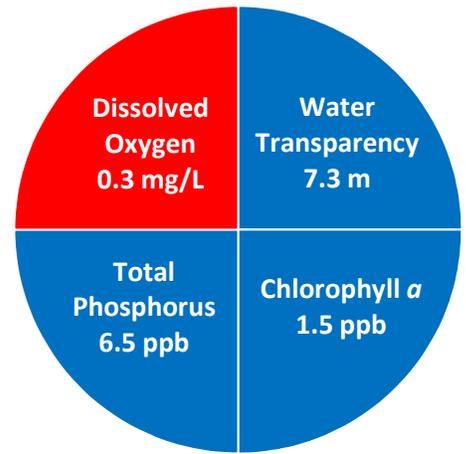


Figure 1. Bow Lake Water Quality (2019)

Water quality data displayed in Tables 1, 2 and 3 are surface water measurements with the exception of the dissolved oxygen data that were collected near the lake bottom. Refer to the 2019 Bow Lake Annual Report for additional information.

Table 1. 2019 Bow Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria¹

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	7.3 meters (5.4 – 8.3)	Oligotrophic
Chlorophyll <i>a</i> ¹ (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	1.5 ppb (1.1 – 2.1)	Oligotrophic
Total Phosphorus ¹ (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	6.5 ppb (4.8 – 7.9)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	0.3 mg/L (0.0 – 1.1)*	Eutrophic

* Dissolved oxygen concentrations were measured on August 26, 2019 between 11.0 and 19.0 meters, in the bottom water layer.

Table 2. 2019 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	17.3 color units (range: 14.7 – 20.2)	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	4.2 mg/L (range: 3.8 – 4.6)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			7.0 standard units (single value)	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		66.3 uS/cm (single value)	Lakes with some human influences

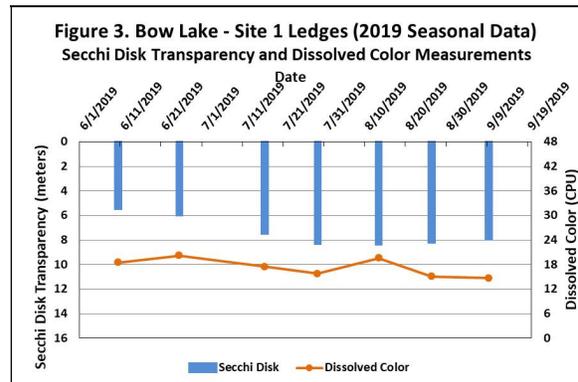
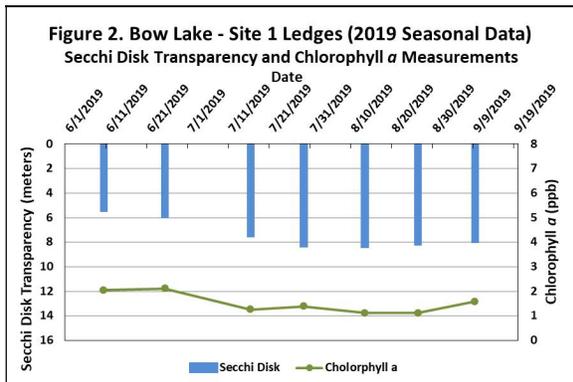


Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in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

LONG-TERM TRENDS (SITE 1 LEDGES)

WATER CLARITY: The Bow Lake water clarity measurements, measured as Secchi Disk transparency, have oscillated among years and display a trend of increasing water clarity over the thirty-five years of water quality monitoring conducted between 1984 and 2019 (Figure 4).

CHLOROPHYLL: The Bow Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, have oscillated among years but do not display a trend of increasing or decreasing concentrations over thirty-four years of water quality monitoring conducted between 1984 and 2019 (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 thirty years of water quality monitoring conducted between 1984 and 2019 (Figure 5).

COLOR: The Bow Lake color data, the result of naturally occurring “tea” color substances from the breakdown of soils and plant materials, do not display a trend of increasing or decreasing concentration over thirty-one years of water quality monitoring conducted between 1984 and 2019 (Figure 5).

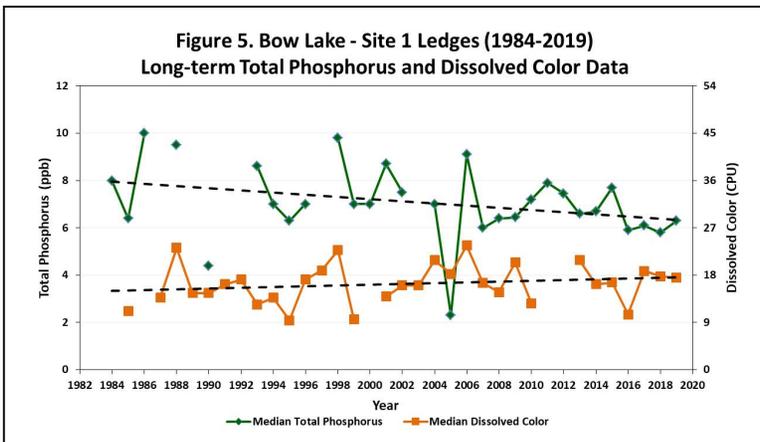
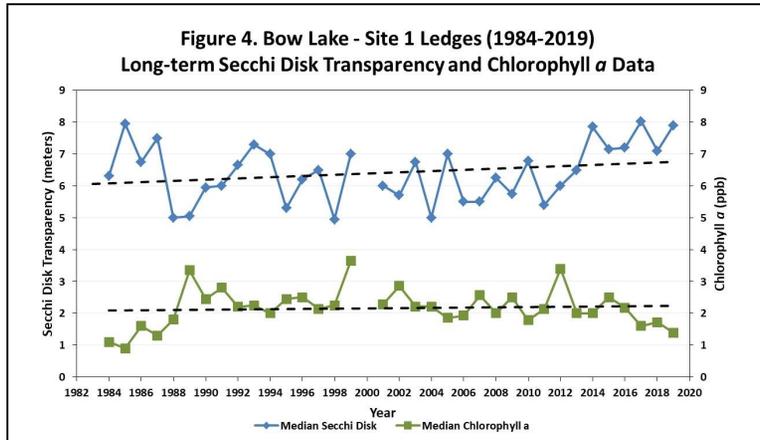


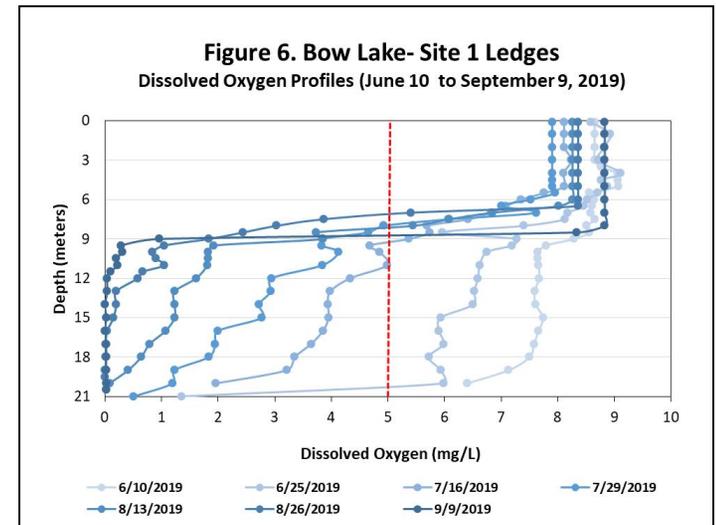
Table 3. Bow Lake Seasonal Average Water Quality Inter-site Comparison (2019)

Site	Average (range) Secchi Disk Transparency (meters)	Average (range) Chlorophyll <i>a</i> (ppb)	Average (range) Total Phosphorus (ppb)	Average (range) Dissolved Oxygen (ppm)
1 Ledges	7.3 (range: 5.4 - 8.3)	1.5 (range: 1.1 - 1.9)	6.5 (range: 4.8 - 7.9)	0.3 (range: 0.0 - 1.1)
3 Bennett	7.1 (range: 5.3 - 8.4)	1.5 (range: 1.1 - 1.9)	6.6 (range: 5.1 - 9.8)	0.3 (range: 0.0 - 0.6)

• Dissolved oxygen data were measured on August 26, 2019 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 2019. 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. Long-term trends are based on the analysis of annual median values.

Figure 6. Bow Lake dissolved oxygen concentrations collected between June 10 and September 9, 2019. 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.



Recommendations

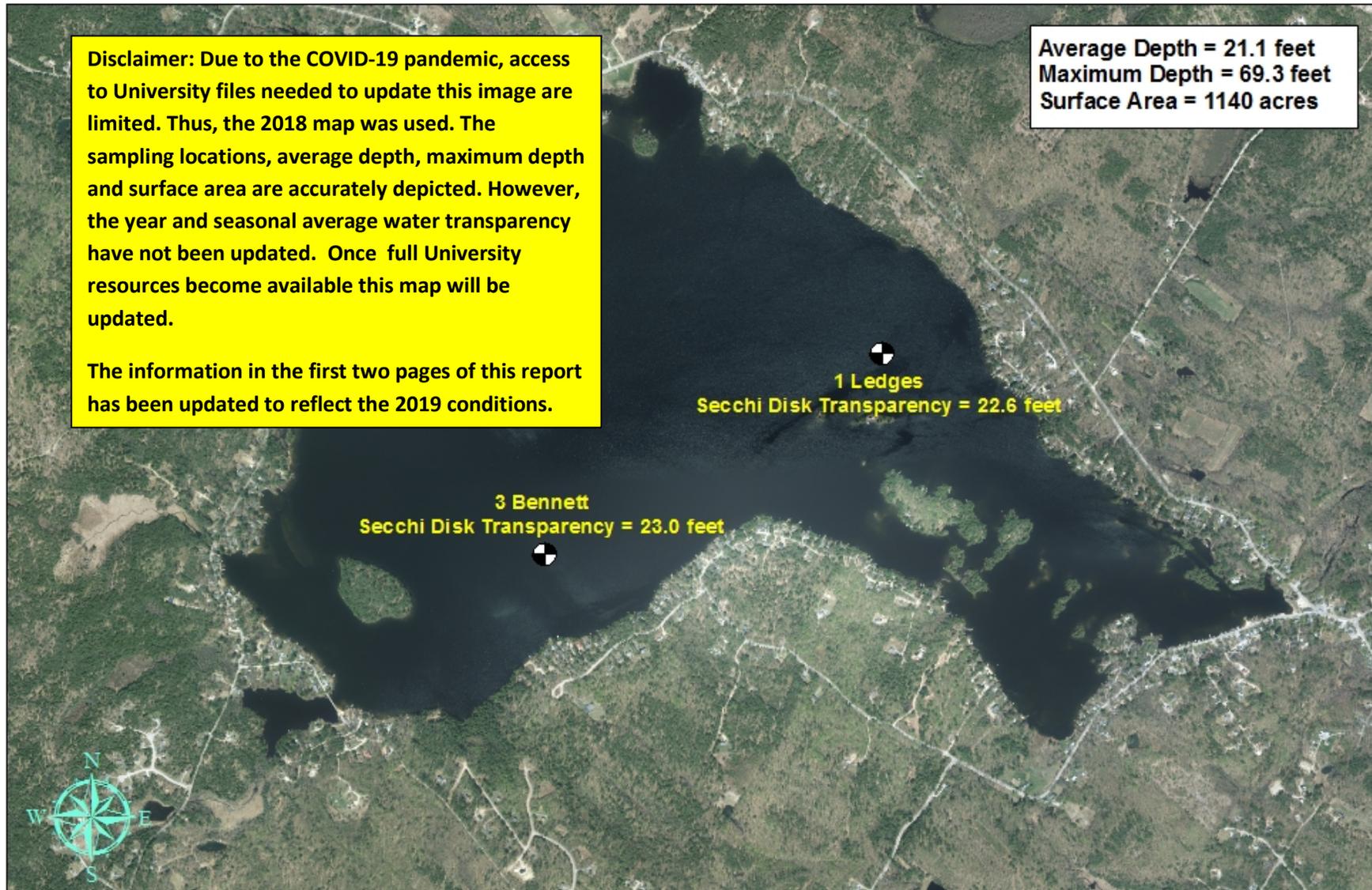
Implement Best Management Practices within the Bow Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Bow Lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions 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://soaknh.org/wp-content/uploads/2016/04/NH-Homeowner-Guide-2016.pdf>

Figure 7. Bow Lake

Strafford & Northwood, NH

2018 Deep water sampling locations and the seasonal average water clarity



0 0.25 0.5 0.75 1 Miles

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



Extension

