BOW LAKE

2021 SAMPLING HIGHLIGHTS

Station 1 Ledges

Strafford and Northwood, NH

NH | Extension

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

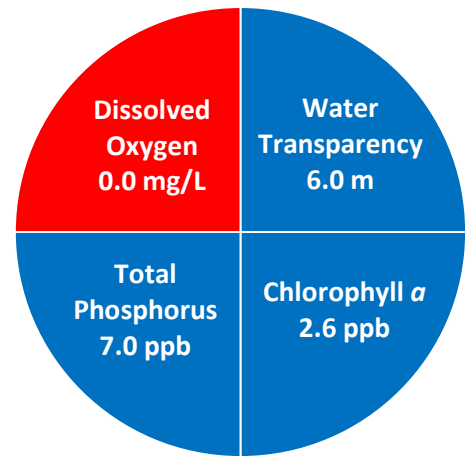|	
Dissolved Oxygen 0.0 mg/L	**Water Transparency 6.0 m**
Total Phosphorus 7.0 ppb	**Chlorophyll *a* 2.6 ppb**

Figure 1. Bow Lake Water Quality (2021)

Table 1. 2021 Bow Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]

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	**6.0** meters (4.8 – 7.9)	**Oligotrophic**
Chlorophyll *a* [1] (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**2.6** ppb (1.5 – 4.0)	**Oligotrophic**
Total Phosphorus [1] (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**7.0** ppb (5.3 – 8.0)	**Oligotrophic**
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	**0.0** mg/L (0.0– 0.1)*	**Eutrophic**

* Dissolved oxygen concentrations were measured on September 15, 2021 between 9.0 and 20.5 meters, in the bottom water layer.

Table 2. 2021 Bow Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Bow Lake – 1 Ledges Average (range)	Bow Lake – 1 Ledges Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**17.9** color units (range: 10.6 – 21.6)	**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	**4.3** mg/L (range: 3.9 – 5.5)	**Moderately vulnerable**
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**6.2** standard units (single value)	**Sufficient 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		**71.4** uS/cm (single value)	**Lakes with some human influence**

Figure 2. Bow Lake - Site 1 Ledges (2021 Seasonal Data) Secchi Disk Transparency and Chlorophyll *a* Measurements

Figure 3. Bow Lake - Site 1 Ledges (2021 Seasonal Data) Secchi Disk Transparency and Dissolved Color Measurements
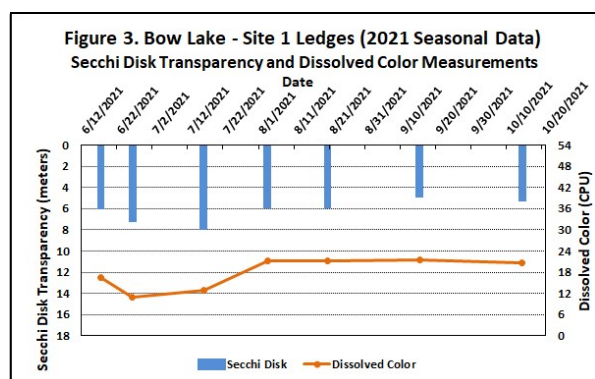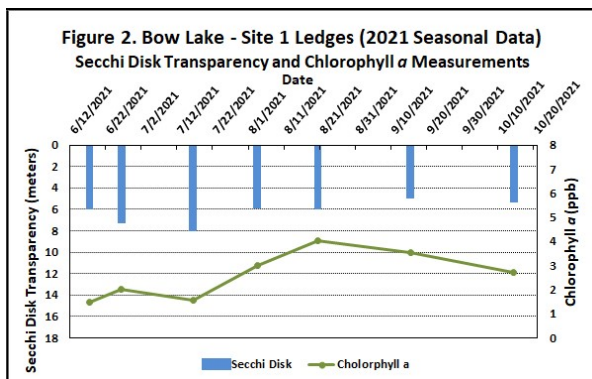
Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in 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-seven years of water quality monitoring conducted between 1984 and 2021 (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-seven years of water quality monitoring conducted between 1984 and 2021 (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-seven years of water quality monitoring conducted between 1984 and 2021 (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 thirty-seven years of water quality monitoring conducted between 1984 and 2021 (Figure 5).
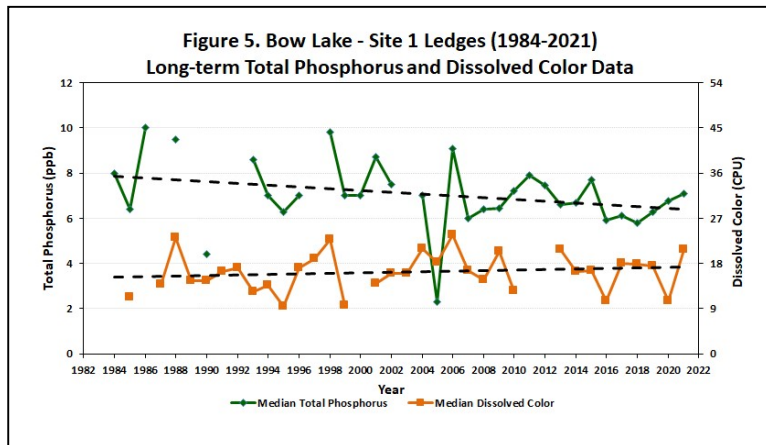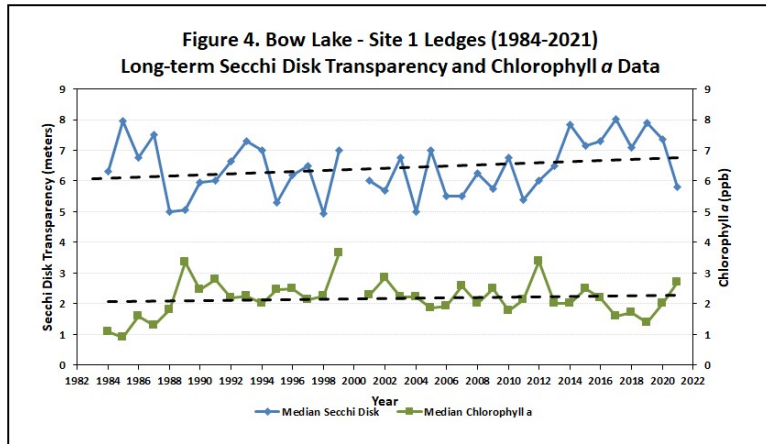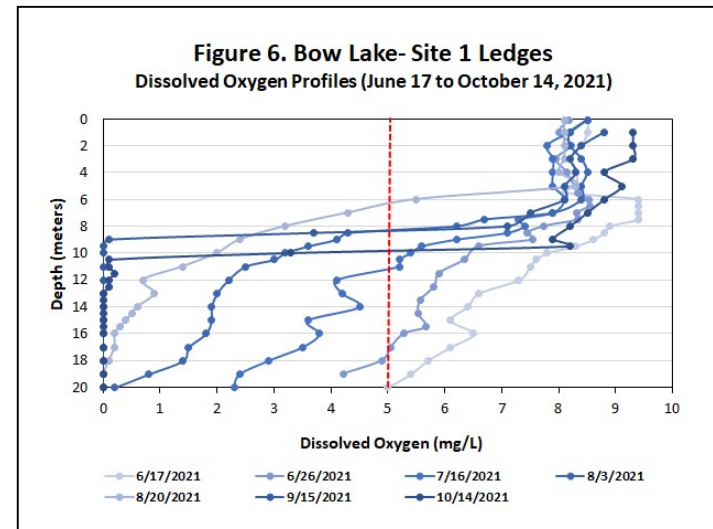

Figure 4. Bow Lake - Site 1 Ledges (1984-2021)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data

Table 3. Bow Lake Seasonal Average Water Quality Inter-site Comparison (2021)

Site	Average (range) Secchi Disk Transparency (meters)	Average (range) Chlorophyll *a* (ppb)	Average (range) Total Phosphorus (ppb)	Average (range) Dissolved Oxygen (ppm)
1 Ledges	6.0 (range: 4.8-7.9)	2.6 (range: 1.5-4.0)	7.0 (range: 5.3-8.0)	0.0 (range: 0.0 – 01)
3 Bennett	5.7 (range: 4.8-7.8)	2.9 (range: 1.5-4.8)	7.3 (range: 5.9-8.8)	0.0 (range: 0.0 – 0.1)

- Dissolved oxygen data were measured on September 15, 2021 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 2021. **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 17 to October 14, 2021. 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 July and September.*

Figure 5. Bow Lake - Site 1 Ledges (1984-2021)
Long-term Total Phosphorus and Dissolved Color Data

Figure 6. Bow Lake- Site 1 Ledges
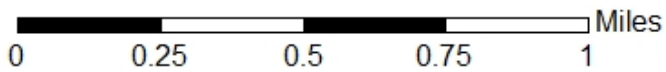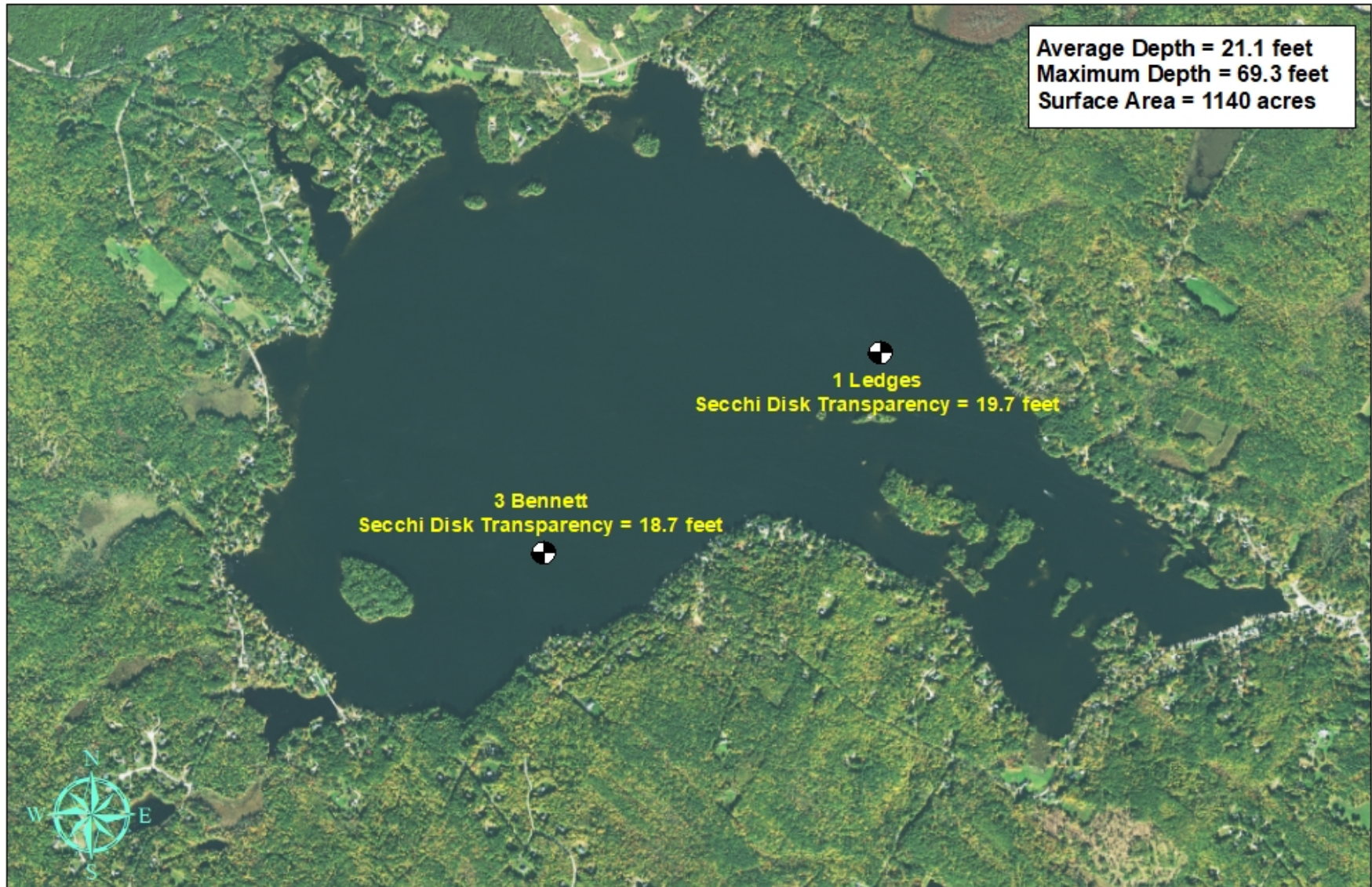Dissolved Oxygen Profiles (June 17 to October 14, 2021)

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.

- https://extension.unh.edu/resources/files/resource004159_rep5940.pdf
- https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/homeowner-guide-stormwater.pdf

Figure 7. Bow Lake
Strafford & Northwood, NH
2021 Deep water sampling locations and the seasonal average water clarity

Average Depth = 21.1 feet
Maximum Depth = 69.3 feet
Surface Area = 1140 acres

1 Ledges
Secchi Disk Transparency = 19.7 feet

3 Bennett
Secchi Disk Transparency = 18.7 feet

Miles
0   0.25   0.5   0.75   1

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