SUNSET LAKE

2021 SAMPLING HIGHLIGHTS

Station – 5 Center

Hampstead, NH

Extension

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. The data reported in Tables 1 and 2 were collected at the deep and centrally located sampling location, Site 1 Deep (Figure 7).

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

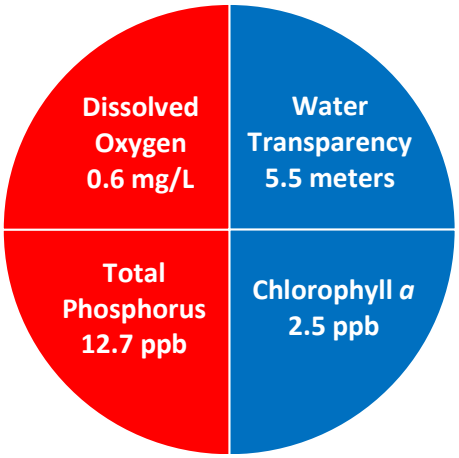


Figure 1. Sunset Lake Water Quality (2021)

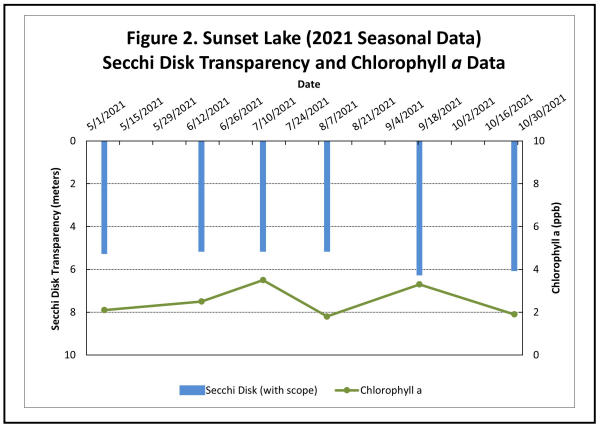
Table 1. 2021 Sunset Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Sunset Lake Average (range)	Sunset Lake Classification
Water Clarity (meters)	> 4.0 – 7.0	2.5 - 4.0	< 2.5	**5.5** meters (5.1 – 6.2)	Oligotrophic
Chlorophyll *a* [1] (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**2.5** ppb (1.8 – 3.5)	Oligotrophic
Total Phosphorus [1] (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**12.7** ppb (11.3 – 15.1)	Eutrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	**0.6** mg/L (0.1 – 1.0)	Eutrophic

* Dissolved oxygen concentrations were measured between 6.5 and 9.5 meters, in the middle and bottom cold bottom water layers, on September 18, 2021.

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

Parameter	Assessment Criteria					Sunset Lake Average (range)	Sunset Lake Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**22.3** color units (range: 16.0 – 31.3)	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	**21.0** mg/L (single value)	Low vulnerability
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**6.8** standard units (single value)	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		**277.5** *u*S/cm (range: 273.9 – 286.2)	Characteristic of lakes experiencing human disturbances



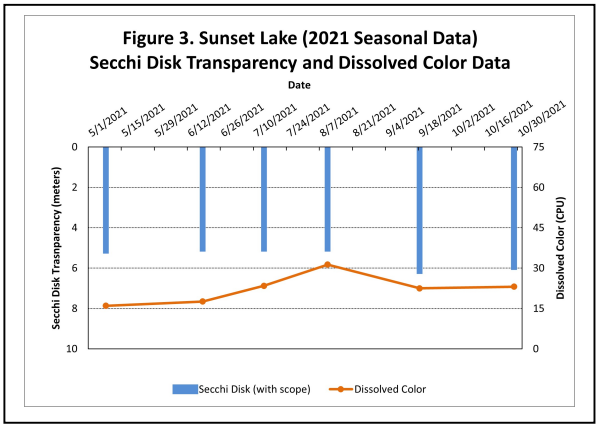


Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* concentrations and dissolved color concentrations. Shallower water transparency measurements oftentimes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

LONG-TERM TRENDS

WATER CLARITY: The Site 1 Deep water clarity measurements, measured as Secchi Disk transparency, display a trend of decreasing water clarity since 1984 (Figure 4). On a positive note, the Secchi Disk transparency was relatively stable between 2014 and 2017 before varying widely the past four years.

CHLOROPHYLL: The Site 1 Deep chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations since 1984 (Figure 4). On a positive note, the chlorophyll *a* concentrations have stabilized since 2010 with four of the lower median values documented between 2018 and 2021.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Site 1 Deep total phosphorus concentrations have oscillated among years while the long-term trend suggests a slight reduction (improvement) in total phosphorus concentrations (Figure 5).

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. Color has varied annually and displays a trend of increasing concentrations between 1985 and 2021 (Figure 5).

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

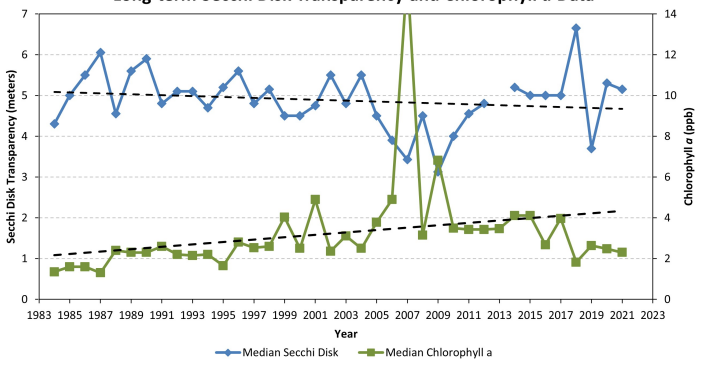
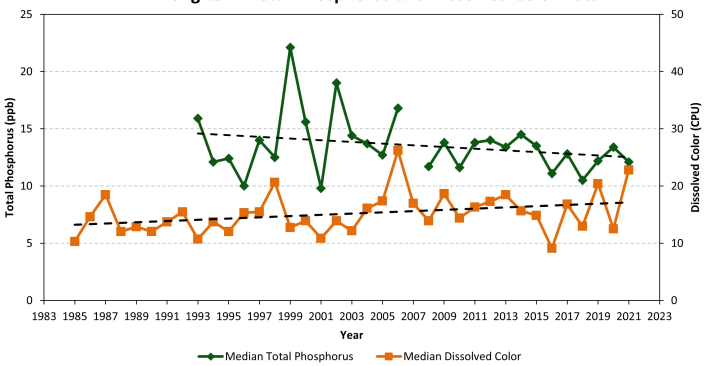


Figure 5. Sunset Lake - Site 1 Deep (1985 - 2021)
Long-term Total Phosphorus and Dissolved Color Data



Figures 3 and 4. Changes in the Site 1 Deep water clarity (Secchi Disk depth), chlorophyll *a* and total phosphorus concentrations measured between 1984 and 2021. **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.** *Long-term trends are based on the analysis of annual median concentrations. Median values reduce the impact of atypically high or low values and are preferred over the use of average values for long-term trend analysis. When a single measurement is collected, the mean and median values are identical.*

Table 3. Sunset Lake near-shore total phosphorus measurements collected on July 14, 2021 as part of a shoreline survey. The July 14, 2021 total phosphorus concentrations were relatively stable among sampling locations.

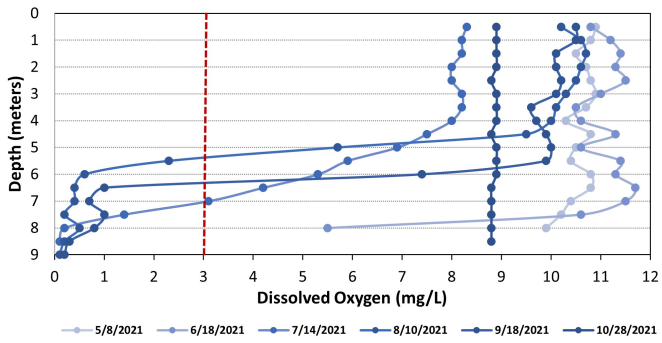
Figure 2. Site 1 Deep dissolved oxygen profiles were collected between May 8 and October 28, 2021. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of warm water fish such as bass and perch. *Notice the low oxygen concentrations near the lake bottom between July 14 and September 18.*

Table 3. Near-shore Total Phosphorus Inter-comparison (2021)

Site	Total Phosphorus (ppb)
S-03	12.6
S-04	11.9
S-05	11.6
S-06	11.5
S-08	11.5
S-09	13.5
S-10	15.5
S-11	15.0
S-13	12.5
S-14	11.6
S-16	13.1
S-18	10.3
S-19	11.1

- *Total phosphorus samples were collected on July 14, 2021 around the shoreline of Sunset Lake. The near-shore total phosphorus samples were collected at a standardized depth of 0.5 meters.*

Figure 6. Sunset Lake- Site 1 Deep
Dissolved Oxygen Profiles (May 8 through October 28, 2021)



Recommendations:

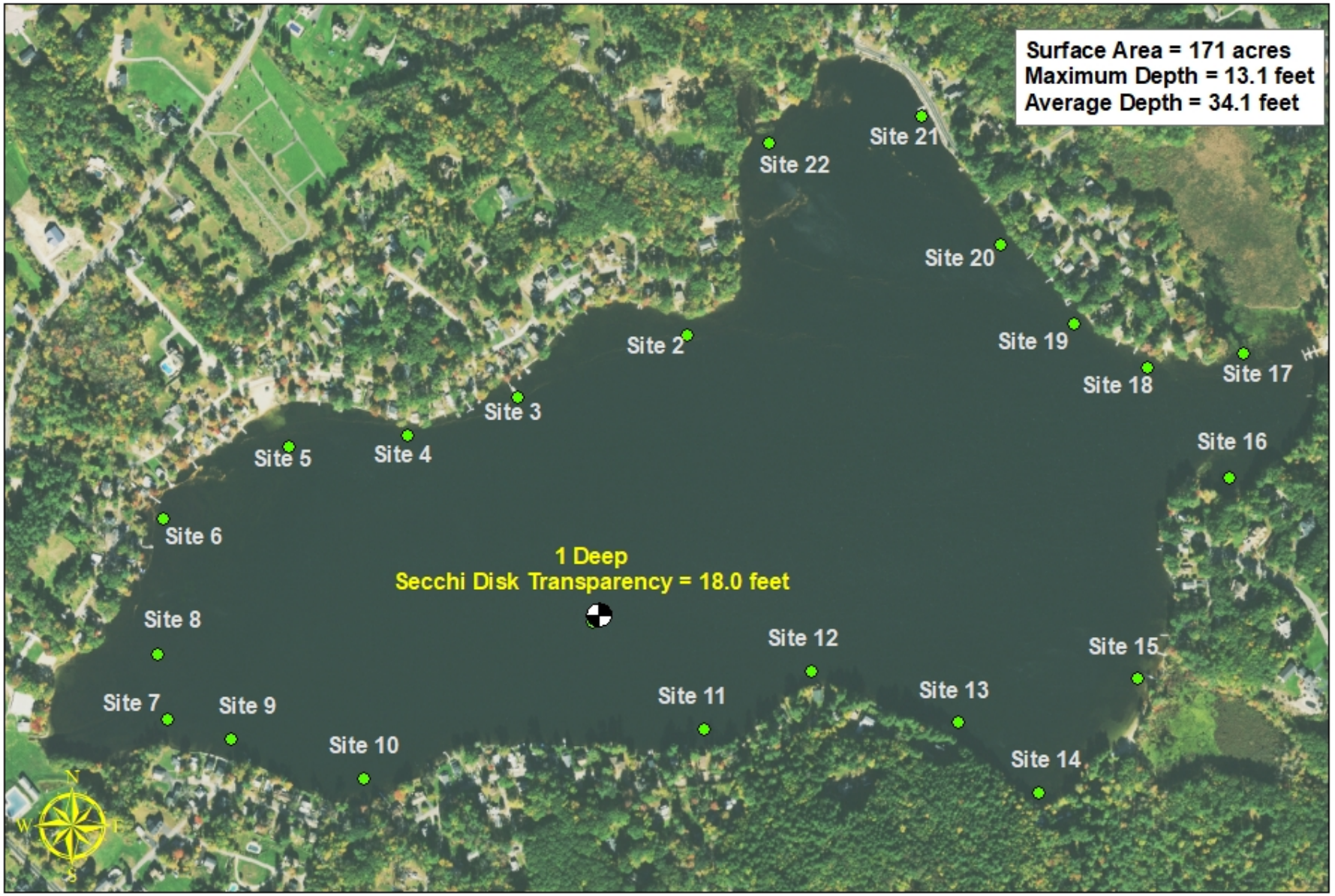
Implement Best Management Practices within the Sunset Lake watershed to minimize the adverse impacts of polluted runoff and erosion on Sunset Lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater 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
- https://extension.unh.edu/resource/rain-gardens-design-and-installation

Figure 7. Sunset Lake

Hampstead, NH

2021 Deep water sampling station and seasonal average water clarity



0 0.1 0.2 0.3 0.4 Miles

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