CRYSTAL LAKE

2013 SAMPLING HIGHLIGHTS

ENFIELD, NH

NEW HAMPSHIRE
LAKES LAY MONITORING

Crystal Pond volunteers collected water quality data between June 9 and September 28, 2013.

Light Blue = Outstanding = Ultraoligotrophic

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

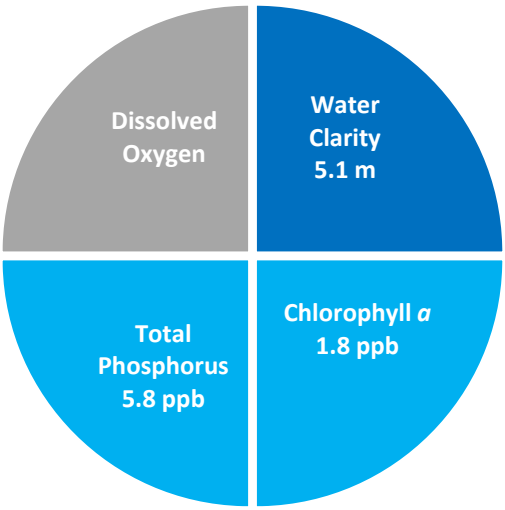

Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 5.1 meters in Crystal Lake. The 2013 water clarity decreased relative to the 2012 levels.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 1.8 parts per billion (ppb) in Crystal Lake. The 2013 chlorophyll *a* concentrations were similar to the 2012 levels.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations collected in Crystal Lake averaged 5.8 ppb. The 2013 Crystal Lake total phosphorus concentrations remained below 10 ppb, which is considered sufficient to support green water events that are referred to as algal blooms.

DISSOLVED OXYGEN: Dissolved oxygen is important for the health of fisheries. Dissolved oxygen measurements were not collected in 2013.

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. The Crystal Lake color averaged 34.5 color units (CPU). Wet years tend to increase wetland drainage and the associated dissolved colored substances that enter the lake. This increase in the "tea" color reduces light penetration, and is oftentimes associated with reduced water clarity.

ALKALINITY: Alkalinity measures the lake's resistance against acid rain. The average Crystal Lake alkalinity measured 8.1 milligrams per liter (mg/L). The 2013 alkalinity indicates Crystal Lake has a moderate vulnerability to acid rain.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific conductivity was not monitored in Crystal Lake in 2013.

CYANOBACTERIA: Cyanobacteria are the measure of potentially harmful plant-like bacteria**.** Cyanobacteria measurements were not collected in 2013.

Note: Site 1 Deep (see map) was used as the reference point to give an overall representation of the Crystal Lake water quality discussed in this summary. For a more detailed discussion of water quality measurements, please refer to the executive summary within the annual Crystal Lake water quality report.

Table 1. 2013 Crystal Lake Seasonal Average Water Quality Readings and Trophic Level Classification Criteria used by the New Hampshire Lakes Lay Monitoring Program

Parameter	Ultraoligotrophic "Outstanding"	Oligo "Excellent"	Meso "Fair"	Eutrophic "Poor"	Crystal Lake Average (range)	Crystal Lake Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	**5.1** meters (range: 4.0 – 6.5)	**Oligotrophic**
Chlorophyll *a* (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	**1.8** ppb (range: 0.8 – 2.7)	**Ultraoligotrophic**
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	**5.8** ppb (range: 4.5 – 7.1)	**Ultraoligotrophic**
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	N/A	N/A
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter (ug/l) lake water, and/or 70,000 cyanobacteria cells per milliliter lake water.			The New Hampshire Department of Environmental services posts warnings at State beaches when cyanobacteria cell numbers exceed 70,000 cells per milliliter lake water.		

LONG TERM TRENDS

WATER CLARITY: Water clarity has increased over the past twenty-four years of sampling. The long-term trend is statistically significant.

CHLOROPHYLL: Chlorophyll *a* concentrations have decreased over the past twenty-four years of sampling. However, the long term trend is not statistically significant.

COLOR: Color has increased slightly over the past twenty-four years of sampling. However, the long term trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus concentrations have decreased since total phosphorus sampling began in 1991. However, the long-term trend is not statistically significant.

In summary, there are indications that the Crystal Lake water quality has improved at the deep and centrally located sampling location. Long-term water clarity has increased while phosphorus (nutrient) and chlorophyll *a* concentrations have decreased. Supplemental total phosphorus concentrations collected near the Bicknell stream inlet are higher than the corresponding deep site levels. Water quality variations are not unusual among sampling sites and can be an indication of localized phosphorus or other pollutant inputs into the lake.

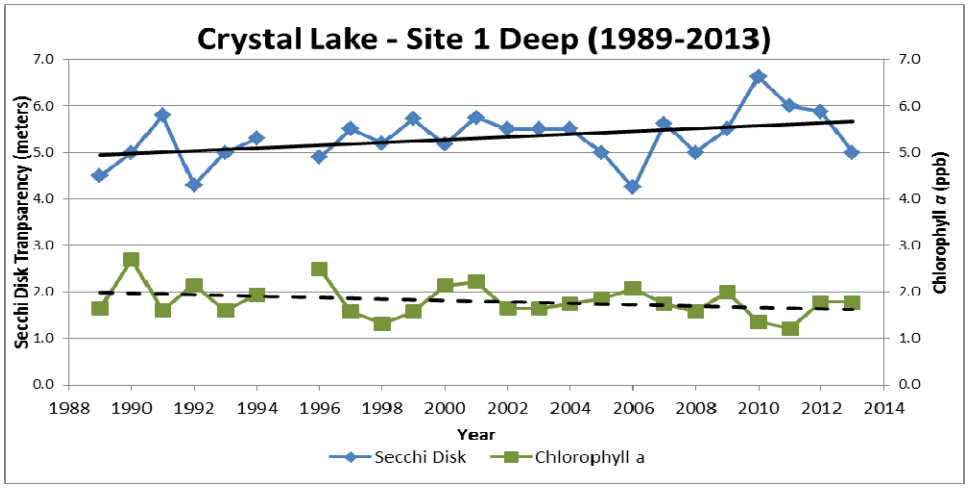

Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* concentrations measured from 1989-2013 at Site 1 Deep. There is a trend of increasing water clarity (solid line, statistically significant). Increasing water clarity is a positive trend for lakes if it is a response to reduced algae growth or polluted runoff. Algal growth (chlorophyll) has decreased slightly over the past twenty-four years of sampling. However, the long-term trend is not statistically significant (dashed line).

Recommendations:

- Implement Best Management Practices within the Crystal 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 guidance on how to improve water quality.
  https://extension.unh.edu/resources/files/Resource001799_Rep2518.pdf
  http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf
- Schedule a **Center of Freshwater Biology** field team visit during which a more in depth water quality survey would be conducted.
- Consider adding a simple cyanobacteria monitoring program that uses existing water quality sample collection protocols. Cyanobacteria collections from the spring through fall months can give insight into how these populations are distributed throughout the seasons and when they are most likely to be at harmful levels. If you are interested in discussing additional water quality monitoring options that would meet your needs please contact Bob Craycraft @ 862-3696 or bob.craycraft@unh.edu.

Crystal Lake

Enfield, NH

2013 Deep water sampling site and average seasonal water clarity

Aerial Orthophoto Source: NH GRANIT
Site locations GPSed by the UNH Center of Freshwater Biology

University of New Hampshire
Cooperative Extension

New Hampshire Lakes Lay Monitoring