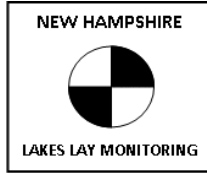


GREAT EAST LAKE

2013 SAMPLING HIGHLIGHTS

WAKEFIELD, NH & ACTON, ME



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

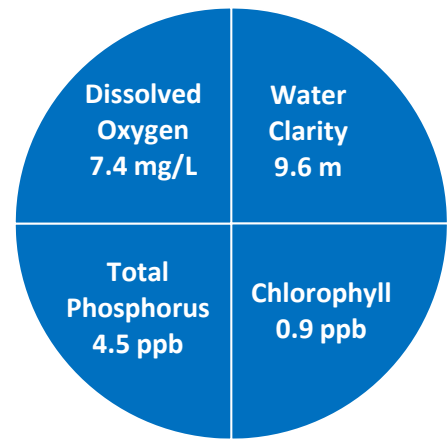


Figure 1. Average Water Quality Conditions

Great East Lake volunteers collected water quality data between June 10 and September 27, 2013 while a more in depth water quality survey of the Great East Lake deep sampling stations were conducted by the **Center for Freshwater Biology** on September 9, 2013.

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 9.6 meters (m) in Great East Lake. The 2013 Great East Lake water clarity was shallower than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 0.9 parts per billion (ppb) in Great East Lake. The 2013 Great East Lake chlorophyll *a* concentration was higher (greener water) than the 2012 level.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 4.5 parts per billion (ppb) and remained well below 10 ppb. A total phosphorus concentration of 10 ppb is considered sufficient to support green water events that are referred to as algal blooms.

DISSOLVED OXYGEN: Dissolved oxygen is important for healthy fisheries. Dissolved oxygen concentrations collected in the bottom waters ranged from 5.7 to 10.4 milligrams per liter (mg/L) on September 9, 2013. Dissolved oxygen concentrations were well above 5.0 mg/l, which is considered the threshold for the growth and reproduction of coldwater fish, such as trout and salmon.

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. The Great East Lake color averaged 10.7 color units (CPU).

ALKALINITY: Alkalinity measures the resistance the lake has against acid rain. The Great East Lake alkalinity averaged 8.4 milligrams per liter (mg/L) and indicates a moderate vulnerability to acid rain. The Great East Lake **pH**, a measure of lake acidity, measured 7.4 units and remained within the acceptable range for most aquatic organisms on the September 9, 2013 sampling date.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific Conductivity ranged from 62.0 to 64.0 micro-Siemans per centimeter ($\mu\text{S}/\text{cm}$) in Great East Lake. The Great East Lake specific conductivity indicates moderate concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

CYANOBACTERIA: Great East Lake did not take part in the 2013 cyanobacteria monitoring program. Please refer to the recommendation section for further information.

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

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

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Great East Lake Average (range)	Great East Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	9.6 meters (range: 8.2 – 10.9)	Oligotrophic
Chlorophyll <i>a</i> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	0.9 ppb (range: 0.3 – 1.5)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	4.5 ppb (range: 2.5 – 6.7)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	* 11.1 mg/L (range: 8.9 – 12.7)	Oligotrophic
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter ($\mu\text{g}/\text{l}$) 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.		

Dissolved oxygen concentrations are reported for the bottom layer. The chlorophyll *a* and total phosphorus trophic Level classification criteria are based on New Hampshire Department of Environmental Services standards.

LONG TERM WATER QUALITY TRENDS

WATER CLARITY: The Great East Lake water clarity data display a trend of increasing water clarity over the past twenty-seven years. The trend is statistically significant.

CHLOROPHYLL: The Great East Lake chlorophyll *a* data display a trend of decreasing chlorophyll *a* concentrations over the past twenty-seven years. The trend is statistically significant.

TOTAL PHOSPHORUS: The Great East Lake total phosphorus concentrations have increased over twenty-five years of water quality monitoring. The trend is statistically significant.

In summary, the long-term Great East Lake water clarity and chlorophyll data indicate trends of increasing water quality over the past twenty-seven years while the total phosphorus concentrations have increased since 1988. The increasing total phosphorus concentrations are a reminder that, while the Great East Lake water quality is high, increasing phosphorus (nutrient) concentrations remain a long-term threat to Great East Lake.

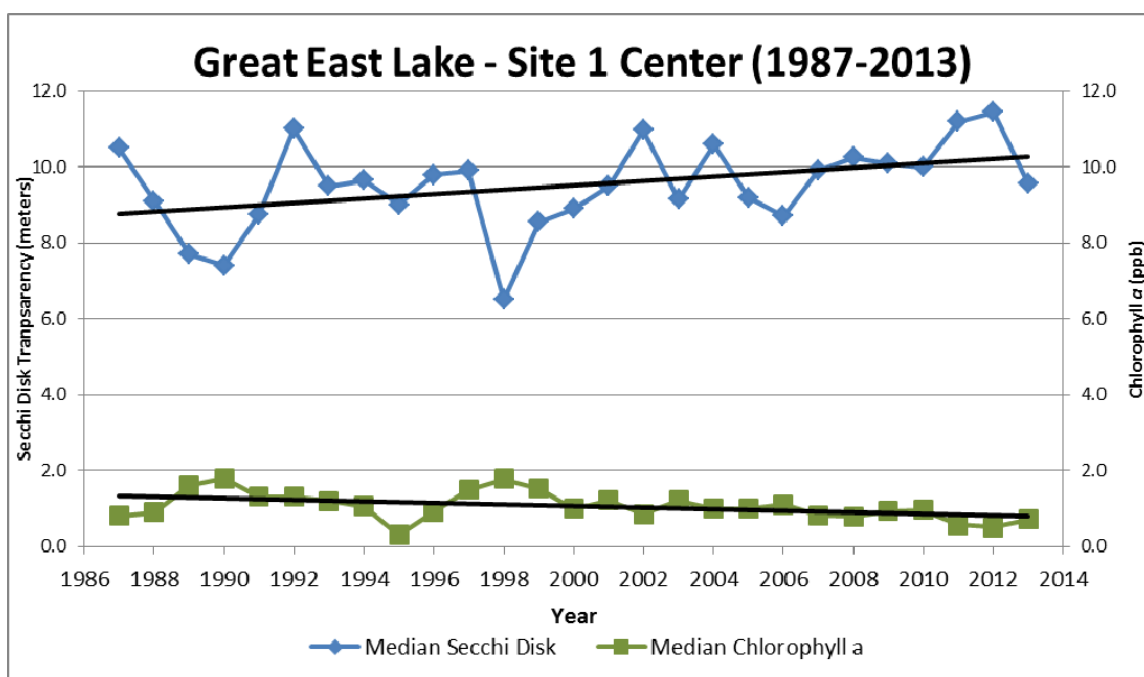


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1987 and 2013 at Site 1 Center. There has been an increasing water clarity trend, statistically significant with time (solid line). Algal growth (chlorophyll *a*) has decreased slightly since 1987 and is also statistically significance with time (solid line).

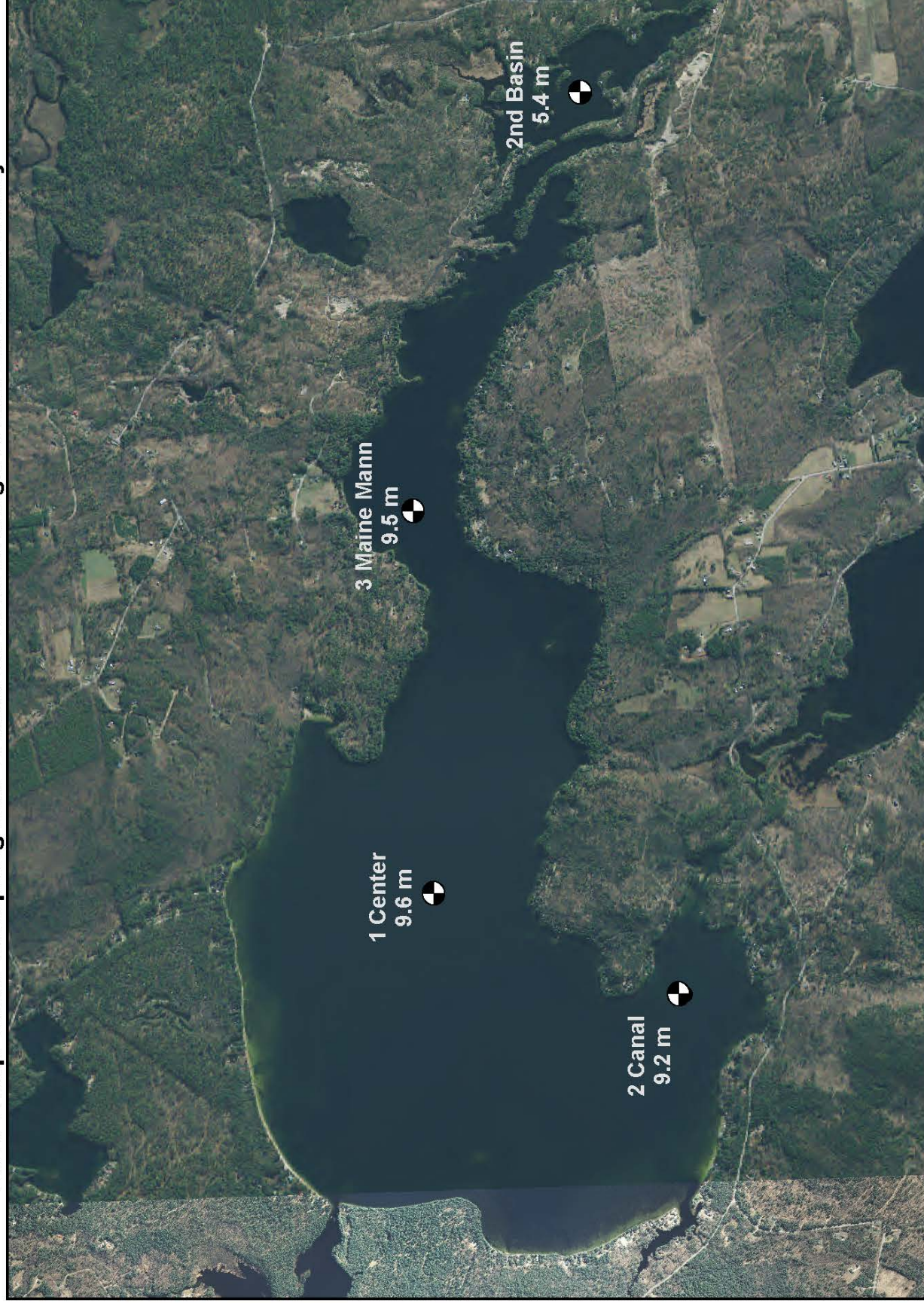
Recommendations:

- Implement Best Management Practices within the Great East 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 more information on how to reduce nutrient loading caused by overland run-off. The Acton Wakefield Watershed Alliance also offers technical assistance to help design and implement erosion control project that protect 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>
- Implement a simple cyanobacteria monitoring routine into the conventional water quality monitoring methods. Cyanobacteria collections throughout the summer and fall months can give insight into how these populations are distributed throughout the seasons and when they are most likely to reach 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 via email, bob.craycraft@unh.edu

Great East Lake

Wakefield, NH & Acton, ME

2013 Deep water sampling site locations with average seasonal water clarity



0.4 0.2 0 0.4 Miles

