LAKE WINNIPESAUKEE (Broads)

2016 SAMPLING HIGHLIGHTS

Station WINBGILD

Gilford, NH

Station WINBGILD (Figure 7) was used as a reference point to represent the condition of the deep and centrally located waters. Water quality data displayed in Tables 1, 2 and 3 were collected in the surface waters with the exception of the dissolved oxygen data that were measured near the lake bottom.

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

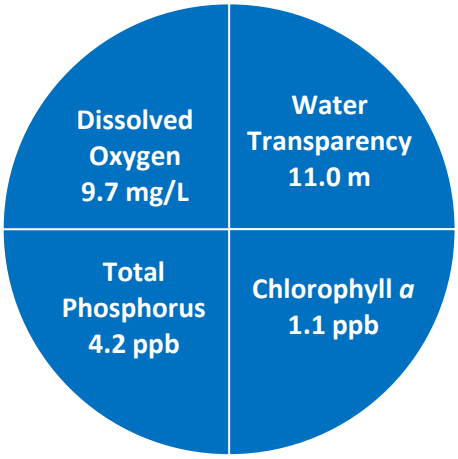


Figure 1. The Broads Water Quality (2016)

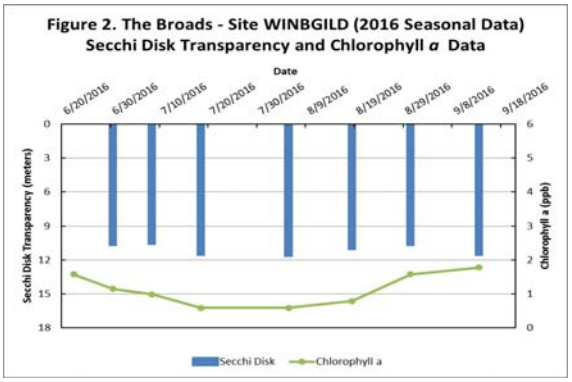
Table 1. 2016 The Broads Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	WINBGILD Average (range)	WINBGILD Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	**11.0** meters (10.5 – 11.6)	Oligotrophic
Chlorophyll *a* [1] (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**1.1** ppb (0.6 – 1.8)	Oligotrophic
Total Phosphorus [1] (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**4.2** ppb (2.9 – 7.2)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	**9.7 mg/L (9.4 – 10.2)**	Oligotrophic

* Dissolved oxygen concentrations were measured on June 30, 2016 between 10.0 and 30.0 meters, in the bottom waters.

Table 2. 2016 The Broads Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					WINBGILD Average (range)	WINBGILD Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**5.2** color units (range: 2.6 – 9.3)	Uncolored
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	**8.7** mg/L (range: 8.6 – 8.8)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**7.3** standard units (range: 7.3 – 7.3)	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		**76.0** *u*S/cm (range: 75.8 – 76.2)	Characteristic of lakes with some human influence



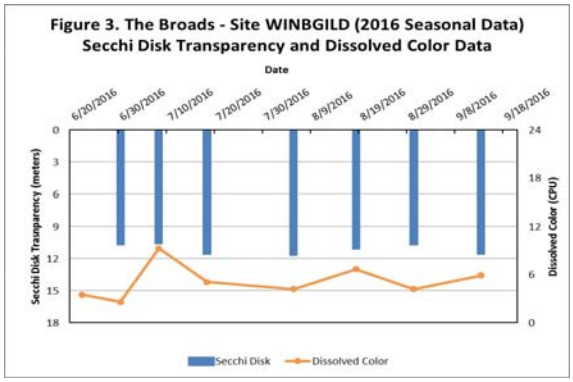


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll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

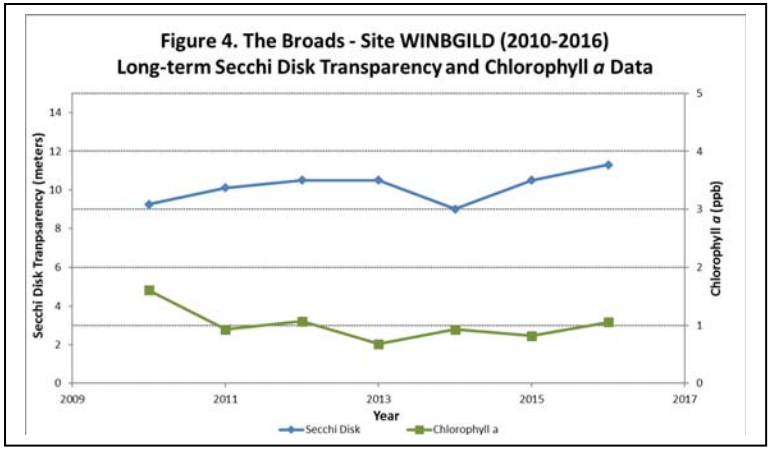
LONG-TERM TRENDS

WATER CLARITY: The Broads – Site WINBGILD Point water clarity measurements, measured as Secchi Disk transparency, have been collected over a span of seven consecutive sampling seasons. Due to the limited number of consecutive years sampled (less than ten) a trend analysis was not performed on the Secchi Disk transparency data (Figure 4).

CHLOROPHYLL: The Broads – Site WINBGILD chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, have been collected over a span of seven consecutive sampling seasons. Due to the limited number of consecutive years sampled (less than ten) a trend analysis was not performed on the chlorophyll *a* data (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Broads – Site WINBGILD total phosphorus measurements have been collected over a span of seven consecutive sampling seasons. Due to the limited number of consecutive years sampled (less than ten) a trend analysis was not performed on the total phosphorus data (Figure 5).

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. Color data have been collected over a span of seven consecutive sampling seasons. Due to a limited number of years sampled (less than ten) a trend analysis was not performed on the color data (Figure 5).



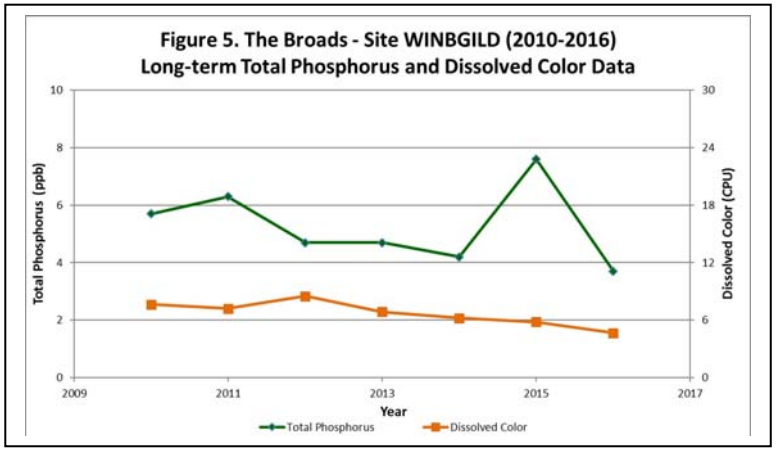
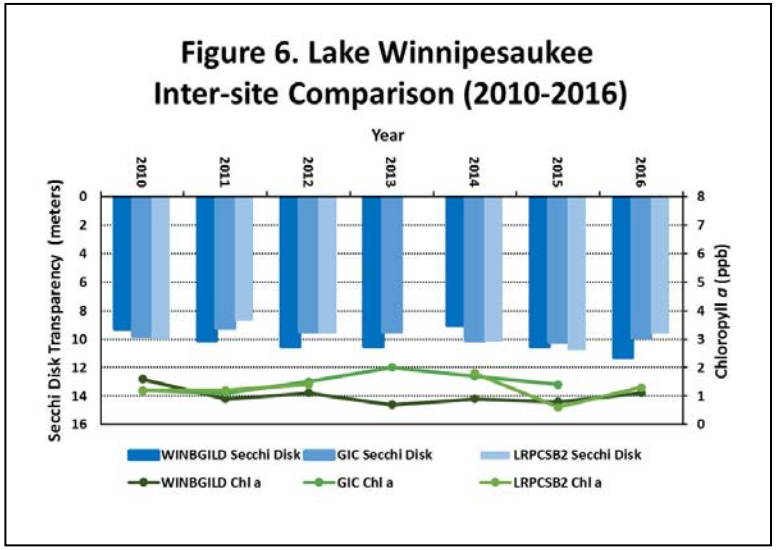


Table 3. Seasonal Average Water Quality Inter-site Comparison (2016)

Site	Average (range) Secchi Disk Transparency (meters)	Average (range) Chlorophyll *a* (ppb)	Average (range) Total Phosphorus (ppb)
WINBGILD	11.0 (range: 10.5 – 11.6)	1.1 (range 0.6 – 1.8)	4.2 (range: 2.9 – 7.2)
GIC	9.8 (range: 9.3 – 10.2)	1.1 (range: 0.7 – 1.3)	2.3 (single value)
LRPCSB2	9.9 (range: 9.3 – 10.7)	1.1 (range: 0.7 – 1.3)	4.8 (range: 3.9 – 5.8)

Figures 4 and 5. Changes in the Lake Winnipesaukee – WINBGILD water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 2010 and 2016. **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.**

Figure 6. Lake Winnipesaukee inter-site comparision among Sites WINBGILD, GIC and LRPCSB2. Both the Secchi Disk transparency and chlorophyll *a* measurements are displayed.



Recommendations

Implement Best Management Practices within the Lake Winnipesaukee watershed to minimize the adverse impacts of polluted runoff and erosion on Lake Winnipesaukee. 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. Lake Winnipesaukee - The Broads

Gilford, NH

2016 sampling sites and seasonal average water clarity

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

NH Extension