

LAKE WINNIPESAUKEE

(Bear Island)

2016 SAMPLING HIGHLIGHTS

Station WINBMERD

Meredith, NH



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

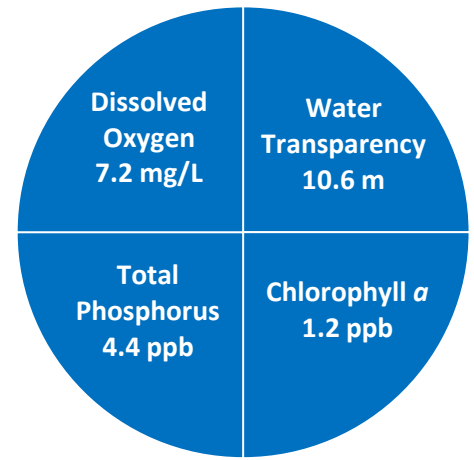


Figure 1. Bear Island Water Quality (2016)

Station WINBMERD (Figure 7) was used as a reference point to represent the water quality east of Bear Island. 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.

Table 1. 2016 Bear Island Seasonal Averages and NH DES Aquatic Life Nutrient Criteria¹

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	WINBMERD Average (range)	WINBMERD Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	10.6 meters (9.5 – 11.5)	Oligotrophic
Chlorophyll a ¹ (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	1.2 ppb (0.8 – 1.5)	Oligotrophic
Total Phosphorus ¹ (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	4.4 ppb (2.3 – 9.0)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	7.2 mg/L (6.4 – 8.2)	Oligotrophic

* Dissolved oxygen concentrations were measured on June 30, 2016 between 19.0 and 26.0 meters, in the bottom waters.

Table 2. 2016 Bear Island Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					WINBMERD Average (range)	WINBMERD 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 – 6.7)	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	8.9 mg/L (range: 8.7 – 9.1)	Moderately Vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			7.2 standard units (range: 7.2 – 7.2)	Optimal range for fish growth and reproduction
Specific Conductivity (uS/cm)	< 50 uS/cm Characteristic of minimally impacted NH lakes		50-100 uS/cm Lakes with some human influence	> 100 uS/cm Characteristic of lakes experiencing human disturbances		75.9 uS/cm (range: 75.0 – 76.6)	Characteristic of lakes with some human influence

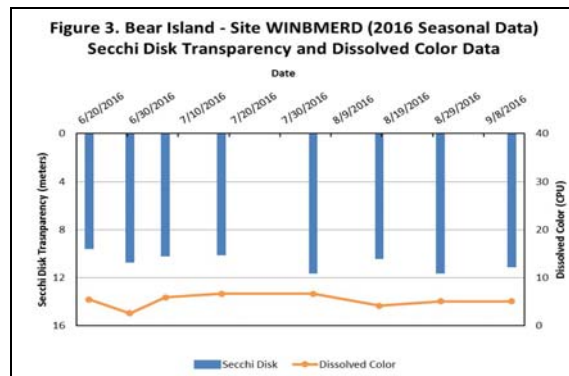
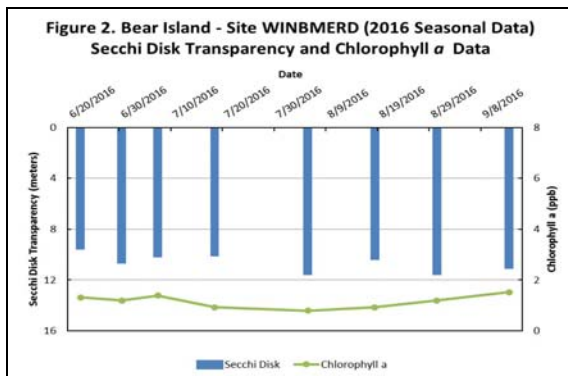


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll a and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll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

LONG-TERM TRENDS

WATER CLARITY: The Bear Island (WINBMERD) 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 Bear Island (WINBMERD) 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 Bear Island (WINBMERD) 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).

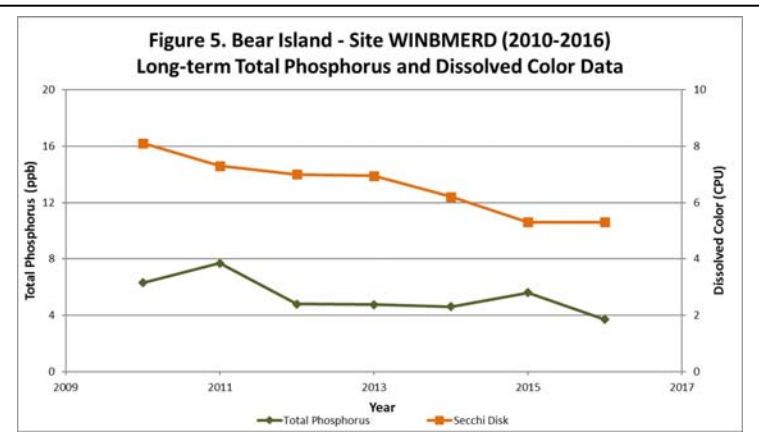
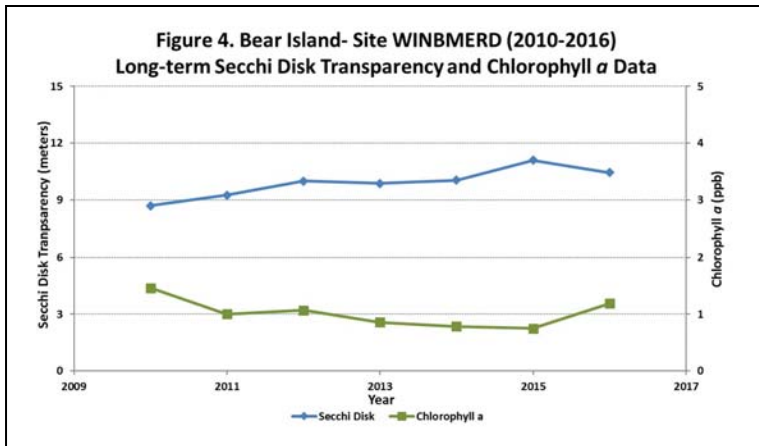
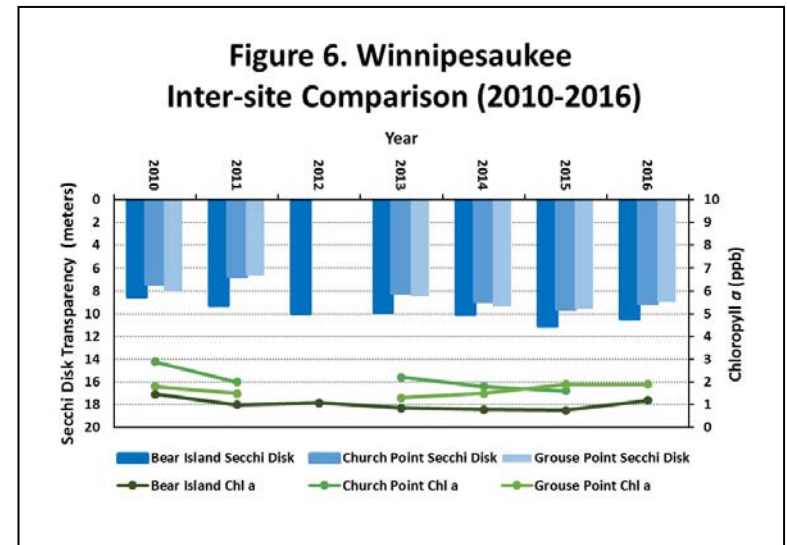


Table 3. Lake Winnepesaukee Seasonal Average Water Quality Inter-site Comparison (2016)

Site	Average (range) Secchi Disk Transparency (meters)	Average (range) Chlorophyll <i>a</i> (ppb)	Average (range) Total Phosphorus (ppb)
Bear Island (WINBMERD)	10.6 (range: 9.5 – 11.5)	1.2 (range: 0.8 – 1.5)	4.4 (range: 2.3 – 9.0)
2 Church Point	8.8 (range: 7.3 – 10.3)	1.6 (range: 1.2 – 2.2)	5.4 (range: 3.5 – 6.5)
3 Grouse Point	8.9 (range: 7.0 – 11.5)	1.8 (range: 1.3 – 2.4)	4.5 (range: 3.6 – 5.3)

Figures 4 and 5. Changes in the Lake Winnepesaukee – WINBMERD water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 2000 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 Winnepesaukee (Meredith) inter-site comparison among Sites Bear Island (WINBMERD), 2 Church Point and 3 Grouse Point. Both the Secchi Disk transparency and chlorophyll *a* measurements are displayed.



Recommendations

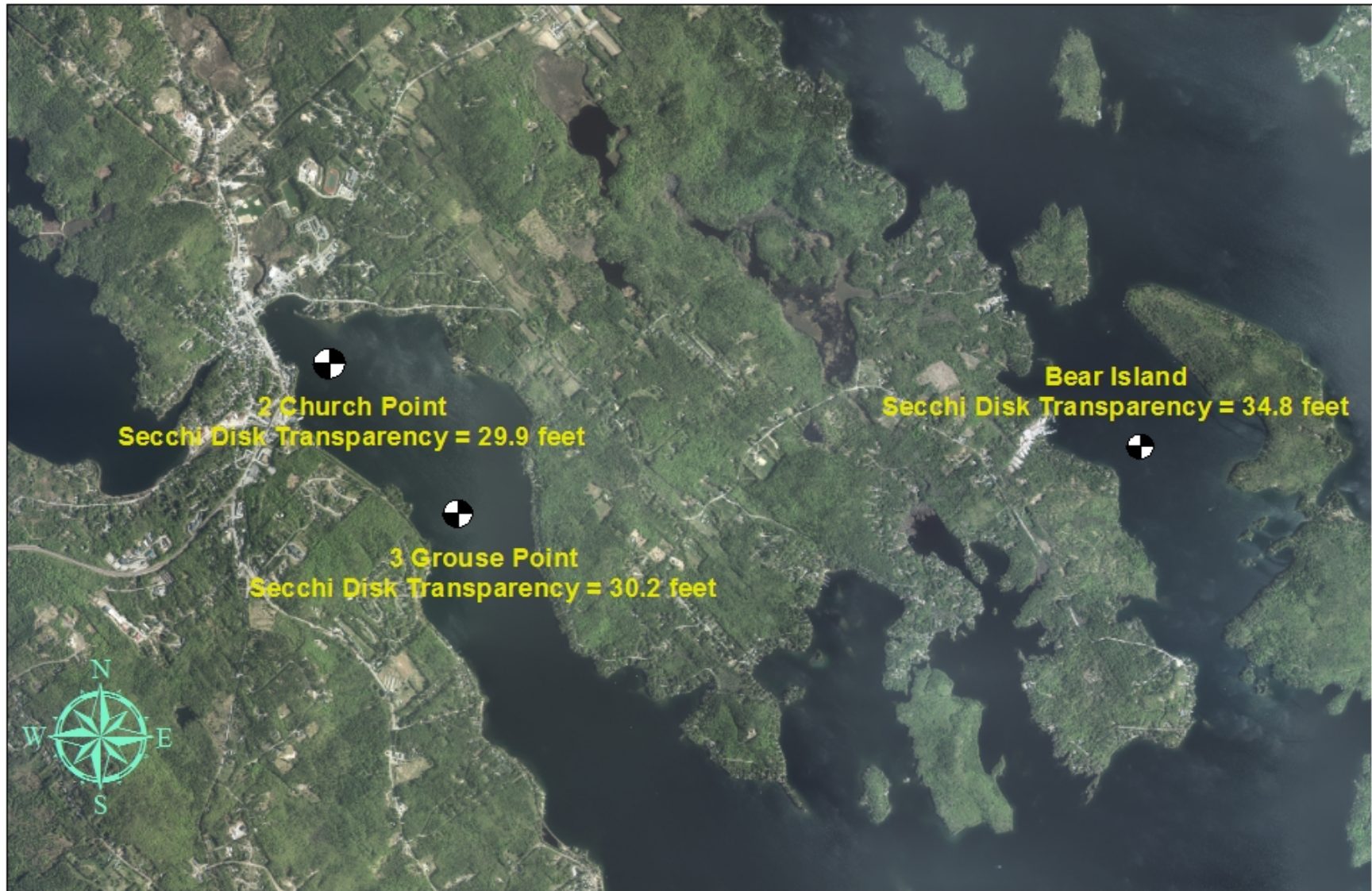
Implement Best Management Practices within the Meredith Bay watershed to minimize the adverse impacts of polluted runoff and erosion into Lake Winnepesaukee. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself 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 Winnepesaukee - Bear Island

Meredith, NH

2016 sampling sites and seasonal average water clarity



0 1 2 3 4 Miles

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



Extension

