

# BELLEAU LAKE

## 2016 SAMPLING HIGHLIGHTS

### Station – 1 Deep

Wakefield, NH



Blue = Oligotrophic

Yellow = Mesotrophic

Red = Eutrophic

Gray = No Data

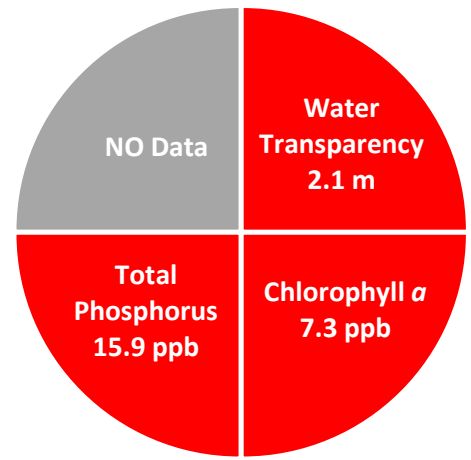


Figure 1. Belleau Lake Water Quality (2016)

Station 1 Deep (Figure 5) was used as a reference point to represent the overall Belleau Lake water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements.

Table 1. 2016 Belleau Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria<sup>1</sup>

| Parameter                           | Oligotrophic | Mesotrophic  | Eutrophic     | Belleau Lake Average (range) | Belleau Lake Classification |
|-------------------------------------|--------------|--------------|---------------|------------------------------|-----------------------------|
| Water Clarity (meters)              | 4.0 – 7.0    | 2.5 - 4.0    | < 2.5         | 2.1 meters (1.8 – 2.5)       | Eutrophic                   |
| Chlorophyll a <sup>1</sup> (ppb)    | < 3.3        | > 3.3 – 5.0  | > 5.0 – 11.0  | 7.3 ppb (5.1 – 12.5)         | Eutrophic                   |
| Total Phosphorus <sup>1</sup> (ppb) | < 8.0        | > 8.0 – 12.0 | > 12.0 – 28.0 | 15.9 ppb (13.9 – 19.6)       | Eutrophic                   |
| Dissolved Oxygen (mg/L)             | 5.0 – 7.0    | 2.0 – 5.0    | <2.0          | Not Assessed *               | N/A                         |

\* Belleau Lake did not develop a deep cold water layer needed to assess dissolved oxygen concentrations.

Table 2. 2016 Belleau Lake Seasonal Average Accessory Water Quality Measurements

| Parameter                     | Assessment Criteria                                      |                                |  |   |                       | Belleau Lake Average (range)          | Belleau Lake Classification                       |
|-------------------------------|--|--------------------------------|--|---|-----------------------|---------------------------------------|---|
|                               | < 10 uncolored   | 10 – 20 slightly colored       | 20 – 40 lightly tea colored                              | 40 – 80 tea colored   | > 80 highly colored   |                                       |   |
| Color (color units)           | < 10 uncolored   | 10 – 20 slightly colored       | 20 – 40 lightly tea colored                              | 40 – 80 tea colored   | > 80 highly colored   | 37.0 color units (range: 30.5 – 44.7) | 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 | 7.8 mg/L (range: 7.0 – 8.4)           | Moderately vulnerable                             |
| pH (std units)                | < 5.5 suboptimal for successful growth and reproduction  |                                | 6.5 – 9.0 optimal range for fish growth and reproduction |   |                       | 7.0 standard units (6.9 – 7.0)        | 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 |                       | 62.1 uS/cm (range: 57.5 – 64.9)       | Characteristic of lakes with some human influence |

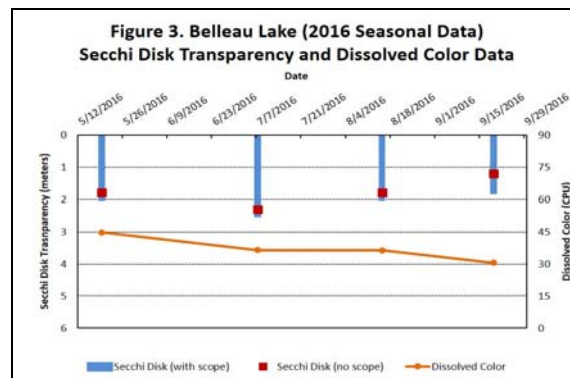
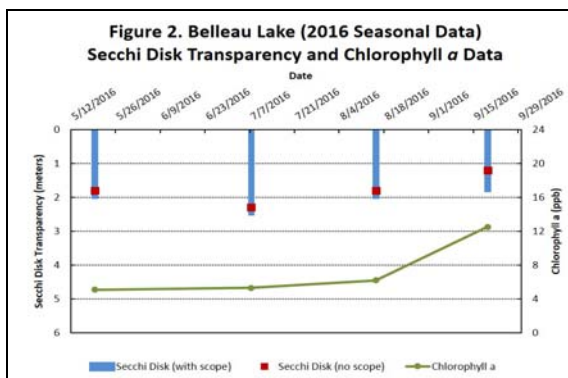


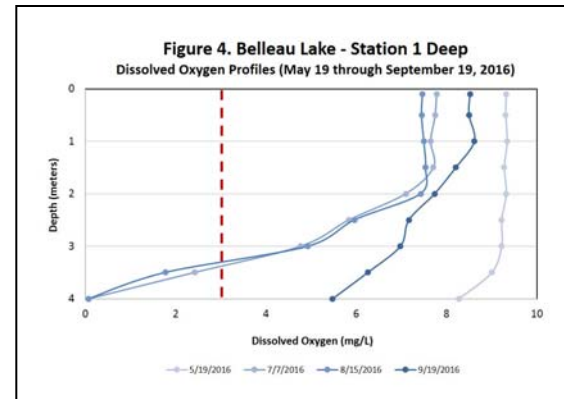
Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll a concentrations and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a and dissolved color. Shallower water transparency measurements oftentimes correspond to increases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

**Table 3. Acton Wakefield Watershed Alliance inter-lake water quality comparison (2016 Data)**

| Lake            | Average (range) Secchi Disk Transparency (meters) | Average (range) Chlorophyll <i>a</i> (ppb) | Average (range) Total Phosphorus (ppb) | Average (range) Dissolved Color (CPU) | Average (range) Dissolved Oxygen (mg/l) |
|-----------------|---|--|--|---------------------------------------|---|
| Belleau Lake    | 2.1 meters (range: 1.8 – 2.5)                     | 7.3 ppb (range: 5.1 – 12.5)                | 15.9 ppb (range: 13.9 – 19.6)          | 37.0 CPU (range: 30.5 – 44.7)         | -----                                   |
| Great East Lake | 11.6 meters (range: 11.2 – 12.5)                  | 1.2 ppb (range: 0.7 – 1.8)                 | 4.4 ppb (range: 2.9 – 6.8)             | 7.4 CPU (range: 5.0 – 10.6)           | 8.6 mg/l (range: 6.1 – 10.4)            |
| Horn Pond       | 7.3 meters (range: 6.2 – 8.8)                     | 1.9 ppb (range: 1.5 – 2.2)                 | 5.7 ppb (range: 4.3 – 7.6)             | 8.3 CPU (range: 5.1 – 10.6)           | 2.9 mg/l (range: 0.3 – 6.7)             |
| Lake Ivanhoe    | 4.1 meters (single value)                         | 3.9 ppb (range: 2.7 – 5.7)                 | 7.9 ppb (range: 7.4 – 8.4)             | 7.5 CPU (range: 5.1 – 8.8)            | -----                                   |
| Lovell Lake     | 7.5 meters (range: 5.0 – 9.6)                     | 2.8 ppb (range: 1.4 – 5.2)                 | 6.5 ppb (range: 5.1 – 7.8)             | 7.8 CPU (range: 5.9 – 9.0)            | 1.7 mg/l (range: 0.3 – 5.1)             |
| Pine River Pond | 5.8 meters (range: 4.5 – 7.0)                     | 2.5 ppb (range: 2.0 – 3.0)                 | 6.7 ppb (range: 5.8 – 7.7)             | 13.2 CPU (range: 8.0 – 18.1)          | 0.2 mg/l (range: 0.1 – 0.6)             |
| Province Lake   | 3.4 meters (range: 2.9 – 4.2)                     | 3.6 ppb (range: 3.0 – 4.5)                 | 14.9 ppb (range: 11.2 – 19.0)          | 17.5 CPU (range: 15.0 – 23.8)         | -----                                   |
| Wilson Lake     | 7.0 meters (range: 4.5 – 8.4)                     | 2.4 ppb (range: 1.3 – 3.5)                 | 5.5 ppb (range: 4.8 – 6.5)             | 11.2 CPU (range: 7.0 – 16.5)          | 0.1 mg/l (range: 0.1 – 0.1)             |

- Water quality data are reported for a deep reference sampling location in each water body
- Dissolved oxygen measurements were collected in the summer (late July and August) in the bottom water layer (hypolimnion or metalimnion).
- ----- Indicates the site is too shallow to form a deep water layer (hypolimnion or metalimnion) during the summer months.

Figure 4. Monthly Belleau Lake dissolved oxygen profiles collected between May 19 and September 19, 2016. 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.



## Recommendations

Implement Best Management Practices within the Belleau Lake watershed to minimize the adverse impacts of polluted runoff and erosion on Belleau 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 projects that protect and improve water quality.

- [http://extension.unh.edu/resources/files/Resource004159\\_Rep5940.pdf](http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf)
- <http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf>
- <http://awwatersheds.org/healthy-lakes/conservation-practices-for-homeowners/>

**Figure 5. Belleau Lake  
Wakefield, NH  
Deep sampling site and 2016 seasonal average water clarity**



0 0.1 0.2 0.3 0.4 0.5  
Miles

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



**Extension**

