# Lower Bolton Lake

Status Update June 20, 2017

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### **Identified Threats To Lower Bolton Lake**

#### Proliferation of Southern Naiad

• Invasive (Non-native) Aquatic Plants

• <u>Severe Cyanobacteria Blooms</u>

#### **Background 1** Lake water sampling stations

- Station 1
  - Deep water =
  - Top, middle, bottom
- Station 2
  - Shallow water =
  - Top & bottom
- Outflows from Middle, Upper, and Lower Bolton Lake



### **Depth Area Curve for LBL**



#### **Background 2**

- 1. WQ data collected in April and September 1979 by CAES &
- 2. Diagnostic study by CT DEP 1978-1979
- 3. Deep (60-70 inches) drawdowns of Middle Bolton Lake during winters of 2006-7, 2007-8, and 2008-9 *(see next)*
- 4. WQ collected on July 27, 2011; and July 3 2012; by NEAR
- 5. In 2011, NEAR mapped 12-15 acres of floating naiad (see following)
- 6. Bloom of blue-green algae in late August 2012
  - Clarity declined from 4 m in early July to 0.5 m in late August
  - NEAR started frequent lake samplings on August 27, 2012
- 7. Sonar herbicide applied May 30, 2013
- 7. Follow-up Sonar booster and copper sulfate applied to deeper water on June 27, 2013

#### Winter Water Level Drawdown of Middle Bolton Lake

Middle Bolton Lake Levels During Deep Drawdowns 2006 - 2010



### Floating rafts of Southern Naiad in Lower Bolton Lake July 27, 2011



### **Southern Naiad**

• Southern Naiad was removed from the <u>Threat List</u> in 2016. Only tiny trace plants have been found since application of the herbicide; Fluridone in 2013.

### Invasive (Non-native) Aquatic Plants 1

- Milfoil (sp.) identified as; <u>most abundant</u> in 1978, and <u>sparse</u> in 1979 (CT DEP)
  - Incidentally CT DEP found only 3 other species in LBL
    - White water-lily, cattail, and Musk-grass
- NEAR findings in 2012 (17 native species)
  - Variable milfoil in small isolated pockets along western shore
  - Fanwort in small cove on western shore
  - Mudmat in tiny patches along southern shore

Not found since 2013 treatment

# Invasive (Non-native) Aquatic Plants 2 Curly-leaf pondweed found in late 2014

Curly-leaf pondweed found in spring 2017



#### Severe Cyanobacteria Blooms

- Important nutrients that stimulate cyanobacteria:
  - Phosphorus
  - Nitrogen
    - Ammonium
    - Nitrate
    - Organic
  - Iron

#### Cyanobacteria Bloom Related Factors Trends discussed tonight

- Water Clarity
- Cyanobacteria cell numbers
- Phosphorus
- Nitrogen
- Iron
- Dissolved oxygen

#### Lake 226 – Northwest Ontario ~1968



N & C

only



# CT DEEP trophic categories and paired total phosphorus

#### and water clarity (Frink and Norvell 1984)



### Total phosphorus trends in LBL



### **Total phosphorus trend**

#### -bottom water



### Water clarity trend at LBL



### Water Clarity of LBL in 1979



# Clarity readings in 2017

- 3-30-17 = 3.4 meters
- 4-24-17 = 2.85 meters
- 5-8-17 = 2.8 meters
- 6-5-17 = 3.1 meter

### Trends in plankton cell numbers







Oct

Jan

Jul

Apr

Oct

Jan

Apr

Jul

Oct

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May

Feb

0 -

Apr

Oct

Jan

Jul

Jul

Apr

Oct

Jan

Apr

Jul

Trends in dissolved oxygen boundary



#### Watershed Sampling Stations

#### • TP

- Average = 235 ppb
- Max = 678 ppb
- Min = 13 ppb

#### • TN

- Average = 777 ppb
- Max = 1,852 ppb
- Min = 77 ppb
- Nitrate
  - Average = 181
  - Max = 1,090
  - Min = 41

#### TSS

- Average = 111 mg/L
- Max = 335 mg/L
- Min = 3 mg/L



#### Phosphorus / Water Clarity revisited



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### Summary

- No southern naiad was found in 2016
- No fanwort or variable milfoil found in 2016, however, now battling curly-leaf pondweed
- Both Phosphorus and Nitrogen are trending down
- Iron still high but suggestions of a decreasing trend
- Water clarity dramatically improved in 2016
- Dissolved oxygen improved with considerably less anoxia in 2016
- Location of LBL on the phosphorus / clarity model shows LBL was essentially a different lake in 2016 over 2013
- Internal phosphorus loading duration dramatically decreased in 2016
- Internal nitrogen loading not severe in 2016
- Focus now on watershed sources of nutrients

#### **Creeping Normalcy**

"Perhaps the commonest circumstance under which societies fail to perceive a problem is when it takes the form of a slow trend concealed by wide up-anddown fluctuations"

> - Jared Diamond *Collapse*