Lower Bolton Lake

Bolton Town Hall
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Working Hypothesis

1. Deep drawdowns of Middle Bolton Lake fueled high growth rates of naiad in Lower Bolton Lake
   1. 60-70 inches during 2006-7, 2007-8, and 2008-9

2. Lower Bolton Lake provided better than average conditions for prolific naiad growth

3. Rafts of floating naiad caused nutrient levels to go up in Lower Bolton Lake
   1. 12-15 acres of floating rafts of southern naiad

4. Combination of higher phosphorus and nitrogen caused blue-green 2012 algae bloom in Lower Bolton Lake
   1. Clarity declined from 4 m in early July to 0.5 m in late August
Approach for 2013

- Monitor the lake regularly during 2013, beginning in the spring to:
  - **Track nutrient chemistry, water clarity, naiad growth, and blue-green cell numbers**
  - Investigate watershed for sources of nutrients ***
  - Search for remaining fanwort beds
  - Construct a nutrient mass balance for the lake starting over the winter
  - May look under the ice if we have a good winter ***
  - Investigate the end-of-pipe area in LBL
Tonight's Presentation

- Lake visits to track nutrient chemistry, water clarity, naiad growth, (and blue-green cell numbers ***)
- Search for remaining fanwort beds
- Construct a nutrient mass balance for the lake starting over the winter
- Discuss 2014
Lake Visits

- Visited two stations
  - Station 1
    - Deep water =
      - Top, middle, bottom
  - Station 2
    - Shallow water =
      - Top, bottom
  - Outflow from Middle Bolton Lake
Lower Bolton Lake Watershed

Watershed size of 2,419 acres = drainage area of 2,244 acres

Watershed of Middle Bolton Lake = 1,945 acres

Watershed of Upper Bolton Lake = 1,460 acres
Phosphorus in Middle Bolton outflow and LBL

**Graph: Total Phosphorus (ppb) for Months 2013**

- **Middle Bolton Outlet**
- **LBL Surface St 1**
- **LBL Surface St 2**

- The graph compares the total phosphorus concentration in different samples over the months of 2013.
- The highest concentration is observed in September, with values exceeding 50 ppb.
- The concentrations vary significantly throughout the year, indicating seasonal changes.
LBL 2013 Phosphorus
Phosphorus at different stations in LBL

- **top**
  - Station 1
  - Station 2

- **middle**
  - Station 1
  - Station 2

**Months 2013**

**Total Phosphorus - ppb**
LBL 2013 Phosphorus as Mass

Months 2013

Total Phosphorus - kg

- top
- middle
- bottom
- Total
Water Clarity During 2013

Water Clarity - meters

Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0
Two Years of Water Clarity

Water Clarity - meters

2012 - 2013
Water Temperature

Months 2013

Water Temperature °C

Surface

Bottom
Dissolved Oxygen

Dissolved Oxygen mg/L

Months 2013

- Surface
- Bottom
Anoxic Boundary in LBL

Months 2013
Deep Water Conditions

Nitrogen ppb

Ammonia
Total Nitrogen
Total Iron

Months 2013

Feb Mar Apr May Jun Jul Aug Sep Oct Nov
Southern Naiad in LBL
July 29, 2013

- Large-leaf pondweed
- Tape grass
- Coontail
- Fanwort
Location of fanwort in LBL
Summary

- Phosphorus in LBL increased steadily during the season
- Phosphorus in the LBL was higher than in water from MBL
- Water clarity declined steadily during the season
  - blue-greens did not dominate instead plankton was composed of green and diatom alga
- Dissolved oxygen was depleted in bottom waters
- Total iron became dissolved in water column at high concentrations adding to poor clarity
- Southern naiad was practically none existent throughout the lake
- A few fanwort plants were found in a small cove on the western shore
## Lower Bolton Lake – Treatment Program Summary

<table>
<thead>
<tr>
<th>Task</th>
<th>Date</th>
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<tbody>
<tr>
<td>Received CT DEEP Permit</td>
<td>April 9&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>Pre-Treatment Inspection (ACT)</td>
<td>April 16&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>Initial Sonar Herbicide Treatment</td>
<td>May 20&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>Inspection</td>
<td>June 4&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>-Follow-Up Booster Herbicide Treatment</td>
<td>June 27&lt;sup&gt;th&lt;/sup&gt;</td>
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<tr>
<td>-Copper Sulfate Algaecide Treatment (1/2 lake)</td>
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<tr>
<td>Inspection</td>
<td>August 6&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>-Inspection</td>
<td></td>
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<tr>
<td>-Small Fanwort Treatment</td>
<td>September 5th</td>
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- Inspections also conducted by NEAR
- Excellent naiad control (>95% reduction) achieved by end of July
Lower Bolton Lake
–
2014
Recommendations

Recommended Budget:

• Prepare and file Permit application with CT DEEP
• Contingency Reward and/or Clipper herbicide treatment (for naiad or fanwort re-growth)
• Copper sulfate algaecide treatments as needed
• OPTIONAL – TO BE DISCUSSED - SeClear/Alum treatment – Added water quality enhancement, phosphorus removal