Water Quality in Bughs and Napowanan Lakes

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Center for Watershed Science and Education
UW-Stevens Point
Tonight’s discussion

- How do we measure water quality?
- How is the water quality in Bugh's and Napowan Lakes?
- How does the landscape affect the lakes?
- What can be done to sustain or improve the water quality for future generations?
A lake is a reflection of its watershed...
Water Quality

- Dissolved Oxygen
- Water Clarity
- Nutrients
- Minerals and Pollutants
Dissolved Oxygen

- Comes from atmosphere/aquatic plants
- Important to aquatic organisms
- Changes with depth and season
Water Clarity

- Measure of light penetration in water

- Effected by
  - Color
  - Sediment
  - Algae

- Controls depth aquatic plants can grow
Water Clarity

Bughs Lake Secchi Depth

Lake Napowanan Secchi Depth
Nutrients

- Phosphorus
- Nitrogen

Common Sources of Nutrients in Lakes

- Wetlands
- Soils
- Plants
- Animals
- Septic Systems
- Fertilizers
- Wastewater
- Erosion/runoff
- Livestock waste
# Bugh's Lake “Nutrient Scorecard”

<table>
<thead>
<tr>
<th></th>
<th>GOOD</th>
<th>FAIR</th>
<th>POOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Median summer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>concentration)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inorganic N (ppm)</strong></td>
<td>0.05 (min)</td>
<td>0.25 (max)</td>
<td></td>
</tr>
<tr>
<td>(Spring)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chlor-a (mg/L)</strong></td>
<td>0.5 (June 2012)</td>
<td>6 (September</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2011)</td>
<td></td>
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</tbody>
</table>
Napowan Lake “Nutrient Scorecard”

<table>
<thead>
<tr>
<th></th>
<th>GOOD</th>
<th>FAIR</th>
<th>POOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total P (ppb)</strong></td>
<td></td>
<td></td>
<td>18.5 (2011) 16 (2012)</td>
</tr>
<tr>
<td>(Summer)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inorganic N (ppm)</strong></td>
<td>0.05 (min)</td>
<td>0.11 (max)</td>
<td></td>
</tr>
<tr>
<td>(Spring)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chlor a (mg/L)</strong></td>
<td>1 (min) June 2011</td>
<td>6 (max) August 2011</td>
<td></td>
</tr>
</tbody>
</table>
Wisconsin Phosphorus Standard
Shallow Seepage Lakes
(40 µg/L)
~Flag Value~
(15 µg/L)
Pollutants

- Sulfate
- Chloride
- Potassium
- Sodium
**Bughs Lake Potential Contaminants**

<table>
<thead>
<tr>
<th>(mg/L)</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>0.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrazine</td>
<td>&lt;0.01 µg/L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Napowanan Lake Potential Contaminants

<table>
<thead>
<tr>
<th></th>
<th>(mg/L)</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td></td>
<td></td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>Potassium</td>
<td></td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td></td>
<td></td>
<td></td>
<td>2.3</td>
</tr>
<tr>
<td>Atrazine</td>
<td></td>
<td></td>
<td></td>
<td>0.10 µg/L</td>
</tr>
</tbody>
</table>
Bugh's Lake Watershed

Surface Watershed: 559 acres
Estimated Phosphorus Load: **129-296 lbs/yr**

1 pound of phosphorus can result in 500 pounds of algae!
Napowan and Big Hills Lake

Surface Watershed: **1,239** acres
Estimated Phosphorus Load: **146-279 lbs/yr**

1 pound of phosphorus can result in 500 pounds of algae!
Shoreland Vegetation Survey

Bugh's Lake Shoreland Vegetation
Waushara Co., Wisconsin

Lake Napowan Shoreland Vegetation
Waushara Co., Wisconsin

Unmowed Vegetation < 3 Ft Tall
Distance Inland from Waters Edge (Ft)
Poor 0 1-15 16-35 Good

Trees and Shrubs
Absent Present

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**Shoreland Inventory**

**Summary**
Shorelines are color-coded to show their overall health based on natural and physical characteristics. For example, shorelines shown in red indicate locations where management or mitigation may be warranted. Blue shorelines mark healthy riparian areas with natural vegetation and few human influences.

**Calculating Shoreline Scores**
Scores are based on the presence/absence of:
- Natural vegetation
- Human influences (docks, boathouses, etc)
- Erosion
- Structures

**Map Date** — July, 2011
**Aerial Date** — April, 2010
Conclusions-Bughs Lake

- Water quality in Bughs Lake is ‘good’.
  - Primarily groundwater fed. Hard water helps buffer excess phosphorus
  - Abundant plants also tie up phosphorus.
- Many shoreland areas need attention to return to healthy condition and comply with zoning regulations.
  - Sedimentation and runoff accelerate algae and aquatic plant growth in the lake.
  - Shoreland areas are critical wildlife habitat.
Recommendations-Bughrs Lake

- **Monitoring** should be conducted for water clarity, phosphorus and chlorophyll-\(a\) to evaluate changes over time.
  - Monitoring strategy should include summer samples and spring/fall overturn samples.
  - Dissolved oxygen should be monitored during periods of ice cover.
  - Efforts should be made to limit nutrient input into the lake, both on shorelands and within the watershed, so as not to exceed the buffering capacity of the hard lake water.

- Strategies should be developed that ensure healthy shorelands remain intact and improvements are made to those that have disturbance.
  - Information for property owners is always a first step.
  - County resources are available to assist.
Conclusions-Lake Napowan

- Water quality in Lake Napowan is ‘good’.
  - Primarily groundwater fed. Hard water helps buffer excess phosphorus
  - Chloride, sodium and atrazine indicate human impacts to lake.
- Some shoreland areas need attention to return to healthy condition and comply with zoning regulations.
  - Sedimentation and runoff accelerate algae and aquatic plant growth in the lake.
  - Shoreland areas are critical wildlife habitat.
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Acknowledgements

Waushara County Citizens and Lake Groups
Waushara County

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UWSP Water and Environmental Analysis Lab

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Nancy Turyk, Paul McGinley, Ryan Haney, Danielle Rupp

UW-Stevens Point Undergraduate Students
Questions?