Water Quality in Fish and Pine Lakes

Ryan Haney
Water Resource Specialist
Center for Watershed Science and Education
UW-Stevens Point
Tonight’s discussion

- How do we measure water quality?
- How is the water quality in Fish and Pine 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
Mixing & Stratification

- **Summer**: Wind drives circulation in the epilimnion. 
  - Epilimnion
  - Metalimnion
  - Hypolimnion

- **Autumn**: Overturn occurs, mixing the water layers. 
  - Overturn

- **Spring**: Wind affects the epilimnion again. 
  - Overturn

- **Winter**: Ice forms, preventing effective circulation. 
  - 4°C to bottom
  - Little effective circulation

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Dissolved Oxygen
Water Clarity

- Measure of light penetration in water

- Effected by
  - Color
  - Sediment
  - Algae

- Controls depth aquatic plants can grow
Water Clarity

Fish Lake Secchi Depth

Pine Lake - Hancock Secchi Depth
Nutrients

- Phosphorus
- Nitrogen

Common Sources of Nutrients in Lakes

- Wetlands
- Soils
- Plants
- Animals

Natural sources

atmospheric deposition (wet & dry)

resuspension and release from sediments

Locally controlled sources

- Septic Systems
- Fertilizers
- Wastewater
- Erosion/runoff
- Livestock waste
Wisconsin Phosphorus Standard
Deep Seepage Lakes
(20 µg/L)
~Flag Value~
(15 µg/L)
Fish 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>11.5</td>
</tr>
<tr>
<td>(Median summer concentration)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inorganic N (ppm)</strong></td>
<td></td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>(Spring)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chlor-a (µg/L)</strong></td>
<td>2.6</td>
<td></td>
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</table>
### Pine 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>17</td>
</tr>
<tr>
<td>(Summer)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inorganic N (ppm)</strong></td>
<td></td>
<td></td>
<td>0.46</td>
</tr>
<tr>
<td>(Spring)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Chlor a (µg/L)</strong></td>
<td>2.8</td>
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Pollutants

- Sulfate
- Chloride
- Potassium
- Sodium
# Fish Lake Potential Contaminants

<table>
<thead>
<tr>
<th>(mg/L)</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
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<tbody>
<tr>
<td>Sulfate</td>
<td>6.8</td>
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<tr>
<td>Chloride</td>
<td></td>
<td>5.8</td>
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</tr>
<tr>
<td>Potassium</td>
<td>0.63</td>
<td></td>
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<tr>
<td>Sodium</td>
<td></td>
<td>2.7</td>
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<tr>
<td>Atrazine (ug/L)</td>
<td>0.07</td>
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</table>
## Pine Lake Potential Contaminants

<table>
<thead>
<tr>
<th>(mg/L)</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
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</thead>
<tbody>
<tr>
<td>Chloride</td>
<td></td>
<td>1.3</td>
<td></td>
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<tr>
<td>Potassium</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrazine (ug/L)</td>
<td></td>
<td>0.055</td>
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Fish Lake Watershed

Surface Watershed: 2,112 acres
Estimated Phosphorus Load: 382-1040 lbs/yr

1 pound of phosphorus can result in 500 pounds of algae!
Pine Lake Hancock Watershed

Surface Watershed: 5,667 acres
Estimated Phosphorus Load: 1,007-2,624 lbs/yr

Watersheds

Pine Lake

1 pound of phosphorus can result in 500 pounds of algae!
Sediment Core (Pine Lake)

- Historically high abundance of aquatic plants
- Increase in nutrients since time of land settlement
Conclusions

- Water quality in Fish and Pine is ‘good’.
  - Phosphorus near State standard
  - Hard water helps buffer excess phosphorus
  - Chloride, sodium, atrazine indicate impacts from watershed
- Some shoreland areas along northern shore (Fish) and southern shore (Pine) 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

- Over-application of chemicals and nutrients should be avoided.
- Private well owners should consider testing their well water.
- Landowners throughout the watershed should be made aware of their connection to the lake.
- A monitoring program should be established to monitor changes in water clarity, phosphorus and inorganic nitrogen over time.
- 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.
Acknowledgements

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Waushara County

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Christine Koeller
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Water Quality and Watersheds –
Nancy Turyk, Paul McGinley, Ryan Haney, Danielle Rupp
Zooplankton - Dr. Chris Hartleb

UW-Stevens Point Undergraduate Students
Questions?