Overview

• Belgrade Lakes Watershed
• Classification of Maine’s Surface Waters
• Assessment Monitoring Results
• Determining Attainment Status
• Ongoing Threats
• Protection / Remediation
• Questions?
Watershed

…The ‘bowl’ of land that drains to a waterbody (lake, chain of lakes, river).

…Watersheds can be ‘nested’

Map from Colby College’s 2012 Statistical Abstract for the Belgrade Lakes Watershed
Classification of Maine’s Surface Waters

- Rivers & Streams
  - Classes AA, A, B & C
- Estuarine & Marine Waters
  - Classes SA, SB, and SC
- Lakes
  - Class GPA

Class GPA waters shall be of such quality that they are suitable for the Designated Uses of: Drinking water after disinfection, Recreation in and on the water, Fishing, Agriculture, Industrial process and Cooling water, Hydroelectric power generation, Navigation, Habitat for fish and other aquatic life, and, Habitat must be characterized as natural.
Lakes – Class GPA

Class GPA waters shall have a stable or decreasing (improving) trophic state, subject to only natural fluctuations and shall be free of culturally induced algal blooms which impair their use and enjoyment.

Also:

E.Coli bacteria (mean 29/100ml; instant. 194/100ml )
No new direct discharge of pollutants
Materials may not be placed on or removed from the shores or banks such that they could fall into the water or contaminants wash into the water.  

(paraphrased)
Class GPA waters shall be described by their trophic state based on measures of:

- Chlorophyll “a” content
- Secchi Disk transparency
- Total phosphorus
- Other appropriate criteria
Belgrade Lakes
East Pond
North Pond
McGrath Pond
Salmon Lake
Great Pond
Long Pond
Messalonskee Lake
18+ smaller ponds

- Watershed Towns
- BELGRADE
- MANCHESTER
- MERCER
- MOUNT VERNON
- NORRIDGEWOCK
- OAKLAND
- READFIELD
- ROME
- SIDNEY
- SMITHFIELD
- VIENNA
Belgrade Lakes Stats

**Relative Volumes of Lakes in the Belgrade Chain**

- McGrath Pond
- Salmon Lake
- Long Pond
- East Pond
- North Pond
- Messalonskee Lake
- Great Pond

**Relative Surface Areas of Lakes in the Belgrade Chain**

- McGrath Pond
- Salmon Lake
- Long Pond
- East Pond
- North Pond
- Messalonskee Lake
- Great Pond

**Flushing Rates for Lakes in the Belgrade Chain**

- McGrath Pond
- Salmon Lake
- Long Pond
- East Pond
- North Pond
- Messalonskee Lake
- Great Pond

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION  www.maine.gov/dep
Lake Monitoring

Volunteers in VLMP
DEP Staff

Parameters
• Transparency
• Dissolved Oxygen
• Temperature
• Water Samples
• Sediment Samples
• Fish Samples

Invasive Surveys (unrelated to Attainment)
## Secchi Transparency Data

<table>
<thead>
<tr>
<th>LAKE</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
<th># Years</th>
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<td>*4.1</td>
<td>*6.3</td>
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<td>37</td>
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</tbody>
</table>

### Distribution of Secchi Disk Transparency in Maine Lakes

- **Minimum**: 0.5
- **Maximum**: 15.5
- **Mean**: 4.82
- **N**: 1378

![Distribution of Secchi Disk Transparency in Maine Lakes](chart.png)
40+ Years of Secchi Transparency Data

Secchi Transparencies in the Belgrade Lakes

- LONG P NORTH
- LONG P SOUTH
- GREAT P
- MESSALONSKEE L
- NORTH P
- MCGRATH P
- EAST P
- SALMON L

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

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### Chlorophyll Data

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<th>Min</th>
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<th>Max</th>
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<tr>
<td>GREAT P</td>
<td>2.4</td>
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<td>9.5</td>
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<tr>
<td>MESSALONSKEE L</td>
<td>2.5</td>
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<td>5.3</td>
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<td>1.4</td>
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#### Distribution of Chlorophyll a in Maine Lakes

- **Minimum**: 0.7
- **Maximum**: 182
- **Mean**: 5.3
- **N**: 1009
Total Phosphorus Data

<table>
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<tr>
<th>LAKE</th>
<th>Epilimnion</th>
<th>Bottom Grabs</th>
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<td>LONG P SOUTH</td>
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<td>GREAT P</td>
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<td>103</td>
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Distribution of Total Phosphorus in Maine Lakes (epilimnetic core)

- MINIMUM: 1
- MAXIMUM: 158
- MEAN: 12
- N: 977
Dissolved Oxygen

Stratified Lakes
  Long Pond – North basin severe anoxia
  Salmon Lake – Severe anoxia
  Great Pond – Partial anoxia
  Messalonskee – Some anoxia

Intermittently Stratified Lakes
  East Pond – Intermittent anoxia

Unstratified Lakes
  North Pond – No or rare anoxia
  McGrath Pond – No or rare anoxia
Belgrade Lakes Non-attainment Listings:
East Pond – Chronic Algal Blooms
Long Pond – Trophic Trend
Great Pond – Trophic Trend

Belgrade Lakes known to have Invasive Plants:

Messalonskee – Variable Leaf Milfoil
Great Pond – Variable Leaf Milfoil
Salmon Lake – Eurasian Milfoil (hopefully eradicated)

Gloeotrichia echinluata
   Long Pond
   Great Pond
   Messalonskee Lake
Threat #1: Phosphorus

**Internal Sources**
- Recycling from sediment
- Relocation from Gloeotrichia

**External Sources** - Non-point sources/storm water
- Roads (dirt & paved)
  - Inadequate drainage
  - Inadequate culvert sizing
- Eroding shorelines
  - Lack of vegetation
  - Buffer
  - Bare ground & Impervious surfaces

**Others Threats:** Invasive plants, Gloeotrichia echinulata, Intense storms, Increased growing season due to reduced ice duration/thickness
Lake Protection:

Local Efforts
  Lake Associations
  BRCA
  Colby SSI Project(s)
  COLA

DEP
  Invasives Prevention (Boat Inspections)
  Shoreland Zoning
  Water Quality Monitoring
  Contractor Certification
  Oil Spill Clean-up
  Clean Water State Revolving Loan Fund
Remediation

Plant Removal – Messalonskee, Salmon & Great Pond
Fish Removal – East Pond
Landowner actions
Conservation Corps – Riprap, Buffer, Rubber razor installations
Town government – permitting, ordinances, code enforcement, etc.

Local Lake entities informing the public
“An ounce of prevention is worth a pound of cure!”
Questions???
## Alkalinity, pH and Conductivity Data

<table>
<thead>
<tr>
<th>LAKE</th>
<th>Alk (mg/l)</th>
<th>pH</th>
<th>Cond (µS)</th>
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<tbody>
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<td>MCGRATH P</td>
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### Distribution of Specific Conductance in Maine Lakes

- **Specific Conductance (µS/cm or µmhos/cm)**
- **Number of Lakes**
- **Minimum:** 10  **Maximum:** 674  **Mean:** 46  **N:** 1012
### Color Data

<table>
<thead>
<tr>
<th>LAKE</th>
<th>Min</th>
<th>Mean</th>
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#### Distribution of Color in Maine Lakes

- **Minimum:** 2
- **Maximum:** 481
- **Mean:** 28
- **N:** 1114
Alkalinity, pH and Conductivity Data

<table>
<thead>
<tr>
<th>LAKE</th>
<th>Alk (mg/l)</th>
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**Distribution of pH in Maine Lakes**

- Minimum: 4.23
- Maximum: 9.51
- Mean: 6.81
- N: 1021
**Alkalinity, pH and Conductivity Data**

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<tr>
<td>SALMON L</td>
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<td>7.12</td>
<td>63</td>
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</tbody>
</table>

**Distribution of Total Alkalinity in Maine Lakes**

- Minimum: 0.3
- Maximum: 155.7
- Mean: 11.9
- N: 1047