HAB Monitoring Efforts in the McKenzie Subbasin

David Donahue, Eugene Water & Electric Board

Protecting Drinking Water Sources from Cyano-HAB Impacts in the Willamette Basin
Virtual Workshop, April 28, 2021
Potential drinking water impacts from HABs

• Cyanotoxins
  o Hepatotoxins – affect the liver (microcystin, cylindrospermopsin)
  o Neurotoxins – affect the nervous system (anatoxin-a, saxitoxin)

• Dissolved Organic Carbon (DOC)
  o Precursor to disinfection by-product (DBP) formation

• Taste and odor issues - Geosmin and 2-methylisoborneol (MIB)

• Intake clogging/reduced filter run times

• Increased diurnal pH swings can complicate treatment
Source Protection sites include major reservoirs, outfalls, mainstem and tributary sites.

- Routine sampling occurs from shore/bank every other week (April through October)
- Reservoir profile sampling occurs once per month by boat

Field visits include:

- Visual assessment of water conditions
  - Clarity, color, algae presence
- Microscopy/qualitative algae assessments
  - Planktonic net-tows
  - Benthic scrapes
- Water quality sonde measurements
  - Temperature/Specific Conductivity
  - pH/ORP
  - Dissolved Oxygen
  - Turbidity
  - Chlorophyll/Phycocyanin
  - fDOM (fluorescent dissolved organic matter)
EWEB’s HAB Monitoring Plan Cont.

Analytical parameters include:

• Algae Identification and Enumeration (private lab)
  o Cyanobacteria, Algae, Diatoms, Flagellates

• Cyanotoxins via ELISA Method (EWEB Water Quality Lab/DEQ Lab)
  o Cylindrospermopsin, Total Microcystin, Anatoxin-a

• Nutrients (EWEB Water Quality Lab)
  o Nitrate/Nitrite, Ammonia
  o Total Phosphorus, Orthophosphate
  o TOC/DOC

• Toxigenic Gene Analysis via qPCR (private lab)
  o Cyanobacteria (16S rDNA)
  o Anatoxin-a (anaC)
  o Cylindrospermopsin (cyrA)
  o Microcystin (mcyE)
  o Saxitoxin (sxtA)
Continuous Real-Time Monitoring Network

Multi-parameter sondes deployed at the following sites (USGS/EWEB/USACE)

- McKenzie River below Trail Bridge
- Cougar Reservoir – Profiling Buoy
- S. Fork McKenzie River below Cougar
- Blue River below Reservoir
- McKenzie River near Vida
- Gate Creek
- McKenzie River @ Walterville
- Camp Creek
- McKenzie River @ Hayden Bridge
Real-Time River Monitoring Dashboard
## Potentially Toxigenic Cyanobacteria Taxa Observed
McKenzie Subbasin, 2010-2021

<table>
<thead>
<tr>
<th>Cyanobacteria (Genus)</th>
<th>Primary Type</th>
<th>Potential Toxins</th>
<th>Primary Location Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Aphanizomenon</em></td>
<td>Planktonic</td>
<td>ATX, CYN, MCY, STX</td>
<td>Blue River &amp; Cougar Reservoirs</td>
</tr>
<tr>
<td><em>Aphanocapsa</em></td>
<td>Planktonic</td>
<td>MCY</td>
<td>Blue River Reservoir</td>
</tr>
<tr>
<td><em>Dolichospermum</em></td>
<td>Planktonic</td>
<td>ATX, CYN, MCY, STX</td>
<td>Blue River &amp; Cougar Reservoirs</td>
</tr>
<tr>
<td><em>Gloeotrichia</em></td>
<td>Planktonic</td>
<td>MCY</td>
<td>Blue River Reservoir</td>
</tr>
<tr>
<td><em>Microcystis</em></td>
<td>Planktonic</td>
<td>MCY</td>
<td>Walterville Pond (no longer filled)</td>
</tr>
<tr>
<td><em>Nostoc</em></td>
<td>Benthic</td>
<td>MCY</td>
<td>McKenzie River, Tributaries</td>
</tr>
<tr>
<td><em>Oscillatoria</em></td>
<td>Benthic</td>
<td>ATX, CYN, MCY, SXT</td>
<td>McKenzie River, Keizer Slough</td>
</tr>
<tr>
<td><em>Planktolyngbya</em></td>
<td>Planktonic</td>
<td>STX</td>
<td>McKenzie River, Keizer Slough</td>
</tr>
<tr>
<td><em>Pseudanabaena</em></td>
<td>Benthic</td>
<td>ATX, MCY</td>
<td>McKenzie River, Keizer Slough</td>
</tr>
</tbody>
</table>

Abbreviations: Anatoxin-a (ATX), Cylindrospermopsin (CYN), Microcystin (MCY), Saxitoxin (STX)
Maximum Observed *Dolichospermum* Concentration

Cells/mL

Year


Blue River Reservoir  Cougar Reservoir  Reservoirs Not Sampled
Holiday Farm Fire Impacts

McKenzie Watershed
2020 Holiday Farm Fire Extent

Details:
Started: September 7, 2020
Size: 173,393 acres
70% on private land
100% contained on October 29, 2020
Benthic HAB Monitoring – Planning Stage (with USGS)

Focus on 6-8 long-term study sites upstream, within and downstream of Holiday Farm Fire.

Target parameters will include:

- Periphyton composition
- Relative abundance
- Spatial/temporal distribution
- Hydrologic setting

- Toxigenic genes
- Cyanotoxins
- Nutrients
- In-situ water quality measurements

Filamentous Cyanobacteria, Keizer Slough, 4/19/2021
Melosira, Blue River, 4/19/2021
Thank you.

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Oscillatoria and Testate Amoebae, Keizer Slough, 4/13/2021