Aquatic Weed Management: A Survey of Techniques & Environmental Impacts 2001-Present

Mike Blankinship
Blankinship & Associates, Inc.
Agricultural & Environmental Consultants
Today’s Talk

• Types of Weeds
• Available Tools
• Regulatory Update
• Water Quality Impacts
Types of Aquatic Weeds

- Emergent
- Riparian
- Floating
- Submersed
- Algae
Emergent

- Cattails
- Tules
- Bulrush
- Ex. Golf Course Ponds
Riparian (that may become aquatic)

- Blackberry (terrestrial)
- Arundo
- Pampas Grass
- Ex. Urban Creeks
Floating

- Primrose
- Duckweed
- Azolla
- Ex: Laguna de Santa Rosa
Submersed

- Pond Weeds
  - Sago
  - American
  - Curly Leaf
- Milfoil
- Hydrilla
- Ex. Irrigation Canals
Algae

- Planktonic
  - Ex: Microcystis
- Filamentous
  - Ex: Anabaena, Planktothrix
- Ex. Drinking Water Reservoir

Anabaena 1600x
Tools for Control

- Biological
- Mechanical
- Chemical
- Other
Biological Control

• Ex. Goats for Emergent and Terrestrial Weeds
Mechanical Control

• Hand Cutting for Emergent Weeds
• Harvesters for Floating Weeds
Chemical Control

- Only 10 registered for Use in CA

<table>
<thead>
<tr>
<th>Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triclopyr</td>
</tr>
<tr>
<td>Diquat Dibromide</td>
</tr>
<tr>
<td>Glyphosate</td>
</tr>
<tr>
<td>Fluridone</td>
</tr>
<tr>
<td>Na$_2$CO$_3$ Peroxyhydrate</td>
</tr>
<tr>
<td>Non-Ionic Surfactants</td>
</tr>
<tr>
<td>2,4-D</td>
</tr>
<tr>
<td>Imazapyr</td>
</tr>
<tr>
<td>Endothall</td>
</tr>
<tr>
<td>Acrolein *</td>
</tr>
<tr>
<td>Copper *</td>
</tr>
</tbody>
</table>
Regulatory Constraints

- 2004 NPDES Aquatic Pesticide Permit
- 2006 Red Legged Frog
- 2009 Goby 11
NPDES Aquatic Pesticide Permit
You Need One if….

• You apply aquatic pesticides to “Waters of U.S.”
• Your chemical leaves a “residue” greater than its WQO or “ Produces Unintended Effects”
• Perceived CWA Violations and Subsequent Citizen Lawsuits Concern You
“Waters of the U.S.”
## “Water Quality Objectives”

<table>
<thead>
<tr>
<th>Chemical</th>
<th>WQO (ug/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triclopyr</td>
<td>N/A, monitoring required</td>
</tr>
<tr>
<td>Diquat Dibromide</td>
<td>20</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>700</td>
</tr>
<tr>
<td>Fluridone</td>
<td>560</td>
</tr>
<tr>
<td>Na$_2$CO$_3$ Peroxyhydrate</td>
<td>Pending</td>
</tr>
<tr>
<td>Non-Ionic Surfactant (nonylphenol)</td>
<td>6.6</td>
</tr>
<tr>
<td>2,4-D</td>
<td>70</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>N/A, monitoring required</td>
</tr>
<tr>
<td>Endothall</td>
<td>100</td>
</tr>
<tr>
<td>* Acrolein</td>
<td>320</td>
</tr>
<tr>
<td>* Copper</td>
<td>3-52 (Hardness Dependent)</td>
</tr>
</tbody>
</table>

* Requires SIP Exception
Red Legged Frog

- Oct 2006: Stipulated Injunction
- 66 pesticides restricted within designated habitat
Red Legged Frog

• 4 aquatic pesticides on list:
  • Imazapryr
  • 2,4-D
  • Glyphosate
  • Triclopyr
• ~40K Ac & 33 Counties
Examples of RLF Habitat in Northern California

Source: Center for Biological Diversity
RLF Habitat Restrictions

• No applications
  – Ground: < 60’ of habitat
  – Aerial: < 200’ of habitat
  – Spot treatment >15’ away OK

• Exceptions:
  – Public Health Vector Control
  – Invasive Species & Noxious Weeds
“Goby 11”

- ESA Failure Alleged by CBD
- 11 Species
- 74 Pesticides
- 8 Counties
“Goby 11”

• 11 Species
  – Tiger salamander
  – SJ Kit Fox
  – Alameda Whip Snake
  – SF Garter Snake
  – Salt Marsh Harvest Mouse
  – CA Clapper Rail
  – CA Freshwater Shrimp
  – Bay Checkerspot Butterfly
  – VELB
  – Tidewater Goby
  – Delta Smelt
“Goby 11”

• 3 Aquatic Pesticides
  – 2,4-D
  – Acrolein
  – Diquat

• 8 Counties
  – Alameda
  – Contra Costa
  – Marin
  – Napa
  – San Mateo
  – Santa Clara
  – Solano
  – Sonoma
“Goby 11”

- No use within habitat
- Must use 100 - 400 ft. buffer Zones
Water Quality Impacts

Aquatic Pesticide Sample Analysis 2002-2007

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Total # of Samples</th>
<th># of Detects &gt; WQO in DS-Initial sample</th>
<th># of Detects &gt; WQO in DS-Final Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>594</td>
<td>39</td>
<td>325</td>
</tr>
<tr>
<td>Nonylphenol</td>
<td>494</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>Acrolein</td>
<td>151</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Copper</td>
<td>325</td>
<td>38</td>
<td>53</td>
</tr>
</tbody>
</table>

Legend:
- Purple: Total # of Samples Analyzed
- Red: # of Detects > WQO in DS-Initial sample (immediately after application)
- Yellow: # of Detects > WQO in DS-Final Samples (4-7 days post application)
Water Quality Impacts

Copper vs. Time

Copper Treatment

Total Copper Concentration (ug/L) Dissolved Copper Concentration (ug/L) Total Copper WQO (ug/L)

- Total Copper Concentration (ug/L)
- Dissolved Copper Concentration (ug/L)
- Total Copper WQO (ug/L)
Mike Blankinship
(530) 757-0941
mike@h2osci.com