CONSIDERATIONS IN AQUATIC WEED CONTROL

“Things you might want to consider”
“Confessions of a few fish kills”
Bill Haller, Jacob Thayer and Lyn Gettys
“Got moss in pond really bad and need help!”
First question you ask is...
What weed is it?

Um, no...
Things you need to know

- How is pond used? Characteristics?
- Oxygen/temp/plant interactions?
- CET, dilution, flow, edge effects?
- Does the formulation fit?
How is the pond used?

• Swimming: full tool chest
• Fishing: full tool chest
• Potable water: limits tools
• Irrigation: limits tools
• Aesthetics only: dead plants and fish
• Koi pond...
Pond characteristics

• Any water flow?
• Downstream uses?
• Where are the weeds?
• Shoreline grasses?
• Algae?
• Submersed plants?
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Oxygen/temp/plant interactions

AWC in June - September
Oxygen/temp/plant interactions

Doh!!!
The atmosphere

Nitrogen 78%
Oxygen 20.9%
Argon gases 0.90%
Other gases 0.17%
Carbon dioxide 0.03%

$O_2$ in water? < 14 ppm

209,000 ppm
Oxygen production

- Wind mixing
- Phytoplankton *
- Submersed plants *
- Algae *
$pH$ and amount of dissolved oxygen over 2 days

- **pH**
- **Oxygen**

**Time (hours, zero is midnight):**

- 0: pH 7.2, Oxygen 12 mg/L
- 12: pH 8.0, Oxygen 7 mg/L
- 24: pH 7.4, Oxygen 11 mg/L

**Photosynthesis**

- pH increases and oxygen decreases during photosynthesis.

**Graphical Representation:**

- The graph shows the fluctuation of pH and dissolved oxygen levels over a 48-hour period.
- Daytime peaks in pH and oxygen levels, with nighttime dips.

**Summary:**

Photosynthesis causes a rise in pH and a drop in dissolved oxygen levels.
Dissolved oxygen vs. temperature

RANGE OF TOLERANCE FOR DISSOLVED OXYGEN IN FISH

- < 3.0 PPM: too low for fish populations
- 3.0 - 5.0 PPM: 12-24 hour range of tolerance / stressful conditions
- 6.0 PPM: supports spawning
- > 7.0 PPM: supports fish populations
- > 9.0 PPM: supports abundant fish populations

7.5 ppm at 86°F
Oxygen production

- No light below 6 to 12”
- Little phytoplankton production
- Little wind mixing
- Very hot water temp
What **uses** oxygen?

- Anything that respires...
- Bacteria, fungi (dead OM) in soil: 24/7
- “Treated dying plants”: 24/7
Waterhyacinth fresh weight/acre?

200 tons (20t DW)
Most label language:

“Treat no more than 1/3 to 1/2 of water body at a time, waiting 2 to 3 weeks before re-treating”
Retreating for skips

Light?
O₂ mixing?
Temp?
Dying plants???
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Concentration: Exposure Times

- Copper: hours
- Diquat: hours
- Peroxides: hours
- Flumioxazin: hours
- Endothall: 1 day

Short half-life in water too

Fast $\rightarrow$ plants all die at once $\rightarrow$ dead fish!!!
Concentration: Exposure Times

- Fluridone  >45 days
- Topramezone  >45 days
- Penoxsulam  >45 days
- Bispyribac  >45 days

Half-life in water 30+ days

Slow \(\rightarrow\) gradual plant death \(\rightarrow\) happy fish!!!
CET research
Netherland – endothall research

CONCENTRATION, mg ae/l

EXPOSURE TIME, hours

< 50% control

50-80% control

80-100% control
Nov-Feb  - Treat with fast acting to reduce biomass
          - About 20% every 4 weeks

Feb-March - Treat with slow acting and /or grass carp

June-October - Topped out: fish problems very likely
               - Short herbicide half-lives → problem
Larger plots/larger systems

- Treated area, edge effect/dilution
Dilution... flow...
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Formulations

Granular or liquid???
Days of static exposure

Percent of fluridone released

Sonar Q: $y = 121.3 \left(1 - e^{-0.02x^2}\right)$; $r = 0.87$

Sonar PR: $y = 66.5 \left(1 - e^{-0.04x^2}\right)$; $r = 0.95$

Sonar ONE: $y = 73.3 \left(1 - e^{-0.03x^2}\right)$; $r = 0.94$

Sonar SRP: $y = 70.4 \left(1 - e^{-0.02x^2}\right)$; $r = 0.89$
## RT50 fluridone & endothall

<table>
<thead>
<tr>
<th></th>
<th>Static</th>
<th>Days</th>
<th>Aerated</th>
<th>Days</th>
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<tr>
<td></td>
<td>Q</td>
<td>27 (21-33)</td>
<td>Q</td>
<td>16 (12-21)</td>
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<tr>
<td>ONE</td>
<td>39 (33-46)</td>
<td></td>
<td>ONE</td>
<td>6 (3-9)</td>
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<tr>
<td>PR</td>
<td>37 (31-42)</td>
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<td>4 (2-6)</td>
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<tr>
<td>SRP</td>
<td>72 (50-93)</td>
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<td>SRP</td>
<td>7 (5-8)</td>
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</tbody>
</table>

\[(Endothall 86.2 (72.0-106.7) hours)\]  
\[(Endothall 0.9 (0.7-1.2) hours)\]
Plant bed water flow

19 expts, 4 plant beds

0.65 cm/sec (15 in/min)

0.07 cm/sec (2 in/min)
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AQUATIC WEED CONTROL
SHORT COURSE