Virtual workshop series: Water quality and aquatic plant management

Natural Resources PFT
Kansas Center for Agricultural Resources and the Environment (KCARE)
Water quality and aquatic plant management

- Offered as a Professional Development Event in PEARs for county extension agents
- Date/Time: June 16 to June 23, 8:30 am to 9:30 am
- Zoom Meeting ID: 952 6066 1935

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service
K-State Research and Extension is an equal opportunity provider and employer.
Schedule

• **Day 1: Aquatic plant management in ponds**
  - Tuesday, 6/16, 8:30-9:30 a.m.
  - Presenter: Charlie Lee, Extension Specialist, Department of Animal Sciences and Industry, K-State

• **Day 2: Water Contaminants affecting cattle health**
  - Thursday, 6/18, 8:30-9:30 a.m.
  - Presenter: A.J. Tarpoff, Assistant Professor and Extension Beef Veterinarian, Department of Animal Sciences and Industry, K-State

• **Day 3: Blue-green algae and its dangers to livestock and pets**
  - Tuesday, June 23, 8:30-9:30 a.m.
  - Presenters: Steve Ensley, College of Veterinary Medicine, Kansas State University; Scott Fritz, Kansas State University Veterinary Diagnostic Laboratory; Jody Holthaus, Extension Agent, Meadowlark District; and Elizabeth Smith, KDHE Bureau of Water
Today’s format

- If you haven’t already, please mute your microphones.
- Speakers will present for 30-40 minutes
- Panelists will join the discussion at the end
- Please ask questions through the chat function (located at the lower part of your screen).
- Although our “end time” is posted for 9:30 a.m., participants are welcome to remain longer if they want to discuss the topic further.
- Please take a moment to participate in the survey.
Speaker

Charlie Lee

Panelists

Brian Rees, County Director, Lyon County
Cody Miller, Extension Agent, Phillips-Rooks District
Aquatic Plant Management
In Ponds

Charlie Lee
Extension Wildlife Specialist
Department of Animal Sciences and Industry
K-State Research and Extension
Benefits of aquatic vegetation

• Primary producers in pond
• Provide food and/or shelter for fish or other species
• Produce oxygen
• Improve water quality
• Nutrients used by aquatic plants are not available for algae so improves clarity
Problems

- Reduces recreational enjoyment
- Too much shelter for small fish
- May cause fish kills when plants die
- Bad taste and odor
- Increases sedimentation rates
Conditions for Aquatic Plant Growth

- **Light**
  - Turbidity: maybe only a few inches of photic zone
  - Depth: extremely clear water may have 300 feet of photic zone

- **Nutrients** - carbon, nitrogen and phosphorus
  - Water nutrients or sediment nutrients
Weed ID

• You **MUST** identify the plant in order to manage it!

• **Aquatic weed identification and control**
  
  
Plant Identification: Aquatic Weeds

- **Algae** - simple plants without roots, leaves, stems or flowers.
  - They reproduce by cell division, fragmentation, or by spore formation.
- **Vascular plants** - plants having roots, stems, leaves, and flowers.
  - Submersed, free-floating, rooted, floating, emerged plants
Three types:

1. **Planktonic algae** - essential, cause blooms, shade pond bottom, but can cause fish kills by lowering $O_2$

2. **Filamentous algae** - thread-like filaments that form mats on surface of the pond. As algae photosynthesize, oxygen gets trapped in the body causing them to rise to the surface as clumps.
   
   **Examples:**
   - *Spirogyra* - bright green and slimy
   - *Cladophora* - cotton mat algae, due to texture
   - *Pitophora* – horsehair, coarse

3. **Chara** – Large green algae that are anchored to the bottom and do not extend above the surface
Planktonic algae: essential, cause blooms, shade pond bottom, but can cause fish kills by lowering $O_2$. 
Cyanobacteria or blue green algae

- Probably always present in a pond
- Been around for millions of years. When environmental conditions just right it blooms - 7 day life cycle
- Sometimes produces toxins
- Livestock deaths since 1890’s
- When you kill the plant, toxins are released throughout the water column
Filamentous algae:
Single cells that form long chains and then float. No known direct food value except for invertebrates.
Chara: called muskgrass or skunkweed because of garlic-like odor, often confused with emerged flowering plants, crunchy texture.
Submerged plants
(grow mainly below surface and have very soft stems)

- Pondweeds
- Elodea
- Watermilfoil
- Coontail
- Naiads
- Bladderwort
American pondweed

Sago pondweed

Aquaplanet
Elodea
Coontail
Floating Plants

(free floating or rooted with floating leaves)

- Duckweed
- Watermeal
- Water lily
- American lotus
Duckweed or watermeal?
Emergent plants
(rooted in water but most of foliage above water)

- Arrowhead
- Cattail
- Water primrose
Arrowhead
Cattail
Water primrose
State quarantine

Hydrilla

Purple loosestrife
What do I do about it?

- Algae control (short term solutions)
  - Chemicals
  - Fish
  - Shading
  - Microbial
  - Phosphorus inactivation (alum floc)

- Reduce nutrient run off
- Find alternative water source
- Aeration
Watershed cover

- Rangeland, cropland, suburban
- Waterfowl use
- Good plants for buffers
  - Native grasses - big four plus
    - Gama grass, cordgrass, sandreed,
  - Forbs
    - arrowhead, cattails, sedges, marsh milkweed, water smartweed and bulrushes
- Usually not necessary to plant in basin
Bottom withdrawal spillways (MDOC drawings)
Aquatic Weed Control

• Treatment may be recommended when aquatic weeds cover more than 25 percent of the pond’s surface area.

• Types of control
  – Physical
  – Mechanical
  – Biological
  – Chemical
Physical control?

- Pond drawdown
- May work for LARGE LAKES
- Need some areas of deep water for fish refuge
- Only draw down in the WINTER time
- Expose bottom for at least ONE MONTH
- Spray exposed weeds when they are green
Mechanical control?
Biological Control?

- Plant-eating fish.
- Introduced from Asia in 1963.
- Reaches 60 pounds.
- *Triploid* species available for stocking.
Grass Carp as a Biological Control of Aquatic Weeds

- Can be very effective but they are not a cure-all.
- May result in turbid water.
- Overstocking can seriously effect sport fish populations.
- Cattails, spatterdock and filamentous algae are eaten last.
- Results are not guaranteed.
Grass Carp Guidelines

• Stock only if pond surface is more than 20 percent covered in vegetation.
• Calculate pond size accurately.
• Total elimination of vegetation occurs at 30 fish (10-12 inches) per acre of vegetation.
• Vegetation control occurs at 15 fish (10-12 inches) per acre of vegetation.
Biological control

• Will fish control HABs?
  – Perhaps
  – Tilapia
    • Stocking rate 25-50/ac adults
    • Digestion efficiency ranged from 58.6 to 78.1% at water temperature of 77°F.
    • Ingestion rate increased with increasing fish weight and water temperature
    • Major problem is they die when water temperature is below 55°F
Chemical Control: its not without problems!
Considerations prior to treatment to avoid fish kills

- Percent of pond covered
- Water temperature
- Plant maturity
- Time of year
- Chemical mode of action
You must calculate the area and volume of a body of water

Area = length X width
Surface area in acres = pond area in square feet/43,560

Volume = average length X average width X average depth

Acre feet = surface area (acres) X average depth

Online calculator
Important Points to Remember

• Match aquatic weed with appropriate herbicide.
• Use only registered herbicides.
• **FOLLOW LABEL INSTRUCTIONS.**
• Treat evenly.
• Apply chemical early in the growing season.
• Check water hardness (>40ppm) when using copper.
Chemicals

- Sodium percarbonate – algae
- Copper – algae (powder or liquid)
- Diquat – contact herbicide (Reward)
- Endothal – contact herbicide (Aquathol)
- Floridone (Sonar) – residual herbicide
- Glyphosate (Rodeo) – grasses, shoreline
- 2,4-D – growth regulator
- Triclopyr – brush (Renovate)
- Imazapyr – emergent weeds (Habitat)
- Penoxsullam (Galleon) Floating plants
- Aquashade – pond water dye – part of algae control
# Some estimated rates and costs (June 2020)

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Rate</th>
<th>Approximate cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquathol</td>
<td>0.3-2.6 gal./ac./ft. of 4.2L</td>
<td>$42-$360/ac.ft.</td>
</tr>
<tr>
<td>Penoxsulam</td>
<td>0.1-26 oz./ac. ft.</td>
<td>$2-564/ac.ft.</td>
</tr>
<tr>
<td>Diquat</td>
<td>0.25-2 gal/ac./ft. of 2L</td>
<td>$18-$150/ac.ft.</td>
</tr>
<tr>
<td>2,4-D</td>
<td>1-2.8 gal. surface acre of 47%</td>
<td>$40-128/surface ac.</td>
</tr>
<tr>
<td>Copper compounds</td>
<td>0.6-3.0 gal. chelated copper/ac.ft.</td>
<td>$28-$138/ac.ft.</td>
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<tr>
<td>Fluridone</td>
<td>3.8-7.7 oz. ac./ft.</td>
<td>$62-$125/ac.ft.</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>4-7.5 pt./surface acre of 5.4L</td>
<td>$48-$90/surface ac.</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>.7-2.3 gal./surface acre of 44%</td>
<td>$56-$184/surface ac.</td>
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<tr>
<td>Sodium carbonate per.</td>
<td>3-170 pounds/ac./ft. of 50G</td>
<td>$7-$400/ac.ft.</td>
</tr>
<tr>
<td>Imazamox</td>
<td>17-173 oz./surface ac.</td>
<td>$39-404/surface ac.</td>
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<tr>
<td>Imazapyr</td>
<td>6-64 oz./surface acre of 4lb/gal</td>
<td>$37-$400/surface ac.</td>
</tr>
<tr>
<td>Acid blue and acid yellow (dyes)</td>
<td>20-80 oz./ac./ft.</td>
<td>$8-32/surface ac.</td>
</tr>
</tbody>
</table>

Labels change frequently. Read and follow the label!
# Response of common aquatic weeds to herbicides

## Rotate products

<table>
<thead>
<tr>
<th>Aquatic group and weed</th>
<th>copper complexes</th>
<th>2, 4-D*</th>
<th>diquat*</th>
<th>endothall*</th>
<th>fluridone</th>
<th>glyphosate</th>
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</thead>
<tbody>
<tr>
<td><strong>Algae</strong></td>
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<tr>
<td>planktonic</td>
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<tr>
<td>filamentous</td>
<td>E</td>
<td>P</td>
<td>E</td>
<td>G (hydro)</td>
<td>P</td>
<td>P</td>
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<tr>
<td>chara</td>
<td>E</td>
<td>P</td>
<td>G</td>
<td>G (hydro)</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>nitella</td>
<td>E</td>
<td>P</td>
<td>G</td>
<td>G (hydro)</td>
<td>P</td>
<td>P</td>
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<tr>
<td><strong>Tank mixes</strong></td>
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<tr>
<td>diquat 1:1 with cutrine</td>
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<tr>
<td>Sodium percarbonate (PAK-27) 25#/ac/ft. + copper sulfate ($52/ac/ft.)</td>
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<td>Clipper effective on resistant species 12 oz. + surfactant ($297 per ac.)</td>
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<td><strong>Floating Plants</strong></td>
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<tr>
<td>bladderwort</td>
<td>P</td>
<td>G (gran)</td>
<td>E</td>
<td>P</td>
<td>E</td>
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</tr>
<tr>
<td>duckweeds</td>
<td>P</td>
<td>G (LV)</td>
<td>G</td>
<td>P</td>
<td>E</td>
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<tr>
<td>water hyacinth</td>
<td>P</td>
<td>E</td>
<td>E</td>
<td>P</td>
<td>G</td>
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<tr>
<td>watermeal</td>
<td>P</td>
<td>P</td>
<td>P-F</td>
<td>F-G</td>
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</tbody>
</table>
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<th>endothall*</th>
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<th>glyphosate</th>
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<td><strong>Emergent Plants</strong></td>
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<tr>
<td>American lotus</td>
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<td>E</td>
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<td>arrowhead</td>
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<td>E</td>
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<tr>
<td>cattails</td>
<td>P</td>
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<td>water lily</td>
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<td>sedges &amp; rushes</td>
<td>P</td>
<td>F</td>
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<tr>
<td>smartweed</td>
<td>P</td>
<td>E</td>
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<tr>
<td>water primrose</td>
<td>P</td>
<td>E</td>
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<td>P</td>
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<tr>
<td>willows</td>
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<td><strong>Submersed Plants</strong></td>
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<td>broadleaf</td>
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<td>water milfoil</td>
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<td>coontail</td>
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<td>elodea</td>
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<td>eurasian</td>
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<td>water milfoil</td>
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<tr>
<td>pondweeds</td>
<td>P</td>
<td>P</td>
<td>G</td>
<td>E</td>
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<td>P</td>
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<tr>
<td>Common Name</td>
<td>Trade Name</td>
<td>Human</td>
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<tr>
<td>2,4-D</td>
<td>DMA 4 IVM, Hardball, Navigate, AquaKleen</td>
<td>ab 0 0</td>
<td>0</td>
<td>21bc 21bc 21bc</td>
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<td>Bispyribac-sodium</td>
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<td>Carfentrazone-ethyl</td>
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<td>1 0 0</td>
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<td>14g 14g 14g</td>
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<td>Copper Complexes</td>
<td>Algimycin PWF, Captain, Clearigate, Current, Cutrine Plus, Cutrine-Ultra, Harpoon, Komeen, K-Tea, Nautique, Symmetry</td>
<td>0h 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0 0</td>
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<tr>
<td>Copper Sulfate</td>
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<tr>
<td>Diquat</td>
<td>Harvester, Redwing, Reward, Weedtrine</td>
<td>1-3 0 0</td>
<td>1</td>
<td>1-3 5 5</td>
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<tr>
<td>Endothall</td>
<td>Aquathol K, Aquathol Super K, Hydrothol 191, Hydrothol Granular</td>
<td>7-25i 0 0</td>
<td>7-25</td>
<td>7-25 7-25 7-25</td>
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<td>Flumioxazin</td>
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<td>0</td>
<td>0.5-5j 0.5-5j 5</td>
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<tr>
<td>Fluridone</td>
<td>Avast, Sonar A.S., Sonar One, Sonar PR, Sonar Q, Sonar SRP,</td>
<td>0 0 0</td>
<td>0</td>
<td>30 30 30</td>
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<tr>
<td>Glyphosate</td>
<td>Avocet, Aquapro, Rodeo, Shore-Klear, Shore-Klear Plus, Touchdown Pro</td>
<td>0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
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<td></td>
</tr>
<tr>
<td>Imazamox</td>
<td>Clearcast</td>
<td>k 0 0</td>
<td>0</td>
<td>k k k</td>
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<tr>
<td>Imazapyr</td>
<td>Aquapier, Gullwing, Habitat</td>
<td>2 0 0</td>
<td>0</td>
<td>120i 120i 120i</td>
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</tr>
<tr>
<td>Penoxsulam</td>
<td>Galleon</td>
<td>0 0 0</td>
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<tr>
<td>Sodium Carbonate Peroxyhydrate</td>
<td>Pak 27, Phycomycin SCP</td>
<td>0 0 0</td>
<td>0</td>
<td>0 0 0</td>
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<tr>
<td>Triclopyr</td>
<td>Navitrol, Navitrol DPF, Renovate3, Renovate OTF</td>
<td>p 0 0</td>
<td>0</td>
<td>-q 120 120</td>
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<tr>
<td>Acid Blue #9 &amp; Yellow #23 Dyes</td>
<td>Aquashade, Enviro-Blue</td>
<td>0 0 0</td>
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<td>0 0 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Things to recall if you got a nap!

<table>
<thead>
<tr>
<th>Does it really need treatment or is it just a hassle?</th>
<th>Is chemical control the best choice?</th>
<th>ID the weed!</th>
<th>Measure the pond volume!</th>
<th>Treat while plants are actively growing which is early in the season!</th>
<th>Follow the label!</th>
<th>Fence livestock out!</th>
</tr>
</thead>
</table>

*Figure: Example of pond depth measurement taken in a pool.*

*Plants, chemical control, pond volume, livestock fence.*
Questions?

Panelists:
Brian Rees
Cody Miller

Charlie Lee
cllee@ksu.edu
Office 785-532-5734
Cell 785-565-1867
Water quality impacts of livestock operations and grazing management

Aquatic plant management in ponds

Tuesday, June 16