Introduction to Pond Management

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  • 40% extension
  • 60% Warnell research and outreach

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  • Warnell instruction and outreach programs
Most Common Pond Questions

- Management of sportfish
- Water quality and algae
- Fish kills
- Aquatic vegetation
Landowner Perceptions

• There’s a “silver bullet” for everything
• What worked for someone else should work for me
• It’s never happened before, so it shouldn’t be happening now
• We’ve been doing it this way for years so we shouldn’t change
Ponds as Simplified Ecosystems

- **Primary producers**
  - light + nutrients + optimal temperature = plants
  - Phytoplankton “bloom”
  - Filamentous algae
  - Macrophytes

- **Consumers (fish and other things)**
  - Shad or herring
  - Zooplankton
  - Invertebrates
  - Grass carp
  - Sunfish
  - Largemouth bass

- **Pond carrying capacity for fish**
  - Maximum sustainable density
  - 40 – 400 lbs per acre.
Sportfish Management

• Predator-prey food chain
• Management depends on goals
  • Trophy size bass
    • Requires intensive management
  • Balanced population
    • Requires some harvest to maintain
  • Frequent catch regardless of size
Standard and Relative Weight

• Standard weight: how much a fish is supposed to weigh given its length
• Relative weight: how much a fish weighs relative to standard weight
Bass-Crowded

Relative Weights (Actual Weights Compared to Standard Weight)

- Weight (lbs.)
- Length (in.)

Standard Weight
Managing for Trophy Bass

- Requires frequent harvest or removal of intermediate bass
- Often uses supplemental forage
- Optional to use all-female bass populations or different strains
- Often requires a consultant to consistently manage conditions
- More infrequent catch rates
What does my water quality report mean?

### Results

pH: 6.65 (Desired pH range 6.5 to 8.5)
Calculated Hardness: 4 ppm

(Water hardness is due to the presence of certain dissolved minerals, primarily calcium and magnesium.)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentration in Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>6 ppm</td>
</tr>
<tr>
<td>Aluminum (Al)</td>
<td>negligible</td>
</tr>
<tr>
<td>Boron (B)</td>
<td>negligible</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>0.7 ppm</td>
</tr>
<tr>
<td>Carbon Dioxide (CO₂)</td>
<td>3.34 ppm</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>negligible</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>negligible</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>0.19 ppm</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>0.4 ppm</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>negligible</td>
</tr>
<tr>
<td>Molybdenum (Mo)</td>
<td>negligible</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>negligible</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>negligible</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>1.7 ppm</td>
</tr>
<tr>
<td>Silica (SiO₂)</td>
<td>1.24 ppm</td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>1.1 ppm</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>negligible</td>
</tr>
</tbody>
</table>

ppm: Stands for parts per million. One part per million is equivalent to 1 pound of an element dissolved in 1,000,000 pounds of water.

ppb: Stands for parts per billion. One part per billion is the same as one milligram per liter (mg/L).

Comments are listed on the next page.
Water Quality

- Alkalinity and Hardness
  - Maintain above 20 ppm
  - Maintains stable pH
  - Ponds may need lime to neutralize acidic soils
- SRAC Publication 4100

https://americanreelfish.com/services/pond-liming/

https://fw.ky.gov/Fish/Pages/Farm-Pond-Management-Water-Quality.aspx

Fig. 1. Changes in pH during a 24-hour period in waters of high and low total alkalinitities (Wurts and Durborow, 1992).
Water Quality

- **Temperature**
- **Dissolved Oxygen**
  - Becomes stratified in Summer
  - Photosynthesis unable to occur below thermocline
Water Quality

• Nutrients
  • Required for phytoplankton growth
  • Base of food chain
  • Excess can cause issues

• Fertilizing
  • Only if necessary, not just because you heard you were supposed to
  • Secchi depth
  • Feeding a form of fertilization

<table>
<thead>
<tr>
<th>Secchi Depth</th>
<th>Fertilizer Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 inches or greater</td>
<td>Fertilize</td>
</tr>
<tr>
<td>18-24 inches</td>
<td>No Action</td>
</tr>
<tr>
<td>18 inches or less</td>
<td>Dense Bloom. Watch.</td>
</tr>
</tbody>
</table>

Algal Blooms

• Not all algae are bad
  • A healthy bloom of planktonic algae is necessary for a healthy aquatic food web

• It’s not always algae
  • An algal bloom is often mistaken for pollen, duckweed, or watermeal

• No recommendations without knowing what it is
Algal Blooms

- Photosynthesis and respiration
- Oxygen dynamics
- Aeration?
  - Only helpful at night
  - Can resuspend nutrients from the bottom

**Graph**

- Concentration of CO₂ and Oxygen over time:
  - Dawn: Low CO₂ and High Oxygen
  - Midday: High CO₂ and Low Oxygen
  - Dusk: Low CO₂ and High Oxygen
  - Midnight: High CO₂ and Low Oxygen
  - Dawn: Cycle repeats
Algal Bloom Control Options

• Chemical Control
  • Must be careful not to treat too much at once
  • Copper sulfate/Copper complexes
    • Toxic to fish at high concentrations and in low alkalinity water
  • Flumioxazin
  • Diquat
  • Sodium carbonate peroxy-hydrate
  • Endothall

Algal Bloom Control Options

• Blue Dyes
  • Suppresses or eliminates productivity
  • Not good for future fish production
  • Can reduce oxygen
Algal Bloom Prevention

- More practical and long-term than chemical treatments
- Nutrient management
  - Fish feeding
  - Vegetative buffers
  - Fertilize only if needed
  - Cattle watering
  - Watershed concept

[Image of cows and pond]

Fish Kills

- Oxygen depletion
  - Turnover events
  - Algal bloom die-offs
  - Large fish die first

- Toxicity
  - Toxic chemicals in the water
  - Small fish die first

- Timeline is Important!!
Aquatic Vegetation

• Vegetative buffers are important
  • Removing all vegetation can lead to nutrient and erosion issues

• Control Options
  • Mechanical
    • Labor intensive
  • Biological
    • Long-term control
    • Doesn’t work for all plants
  • Chemical
    • Control may only be temporary
    • Some herbicides can get expensive
Mechanical Vegetation Control

• Physical harvest of plants
  • Raking
  • Specialized harvesting machines


Biological Vegetation Control

• Sterile Grass Carp
  • Must be sourced from certified growers that produce sterile triploid fish
  • It is illegal to stock non-sterile grass carp in Georgia

• Although Tilapia are used in other states for vegetation control, they are ILLEGAL in Georgia


Chemical Vegetation Control

- Contact herbicides
  - Act quickly, but only kill what they contact
- Systemic herbicides
  - Act slowly, but can be effective at treating entire ponds
- Herbicides must ALWAYS be applied at rates consistent with their labels
Herbicide Considerations

• Post-treatment use restrictions
  • Irrigation
  • Watering cattle
  • Recreation
• Water temperatures
  • Herbicide effectiveness diminishes in cold weather
• Oxygen depletion
  • Large amounts of plant death can deplete oxygen
• Surfactants
• Formulation (Spray or Granular)
Plant Identification

• Control recommendations require identification of all plants in need of control

• Assistance with plant identification requires good photos
Pond Management Take-Homes

• It’s all about a landowner’s objectives
  • There is no one formula that will work for everyone

• Whether it’s weeds or algae, make sure you know what you are dealing with before making recommendations

• Gather as much information from the landowners as possible
  • Timelines are very important for answering most complex pond questions
Useful Pond and Aquaculture Resources

- Georgia Certified Grass Carp Dealers
- Georgia Licensed Fish Dealers
- Georgia Pond Consultants List
- Southern Regional Aquaculture Center Fact Sheets
- UGA Extension Publications: Search “Ponds”
- Texas A&M AquaPlant
Questions?

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