Pond Management

- Presented by

Triangle Pond MANAGEMENT

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Overview of Topics

- Our Approach to Pond Management
- New Pond Design and Considerations
- Stocking and Harvesting
- Harvesting Insights
- Common Calls- Management Options and Solutions

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Pond Management and our Approach

- Focus on client goals and expectations for their pond
  - Clean and Healthy
  - Aesthetically Pleasing
  - Swimming and Boating
  - Fishing Considerations
    - Large Bass
    - Catfish and Bream
    - Lots of Fish
    - Catchable Fish
    - Balanced Fish Populations
- Consults start with determining goals and expectations. Then applying scienced based solutions and experience to meet those criteria.

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Pond Design Considerations…

- What we think about when we talk new pond construction
- #1 Client goals and expectations

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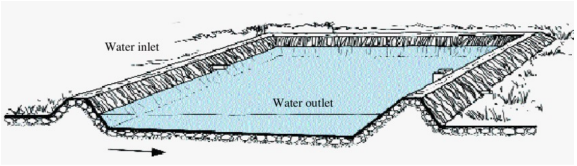
Parts to a Pond

- Structural Parts
  - Basin
  - Embankments
  - Dam
  - Inlets
  - Outlet
- Ecosystem
  - Plants
  - Fish
  - Water
  - Microorganisms



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Types of Constructed Ponds

- Embankment or Watershed Ponds
  - Dam up an area to collect water from runoff, spring, or a stream.
- Excavated Ponds
  - Dig into the water table on relatively flat ground.

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Drainage

- Pasture Ponds
  - 5-20 acres surface drainage per surface acre of water
- Woodland Ponds
  - 20-40 acres surface drainage per surface acre of water

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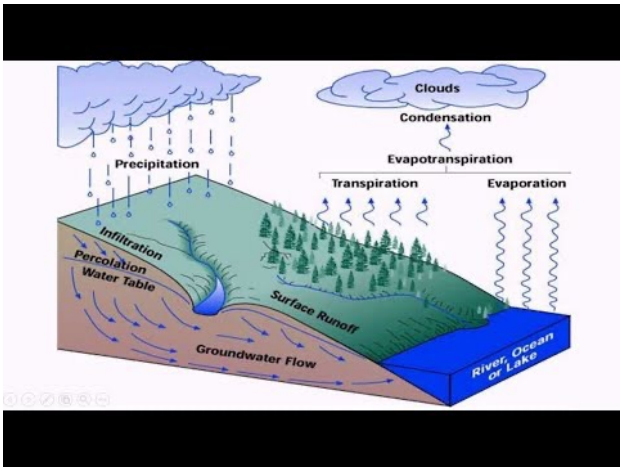
Water Source

- Surface Runoff
  - Can lead to pond fluctuations in the spring and fall.
- Streams
  - High in DO but have the potential for fluctuations and to bring in unwanted plants/wildlife
- Springs
  - Great source because of consistent flow and temperature. Potential for gases and clear water may lead to vegetation issues.
- Shallow Ground Water
  - Potential for poor water chemistry

The Water Cycle



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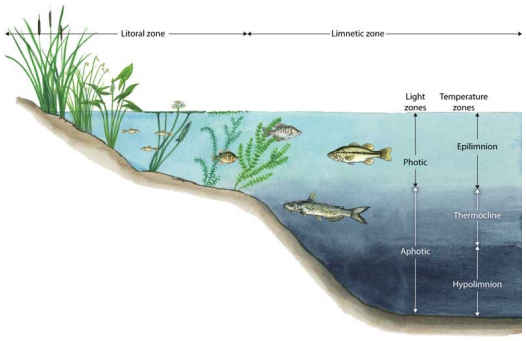
Site Prep

- Dam Construction
  - 12-16' wide
  - Traffic considerations
- Variable Depths and Transitions
  - Varying depths for different stages of life
- Structure
  - Install 20-25% of the pond in structure (Brush Piles, Rock Piles, Stake Beds, ect…)



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Sizing

- Depth
  - 1 acre pond 6-8' depth
  - No more than 10-12'
  - Greater than 12' no benefit increased chance of fish kills
  - Less than 6' greater chance of vegetation issues
  - 3:1 slope if possible
  - Varying depths and transition areas to facilitate habitat and fish growth.
- Surface Acres
  - Best fishing ponds at least 1 Acre
  - Determined by the size of the watershed
  - Smaller/shallow ponds have the potential for vegetation and population issues

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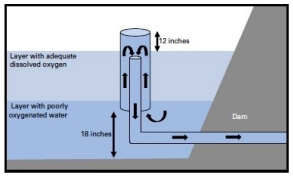
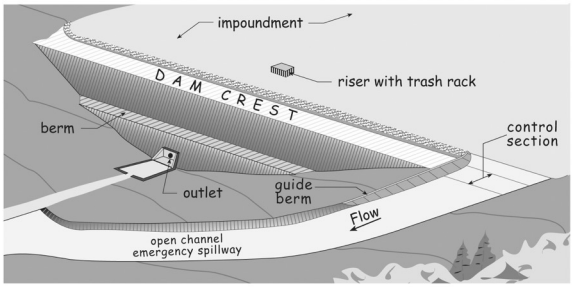
Control Structure

- Important for future management
  - Repairs, leaks, harvesting, vegetation control.
- Valve and Trash Rack
- Drainpipes that draw water from the bottom of the pond
- Emergency Spillways





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Other thoughts…

- Vegetate slopes and dams quickly to reduce erosion and sedimentation
- Install forebays where applicable.
- Armor areas of high waterflow (outfalls/Inlets)
- Consider docks and other structures during planning phase
- Apply lime before pond fills

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Permits?

- Streams and Wetland Areas
  - U.S. Army Corps (USACE)
  - 401 Permit (NCDEQ)
  - 404 Permit (USACE)
  - Stocking Permit (NCWRC)
  - High Hazzard Dam (Construction Drawings)
  - Sediment and Erosion Control Plans (NCDEQ)

*TPM typically recommends getting a licensed engineer involved to assist in the design process and permitting process if needed when constructing a pond.

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Stocking and Harvesting

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Fish Selection and New Pond Rates

Largemouth Bass

Bluegill Sunfish

Redear Sunfish

Channel Catfish

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Option 1

Number Per Acre				
Species	Fertilized	Unfertilized	Size (inches)	When Stocked
Bluegill	700	350	1 to 2	Oct. to Nov.
Redear sunfish	300	150	1 to 2	Oct. to Nov.
Channel catfish	100	50	2 to 4	Oct. to Nov.
Largemouth bass	100	50	2 to 4	The following June (after sunfish)

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Option 1

- Economical and common option for bluegill/bass fishery
- Sunfish harvest 2nd year post stocking
- Bass harvest 3rd year post stocking at 12-14”
- Catfish supplemental stocking as needed. 8-10”
- *Ponds under 10 acres.
- *Avoid hybrid sunfish

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Option 2

Species	Number Per Acre	Size (inches)	When Stocked
Bluegill	70	3 to 5	April
Redear sunfish	30	3 to 5	April
Largemouth bass	20	8 to 14	April

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Option 2

- More expensive, better for faster fishing
- Catch and release available immediately
- Harvest sunfish after 1st year
- Harvest bass after 2nd year (12-14")
- Redear can replace bluegill if desired

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Option 3

Species	Number Per Acre	Size (inches)	When Stocked
Bluegill	60	3 to 5	April
Redear sunfish	15	3 to 5	April
Largemouth bass	100	2 to 4	June

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Option 3

- Can be used when larger bass are hard to find.
- Allows time for sunfish to spawn in the summer.
- Redear can be replaced by bluegill if desired.

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Option 4

Species	Number Per Acre	Size (inches)	When Stocked
Channel Catfish	100	2 to 4	June/July
Hybrid Sunfish	300	1 to 2	June/July

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Option 4

- Good option for smaller ponds (less than 1acre)
- Some bass can be stocked to help control sunfish population
- Supplemental stocking can be expected because of reproduction
- These fish adapt great to feeding

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Harvesting Bass

- Delay bass harvest until 12-14”
- Stocked bass should support the fishery for 3-4 years
- Bass harvest rate of 10-15lbs per acre per year. Double if fertilized
- Over harvesting can lead to unbalance between bass and sunfish
- Catch and release can lead over abundant and stunted bass
- Spread harvest out over the year and keep records

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Harvesting Sunfish

- 40-80lb per acre can be removed per year
- Not essential if bass population is maintained
- Hybrid sunfish and catfish are maintained by stocking so harvest at will.

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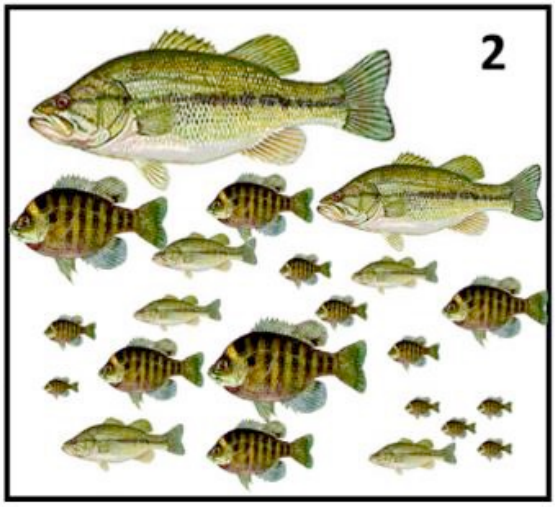
Balanced Populations

- Three indicators
  - Fish of harvestable size
  - Annual reproduction
  - Combination of fishes with at least one predator species
- Bluegill 6” and larger
- Bass averaging 1-2lbs (Some larger and some smaller)



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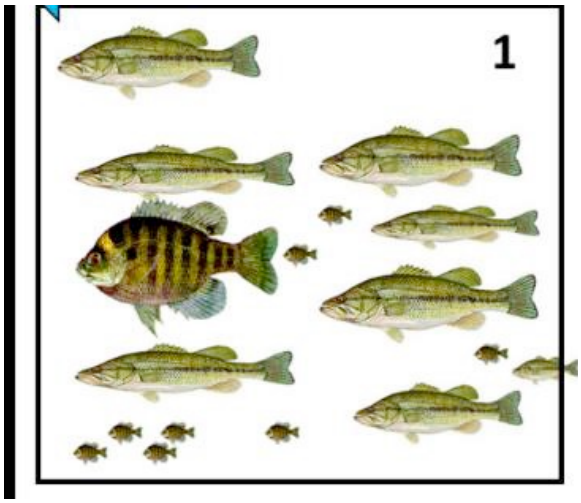
Over Crowding of Bass

- Bluegill average more than 1/3 lb
- Bass average less than 1 lb.
- May be good for large bluegill

- Corrective Actions…
  - Harvest 20-30 bass per acre
  - Winter draw down
  - Feed Sunfish
  - Fertilize



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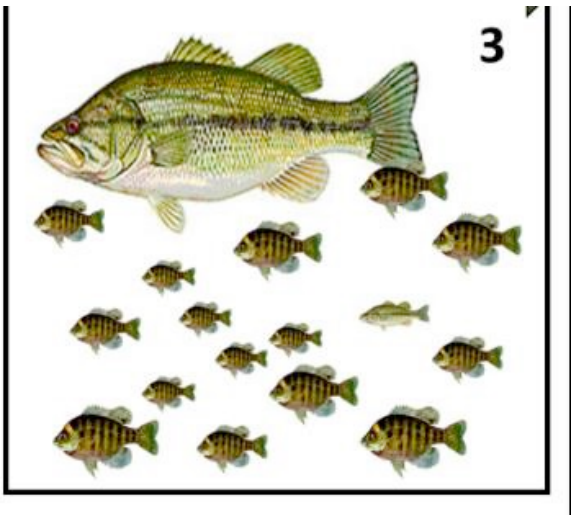
Over Crowding of Sunfish

- Only 3-5” bluegill
- Few bass but averaging 2+ lbs
- Trophy Bass Potential

- Corrective Actions…
  - Stop bass harvest
  - Stock more bass (50 6-8”, 20 10+”)
  - Feed Sunfish
  - Fertilize
  - Harvest Sunfish (Up to100lbs/Acre)
  - Winter Drawdown



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Undesirable Species

Black Crappie

White Crappie

Warmouth Sunfish

Blue Catfish

White Perch

Green Sunfish

Flathead Catfish

Bullhead Catfish

Carp or Suckers

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Solutions to Undesired Species

- Keep large bass population up
  - Stocking
- Cull heavily undesired species
  - Fishing, Shocking, Netting
- Reclaim Pond
  - Rotenone Application
  - Alum/Hydrated Lime

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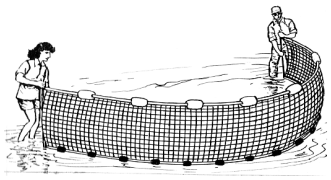
Harvesting Methods and Insights

- Hook and Line
- Seining
- Electrofishing

- *Record Catches



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Hook and Line

- Larger bluegill and 1-2lb average bass= Balanced population
- Bluegill average 1/3 lb and bass average less than 1lb= Bass Crowded
- Small bluegill 3-5” and a few bass larger than 2lbs=Sunfish Crowded
- Undesirable Fish=Undesired Fish Population

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Seining Method

- Young bass and bluegill, some 3-5” bluegill = Balanced Population
- Many hatched bluegill, maybe small bass, no 3-5” bluegill = Bass crowded
- No young bass, No hatched bluegill, Many 3-5” bluegill = Sunfish Crowded
- Young bass, No hatched bluegill, no 3-5” bluegill = Absent Bluegill
- No gamefish present = Undesired Population

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Electrofishing

- Larger bluegill and 1-2lb average bass= Balanced Population
- Bluegill average 1/3 lb and bass average less than 1lb= Bass Crowded
- Small bluegill 3-5” and a few bass larger than 2lbs=Sunfish Crowded
- Undesirable Fish=Undesired Fish Population

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Pond Management- Commons Calls, and Solutions

Common calls we take…

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Pond Liming

- Most NC pond are naturally acidic
- Ideal pH range – 6.0---9.0
- Ideal alkalinity above 20ppm
- Soil test can help determine amount of material to use
- Products
  - Calcis (5 Gallons = 1 Ton ag lime)
  - Liquid Lime
  - Ag Lime (1Ton to raise 1 point)

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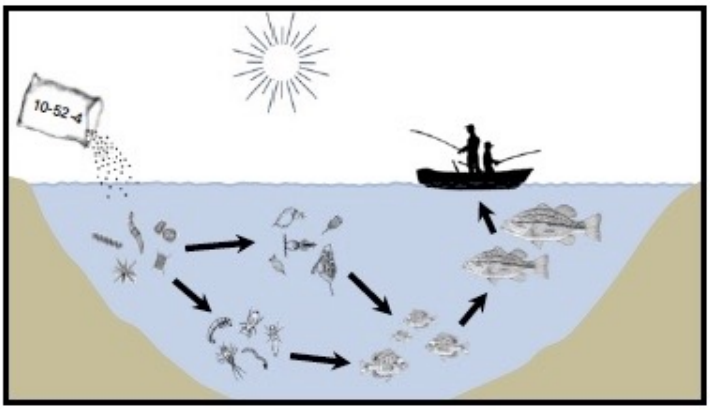
Fertilization

- Typical ponds can support 100-150lbs of fish per acre
  - Fertilizing correctly can double or triple this number
- Don't fertilize if naturally fertile, high flow rate, or no fishing pressure
- Potential for issues
- Fertilized ponds should have adequate alkalinity, low turbidity, and no vegetation issues.

Aquatic Food Chain



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Supplemental Feeding

- Can be used to increase growth and harvest rates
- Not recommended in fertilized ponds
- Bluegill, sunfish, and catfish take feed readily
- Grass carp will as well, reducing effectiveness
- Feed when Spring and Fall temps 65-90 degrees
- Choose high quality feeds (40% crude protein, 1% phosphorus)

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Habitat Improvement

- Habitat can improve fishing and production
- Improvements shouldn't exceed 25% of pond bottom
- Types
  - Brush Piles
  - Stake Beds
  - Artificial Structure
  - Aquatic Vegetation
  - Spawning Beds

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Fish Kills

- Oxygen Depletion
  - Plant Die Off
  - Pond Turn Over (Stratifcation)
- Less Common
  - Herbicide Use or Chemicals
  - pH (Acidic Water)
  - Disease

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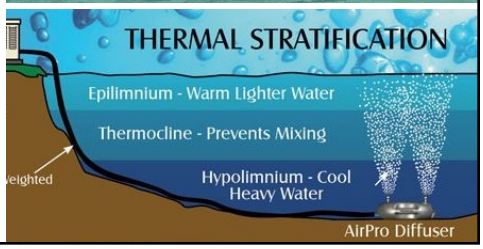
Aeration

- Diffused aeration is best
- Allows for mixing of the water column which gives multiple benefits
- Increased dissolved oxygen
- Higher water quality
- Reduced nutrient loading
- Reduced chance of fish kills

- *Systems must be sized correctly



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Fountains and Surface Aerators

- Fountains
  - Look great and can have lighting features
  - Don't do much as far as aeration is concerned

- Surface Aerators (Aerating Fountains)
  - Hybrid option, can give some benefits of both
  - Good option for shallower ponds
  - Can add lights

- *Diffused aeration is the best aeration

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Nuisance Animals

- Muskrats
  - Erosion Issues (Burrowing)
- Nutria
  - Erosion and Plant Issues (Burrowing, Predation)
- Beavers
  - Take down trees, create dams, plug up orifices, chew cables and floats
- Otters
  - Can devastate fish populations (Grass Carp)

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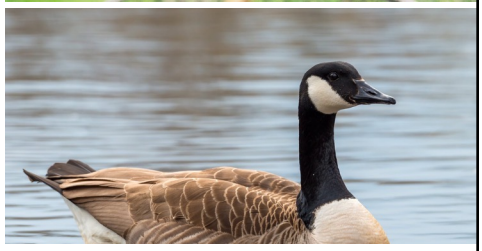
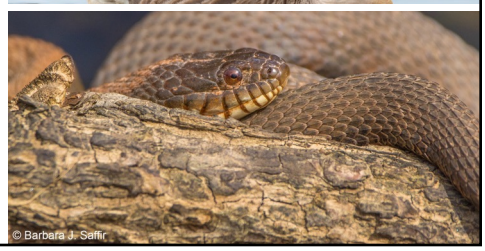
Nuisance Animals Continued…





- Turtles
  - Can harm fish but in most cases won't destroy populations
- Snakes
  - Not really an issue, public perception
- Waterfowl
  - Can cause issues when they become too abundant (Geese)

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Damage (Beavers)

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Nuisance Animal Solutions

- Most cases trapping them to remove or relocate is the best solution
  - Beavers, Muskrats, Turtles, Otters
- Reduce habitat
  - Snakes
- Geese can be harassed, or borders installed
- Goose Repellent


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Muddy/Turbid Water

- Common with newly installed ponds
- Testing
  - Collect a clear jar of water
  - Leave for a week
- Results
  - Water clears- Likely a physical source of turbidity
  - Water doesn't clear- Problem maybe related to water chemistry.

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Solutions to Muddy Water

- Control the source of turbidity
  - Vegetate watershed areas
  - Remove carp or bullhead catfish
  - Limit livestock wadding
  - Reduce waterfowl population
  - Installation of Forebays (Settling Pools)
- Aluminum Sulfate (Alum)
  - Jar test to calculate product usage
  - Buffer with lime product
  - Sharp decrease in pH
- Apply Lime Product
  - Good first choice

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Pond Leaks

- Watershed contributes to how well a pond stays full
- Common Pond Leaks
  - Infiltration from uncompacted soils
  - Soil piping issues at the outlet pipe
  - Compromised outlet pipe

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Pond Leak Solutions (Infiltration)

- Installation of a pond liner
  - Clay, or EPDM Liner
- Sodium Bentonite
  - Used with clay liner install
- SoilFloc
  - Flocculant treatment

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Pond Leak Solutions (Soil Piping)

- Repair the disconnected joint
- Install an anti-seep collar or concrete cradle
- Replace the pipe and recompact

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Nuisance Vegetation

- Algae
  - Planktonic and Filamentous
- Submersed
  - Under the water
  - Hydrilla, Elodea, Naiads, Watermilfoil, Chara
- Emergent
  - Rooted but breaks the waters surface
  - Alligator weed, American Lotus, Cattails, Spike Rush, Water Shield, Primrose, Smartweed, Parrots Feather

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Physical Removal

- Removal by hand or machine

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Herbicide Application

- Quick results
- Can be economical when compared to physical removal
- Doesn't always treat the cause

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Herbicide Application

- 2 weeks post application

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Chemical Options

- Fluridone
- Copper Products
- Diquat
- Endothall
- Glyphosate
- Imazapyr
- 2,4-D Products
- Peroxide Products
- Triclopyr
- Flumioxazin
- Bispyribac
- Carfentrazone
- Imazamox
- Florpyrauxifen
- Penoxsulam

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Herbicide Considerations

- Public Image
- Off site movement
- Irrigation
- Drinking
- Fishing
- Recreation/Swimming
- Livestock Usage
- Fish Kills

- Treating during the summer or cloudy days can lead to low oxygen levels in ponds.
- Target plant may grow back in the season with preventative measures
- Once target plant is gone others may take its place…

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Water Quality and Effectiveness

- pH
  - Basic (Above 7) or Acidic (Below 7)
  - Flumioxazin and Carfentrazone
- Hardness/Alkalinity
  - Soft < 50ppm CaCo3 > Hard
  - Copper Products (More toxic at lower Alkalinities
- Turbidity
  - Diquat
- Temperature
  - Copper

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Application Methods

- Dilute and Apply from backpack or boat spray systems.
  - Surface application
  - Foliar Application
- Granular Application via spreader
- Injections beneath waters surface

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Biological Control

- Triploid Grass Carp
- Effective on submersed weeds
  - Hydrilla, Chara, Elodea, Widegongrass, Bladderwort, Fanwort, Coontail, Pondweed, Naiads
- Less effective
  - Duckweed, Milfoils, Parrotfeather, Algae
- Not Recommended
  - Watermeal, Eelgrass, Smartweed, Lotus, Lilys, Cattails.

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Grass Carp Continued

- Rates
  - 10-15/ Acre for Control
  - 10-20/ Acre for larger ponds
- Provide control for 5-8 years after stocked
- Stocking larger fish help reduce predation (8-10”)
- Supplement 20% year to account for losses
- Permits – Purchase receipt can count as permit if the following are met…
  - Pond is less than 10 acres
  - Pond is owned by 1 owner or entity
  - Stocking less than 150
  - Pond is self contained and not connected to other waters.
- https://www.ncwildlife.org/Portals/0/Fishing/documents/2023/Fish-Stocking-and-Grass-Carp-Possession-Permit-Application.pdf

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Pond Dye/Colorant

- Pond Dye/Colorant
  - 1 quart per acre
  - Blue and Black
  - Fish and Animal Safe
- Can help reduce plant growth by limiting sunlight penetration

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Draw Down

- Reduce water levels middle of November- February 1st
- Draw down can allow for treatment/die off
- Bass can better feed on bluegill populations
- *Some species can survive this and return next season.

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Pond Deepening

- Sunlight penetration allows for growth
- Deepening areas to a minimum of 24” will reduce weed infestations

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Resources and Acknowledgments

- https://content.ces.ncsu.edu/pond-management-guide
- https://aquaplant.tamu.edu/
- https://www.ncwildlife.org/

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Thank You! Questions?

Roger Pittman

919-215-7993

Roger.Pittman@trianglepondmanagement.com

Caleb Hopkins

919-500-6418

Fisheries@trianglepondmanagement.com

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