

# Pond Management

David Wyffels

IDNR Fisheries Biologist



# Pond Construction

- **1. Begin with a visit to NRCS (Natural Resource Conservation Service)**

## **Why?**

- **Soil type of the pond construction area**
  - **Clay Soils are important in Dam and basin construction**
- **Watershed to Lake Ratio:**

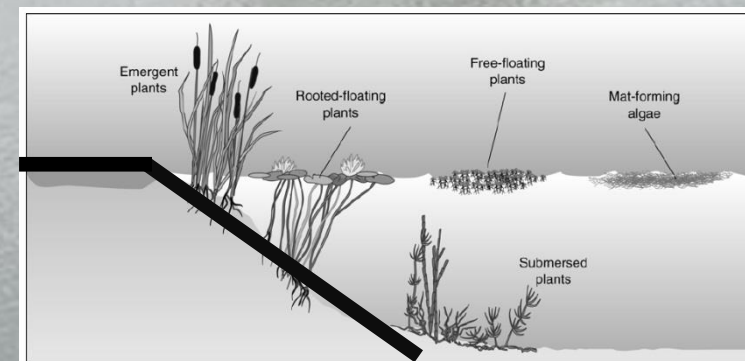
**How many acres drain into your pond per surface acre of pond.**

**IDEAL IS 10 to 20 ACRES TO 1 ACRE OF POND**
- **Pond Size: 1 acre and larger better, 0.5 acre and smaller not stable**



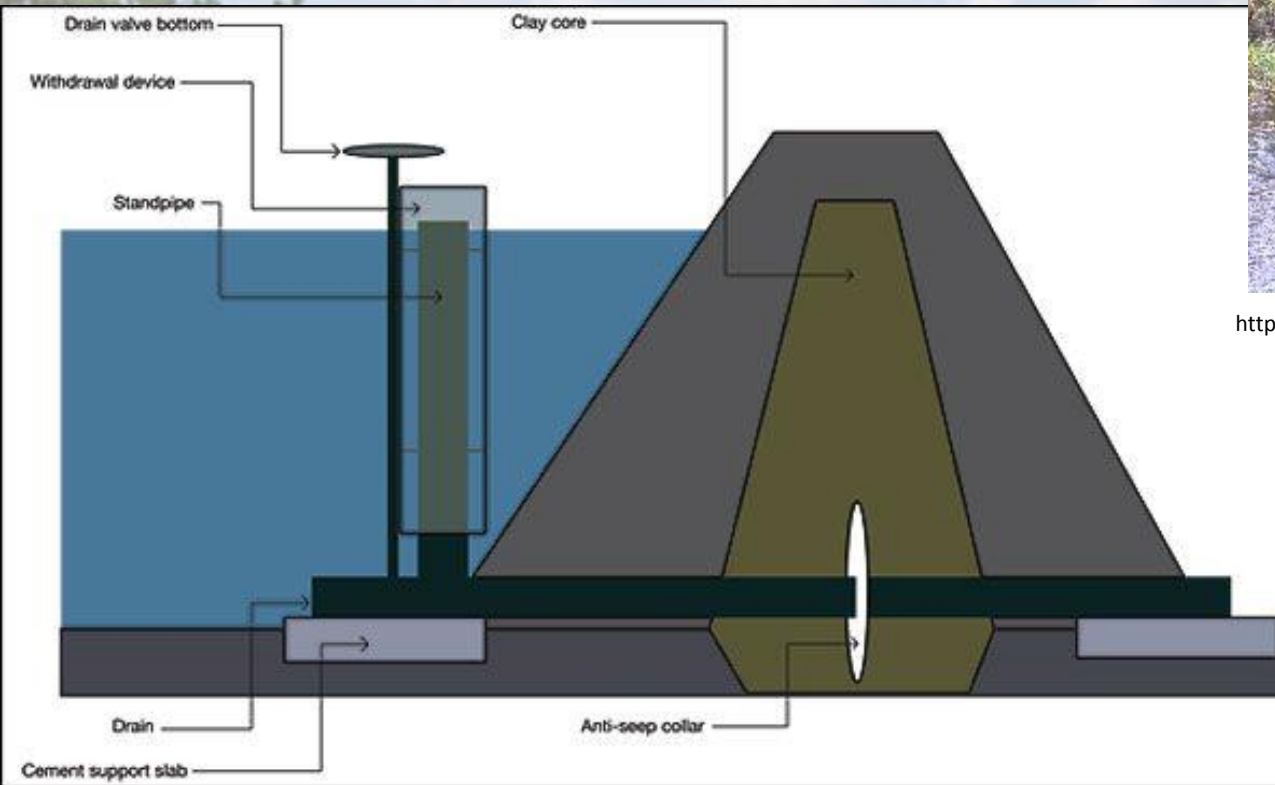
# Steps in pond construction

- 2. Pond edge
  - What Slope ?
    - Grade pond edge at a 3 to 1 slope to a depth of 3-4 feet
    - This will reduce the amount of soil that falls within the photic zone and thus discourage excessive aquatic plant growth



# Steps in pond construction

- 3. Water Control Structure



<https://www.hydrocad.net/photos/riser1closeup.jpg>

<https://i.pinimg.com/originals/36/aa/a0/36aaa032c6b9d81ab643b450a87678e5.jpg>

# Depth Requirements

- 4. Minimum Max Depth Requirements
  - **Northern Illinois =10 feet, 15 feet or greater desired**

Why?

Oxygen availability for Fish:

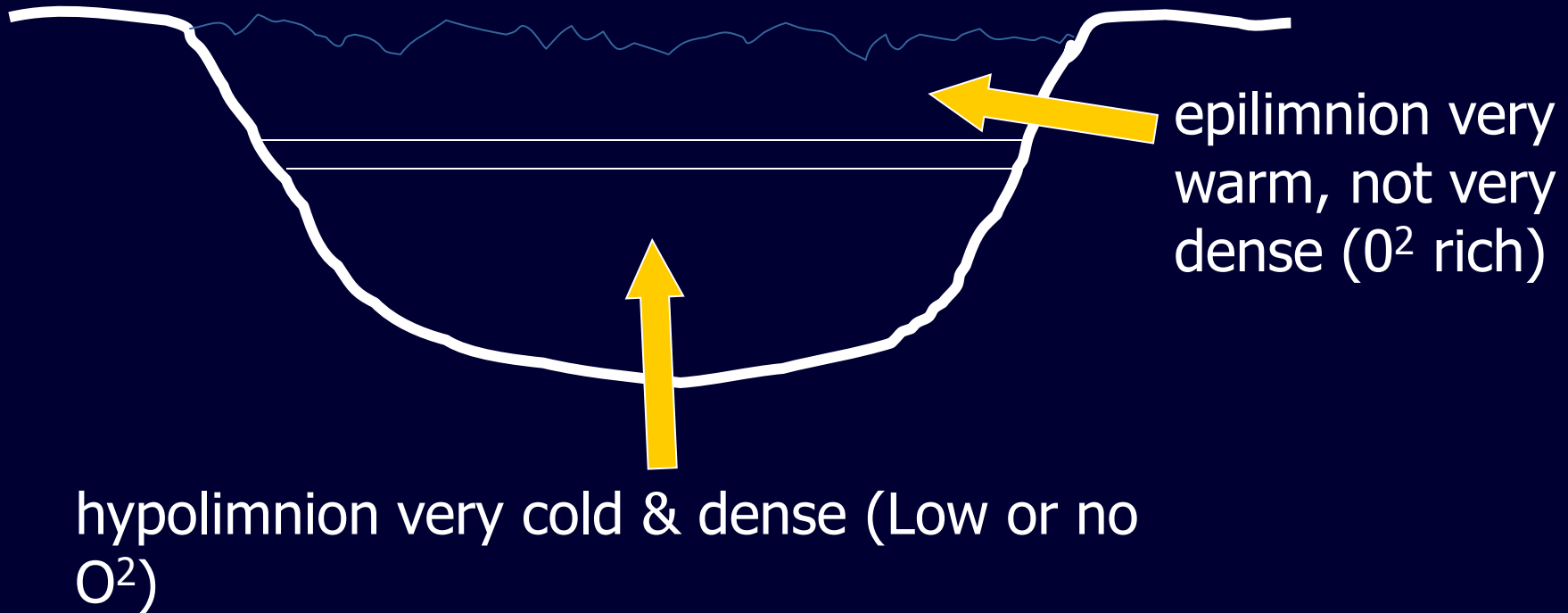
Ponds turn over twice a year

Spring and Fall: Possible high demand for oxygen

**This is because water is the densest at 39 degrees F**

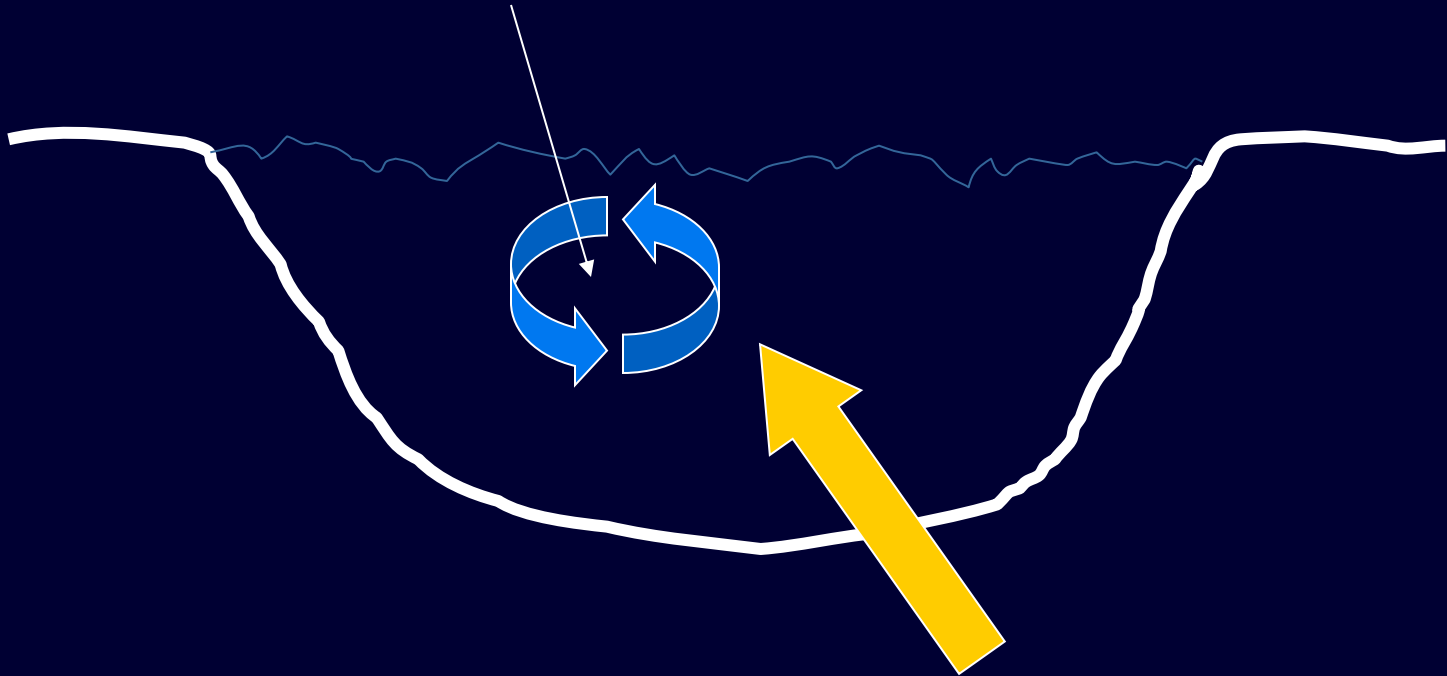
# Summer

very little mixing b/c  
different densities



# Fall

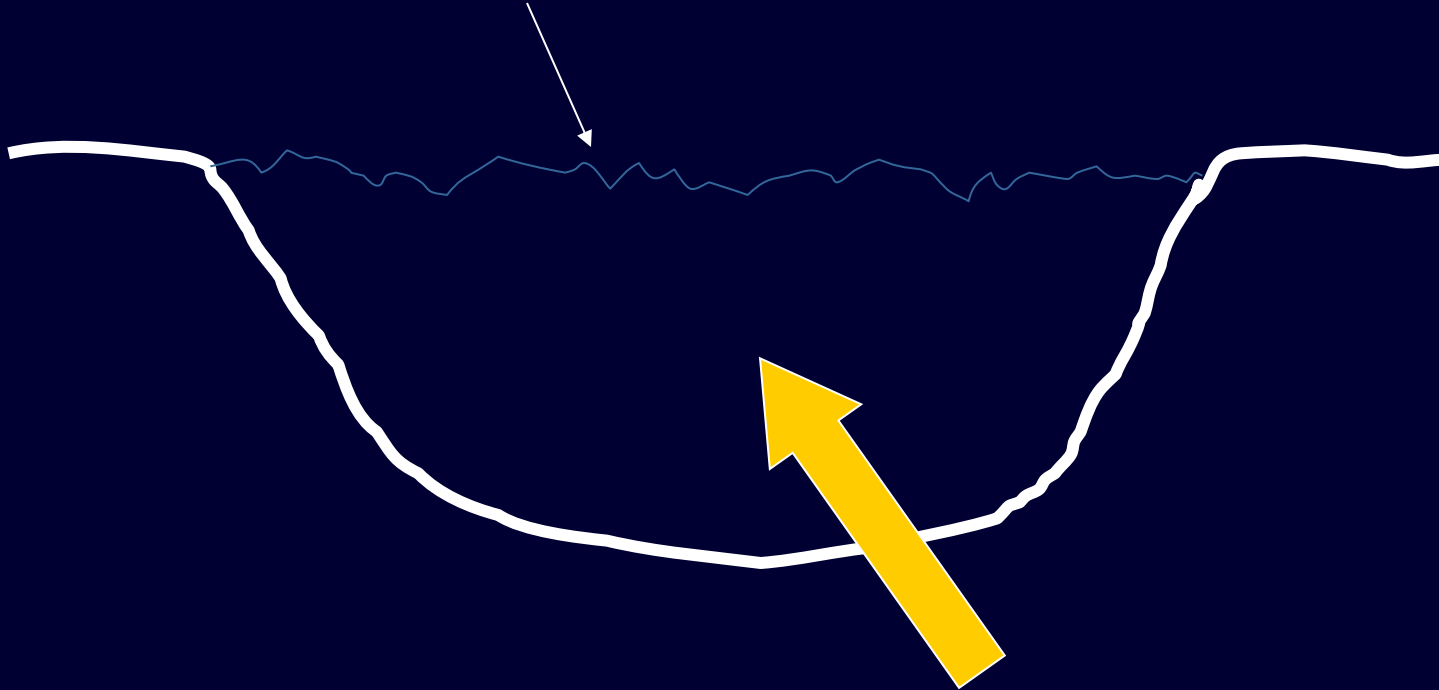
lots of mixing = fall turnover



entire lake = cooling down,  
same density

# Winter

ice = 0 C



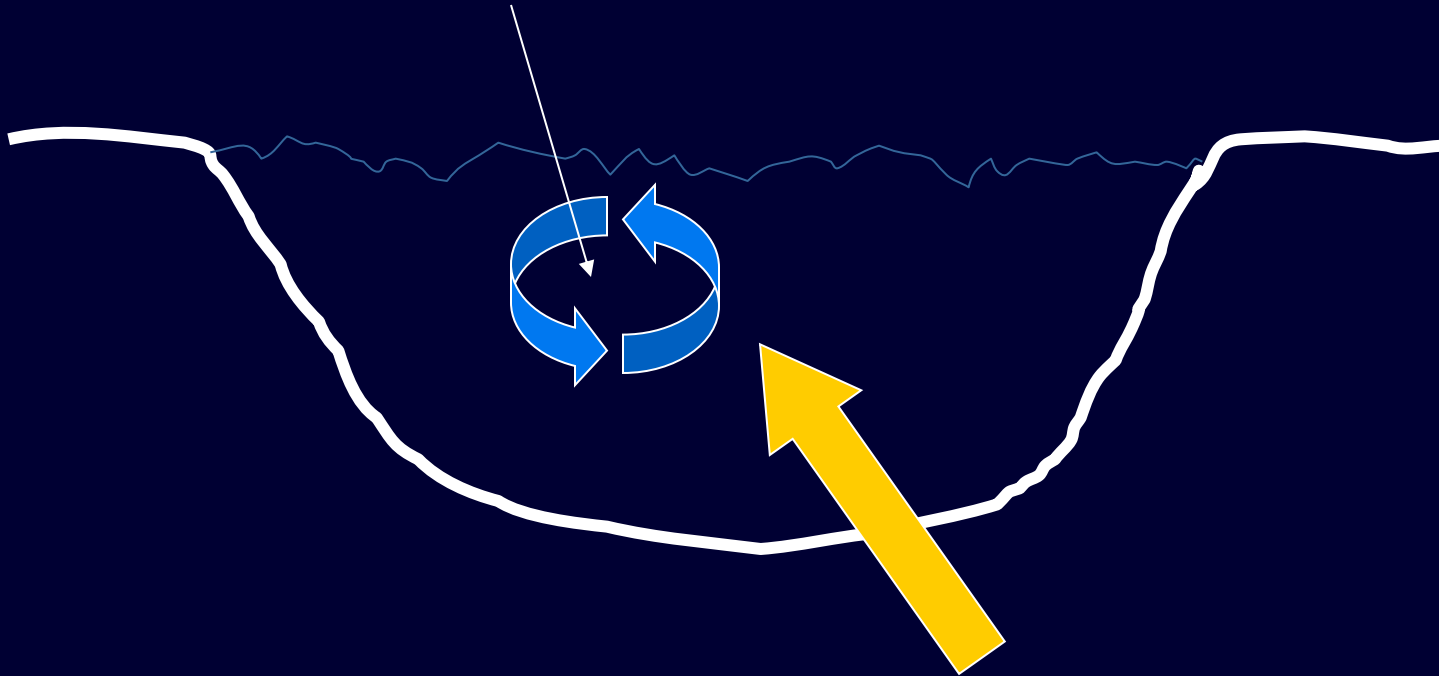
entire lake = 39 – 50 F

Entire lake = O<sup>2</sup>



# Spring

lots of mixing = spring turnover



entire lake = warmer

O<sup>2</sup> changes

# Fish, Stocking, and Management



# Pond Fish Species

- Approximately 180 Native Fish Species in Illinois
- Bluegill, Largemouth Bass, Channel Catfish and Redear are the most widely and successful pond species.
- These are the only species recommended for pond in Illinois

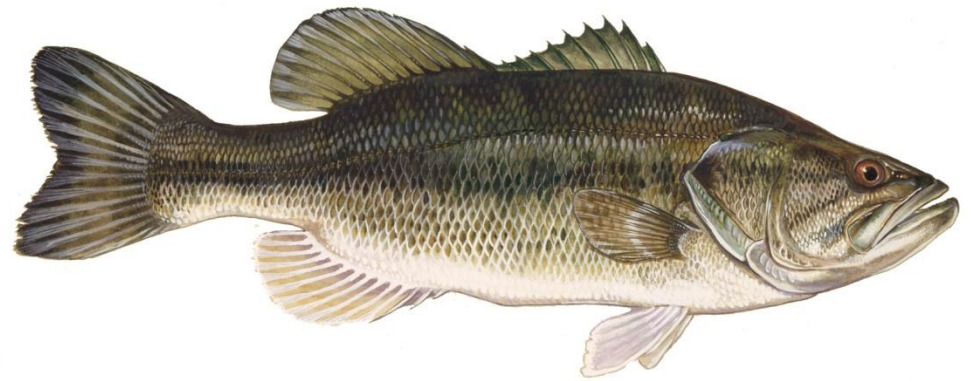
# Bluegill: State Fish



- Forge base for a Pond
- Can reproduce multiple times a year (Typical year twice)



# Largemouth Bass



- Pond Predator, sight feeders, greenish in color
- Only reproduce one time a year (before Bluegill and Redear)

# Redear Sunfish



- Similar to the Bluegill,
- Only reproduce once a year
- Can not be the ponds only source of food!
- Called Shell crackers due to feeding preference for aquatic snails



# Channel Catfish

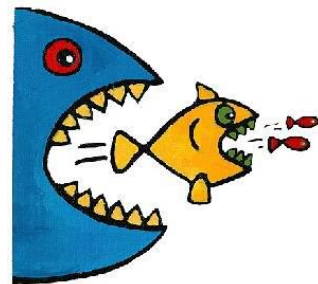


- whiskers, forked tail, no scales
- Omnivore, eat anything
- Can reproduce in ponds, but eggs and young are eaten quickly , no survival of young (This all depends on if cavities are available for them to spawn in)
- Need to supplemental stock 8 inch fish as they are removed from the pond

# Why does this combo work ???

## The Pond Food Chain

- Sunlight + Nutrients = Phytoplankton= food for all young fish
- Sunlight + Nutrients = Aquatic plant growth = Aquatic insects= Food for young fish and adult Bluegill
- Bluegills = Food for Largemouth Bass
- Aquatic insects, Aquatic vegetation and fish = Channel Catfish food





# Illinois Pond Stocking Plans

- **New ponds:** Fingerling stocking (smallest fish available)
  - 100 Largemouth Bass / Surface acre (Fall After BLG and CCF)
  - 1000 Bluegill / Surface acre
    - Can be 700 Bluegill and 300 Redear sunfish, Not north of IL RT. 30 typically
  - 100 Channel Catfish /Surface acre
- **Corrective Stocking:** will need larger fish
  - Bluegill overpopulation: stock 25-100 8-10 inch bass
  - Largemouth overpopulation: stock up to 200-300 Adult Bluegill
- **Supplemental Stocking:** will need larger fish
  - Channel Catfish will need to be supplementary stocked through the ponds life

# Where do I get Fish for stocking?

1. County Soil and Water Conservation District Fish Sales : Twice a year (Fall and Spring)
2. IDNR Private Fish Dealer List  
[www.ifishillinois.org](http://www.ifishillinois.org)
3. Some local Farm and Feed Stores



## Pike County SWCD 2018 Spring Fish Sale

The Pike County Soil & Water Conservation District is currently taking orders for the 2018 Spring Fish Sale. Orders can be placed from now until Friday, April 13, 2018. The fish will be delivered at the Pike County SWCD office in Pittsfield on Wednesday, April 18, 2018 at 11:00 a.m. All fish except the 8-10" Catfish will be bagged. Please fill out the form below and return it with your check made payable to: Pike County SWCD, 1319 W. Washington St., Pittsfield, IL 62363. If you have any questions, please do not hesitate to call our office at 217-285-5448 Ext #3.

Type of Fish	Price	Quantity	Total
Channel Catfish 4-6"	.75 Each		
Channel Catfish 6-8"	.90 Each		
Channel Catfish 8-10"	\$1.05 Each		
Largemouth Bass 2-3"	.95 Each		
Largemouth Bass 5-8"	\$2.45 Each		
Hybrid Sunfish 1-2"	\$68.00 (250 Per Bag)		
Hybrid Sunfish 3-5"	.85 Each		
Hybrid Sunfish 5-7"	\$1.15 Each		
Bluegill 1-2"	\$68.00 (250 Per Bag)		
Bluegill 3-5"	.85 Each		
Black Crappie 2-3"	\$58.00 (250 Per Bag)		
Redear 1-2"	\$68.00 (250 Per Bag)		
Albino Catfish 4-6"	\$2.00 Each		
Triploid Grass Carp 8-11"	\$11.50 Each		
Fathead Minnows 150 per #	\$12.00 per #		
		Total:	

Name:

Address:

Daytime Phone:

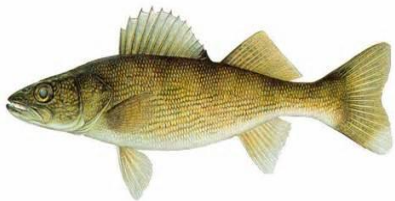
If ordering Grass Carp, please complete the following:

**Grass Carp must be ordered by Monday, April 2nd, 2018** and should be stocked at 5-6 per surface acre of water.

County: Township: Range: Section: Pond Acres:

# Game species **NOT** to be stocked

- Smallmouth Bass
- Northern Pike
- Muskie
- Walleye/Sauger
- Flathead Catfish



# Crappie Species?



• **NO! NO! NO!**

- Crappie in lakes less than 25 acres will be problematic
- The Black and White Crappie have high reproductive rates and spawn prior to Largemouth bass, allowing the crappie young to have a head start on the Largemouth Bass.
- **If you must have Crappie, stock the Black Crappie it does better due to its diet of aquatic insects.**
- YOU HAVE BEEN WARNED!





# Undesirable Species



- Common Carp :
  - Cause muddy water, reduce productivity of a pond, reduce spawning
- Bullhead Species (Brown, Yellow and Black):
  - Cause muddy water, Overpopulate
- Gizzard Shad:
  - Over population, Competition with Bluegill
- Green Sunfish:
  - Small undesirable fish for fishermen, Small predator

# Undesirable Species

- How do I deal with them ?
  - Common carp : Bow fishing, Rotenone, Drain pond
  - Bullhead species: Harvest, Rotenone, Drain pond
  - Gizzard Shad: Rotenone, Drain Pond
  - Green Sunfish: Harvest, Rotenone
- Rotenone will cost about 100 dollars an acre/foot. 1 acre pond average depth 6 ft. = 6 acre feet: Cost \$600

# Hybrid Sunfish

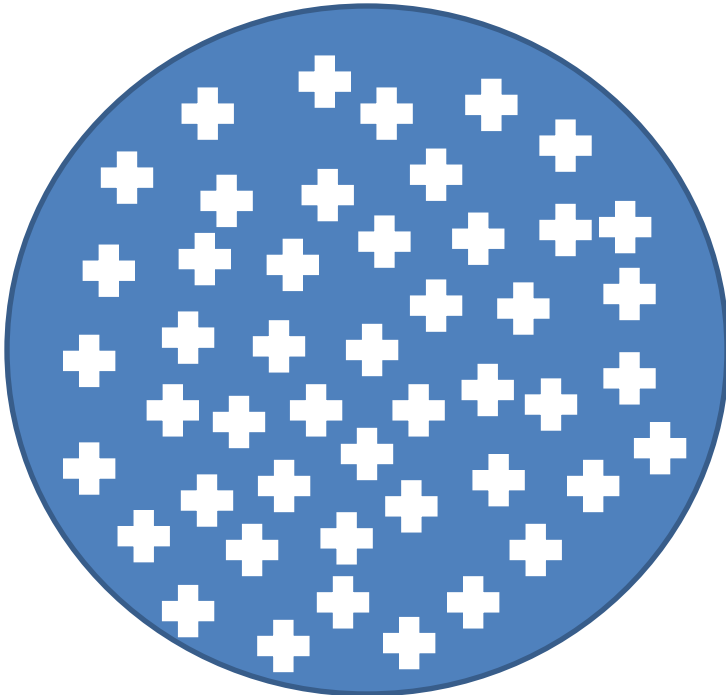
- Hybrid Bluegills?
  - Not correct –only identifies one parent
- Cross between Bluegill and Green sunfish (Mostly Male)
  - Stocked with the idea that they do not overpopulate, grow faster and are easier to catch
- Not all true
  - Will not support a Largemouth bass population (Stunted)
  - Have to be stocked after initial stocking with expensive 3-5 inch fish
  - If stocked with true Bluegills, hybrids have reduced growth potentials.
  - Can back cross to Green sunfish an undesirable species

# Fisheries Management

Ponds can only hold so many fish

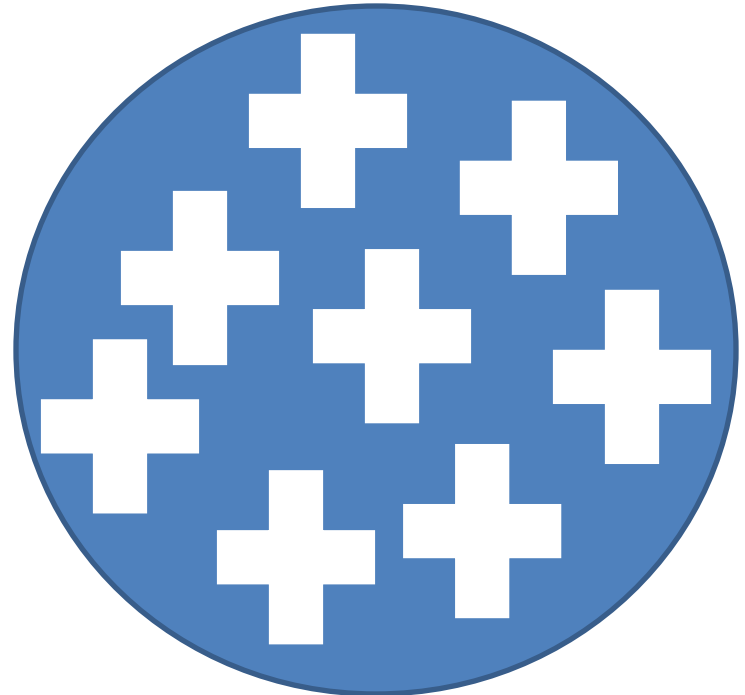
Pond 1

Lots of small fish (400 lbs. acre)



Pond 2

Few large fish (400 lbs. acre)





# Fish Density, Competition and Growth

- Growth rate of a fish is controlled by density as it relates to the amount of food and space available.

	Pond 1	Pond 2	Pond 3	Pond 4
Stocking Rate (fish/acre)	600	1200	2400	4800
Initial stocking weight/fish	0.06 lbs. (1 oz.)	0.06 lbs. (1 oz.)	0.06 lbs. (1 oz.)	0.06 lbs. (1 oz.)
Final Average Weight/fish	0.50 lbs. (8 oz.)	0.25 lbs. (4 oz.)	0.125 lbs. (2 oz.)	0.06 lbs. (1 oz.)
Final total Weight (All Fish)	300 lbs.	300 lbs.	300lbs	300 lbs.

# “Balance”

- Stability between fish and their habitat
- A balanced fish population is an optimum density with its food and space supply and produces a sustained yield of harvestable sized fish.



# How do I maintain Balance

- Harvest is important!
  - Most ponds reach full capacity in year three after stocking
  - No Bass should be harvested in first two years
  - Bluegill and Redear can be harvested at the end of the second year.
  - **Ponds support 4 times more sunfish than bass so harvest should be directed to sunfish harvest**

# How is my fish population?

- Go Fishing
- Keep records of fish caught and size
- Contact your IDNR district biologist
- You are looking for multiple size groups of Bass and Bluegill
  - Bluegills 6 inches or larger
  - Bass average 1-2 pounds



# Common balance issue

“order tends to disorder”

- Bluegill all 4-5 inches long
  - Harvest
  - Reduce the Aquatic Vegetation to allow bass to feed on Bluegill better
  - Fall Draw down
  - Untreated: Bass numbers will decline-Bass size will increase
- Largemouth all 10-12 inches long
  - Harvest
  - Untreated: Have small population of large Bluegills, lots of small Bass

# Management choices

- Trophy Bluegill Pond

- Purposely stunt the Bass population

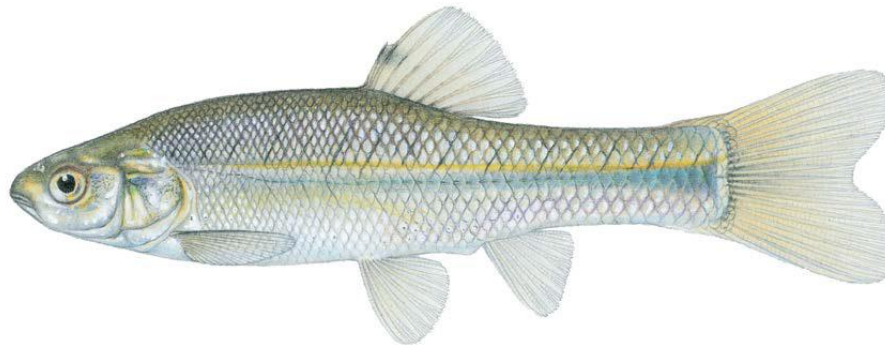
- Lot of 10-12 inch Bass: No Harvest
    - Limited Aquatic Vegetation: Increase Bass feeding
    - Limited numbers of Bluegills in large sizes

- Trophy Largemouth Bass Pond

- Purposely stunt Bluegill population

- Lots of 2-4 inch Bluegills
    - Bluegills will keep bass reproduction to minimum
    - Limited numbers of Large Bass produced

# Fathead Minnows



- Fathead Minnows can be stocked in a new pond to give Largemouth Bass a jump start on growth
- In Bass established ponds, fathead minnows will get eaten up quickly

# Feeding Fish?

- Do I have to feed my fish?
  - It is up to you, can be family fun to feed Catfish
- Get floating feed pellets
- Catfish and sometimes Bluegill will take to pellets
- Feed at a rate of 2 lbs. /acre to start
- Use no more than what can be consumed in 15-20 minutes
- Too much can cause a fish kill



# Questions and Break





# District Biologist By County

- **David Wyffels: 630-360-4185**
  - Rock Island, Henry, Bureau, LaSalle, Whiteside, Lee and DeKalb
  - [David.wyffels@illinois.gov](mailto:David.wyffels@illinois.gov)
- **Brennan Caputo: 630-360-4181**
  - Jo Davies, Stephenson, Winnebago, Boone, Carrol and Ogle
  - [Brennan.caputo@illinois.gov](mailto:Brennan.caputo@illinois.gov)





# Aquatic Plants

- **Good Why?**

Create Oxygen

Photosynthesis process gives off Oxygen

Provide habitat, nursery for young fish, food source for invertebrates, ambush area for predators

- **Can be bad if not managed**

**How?**

Can cause poor fish population

Bass not able to control bluegill population

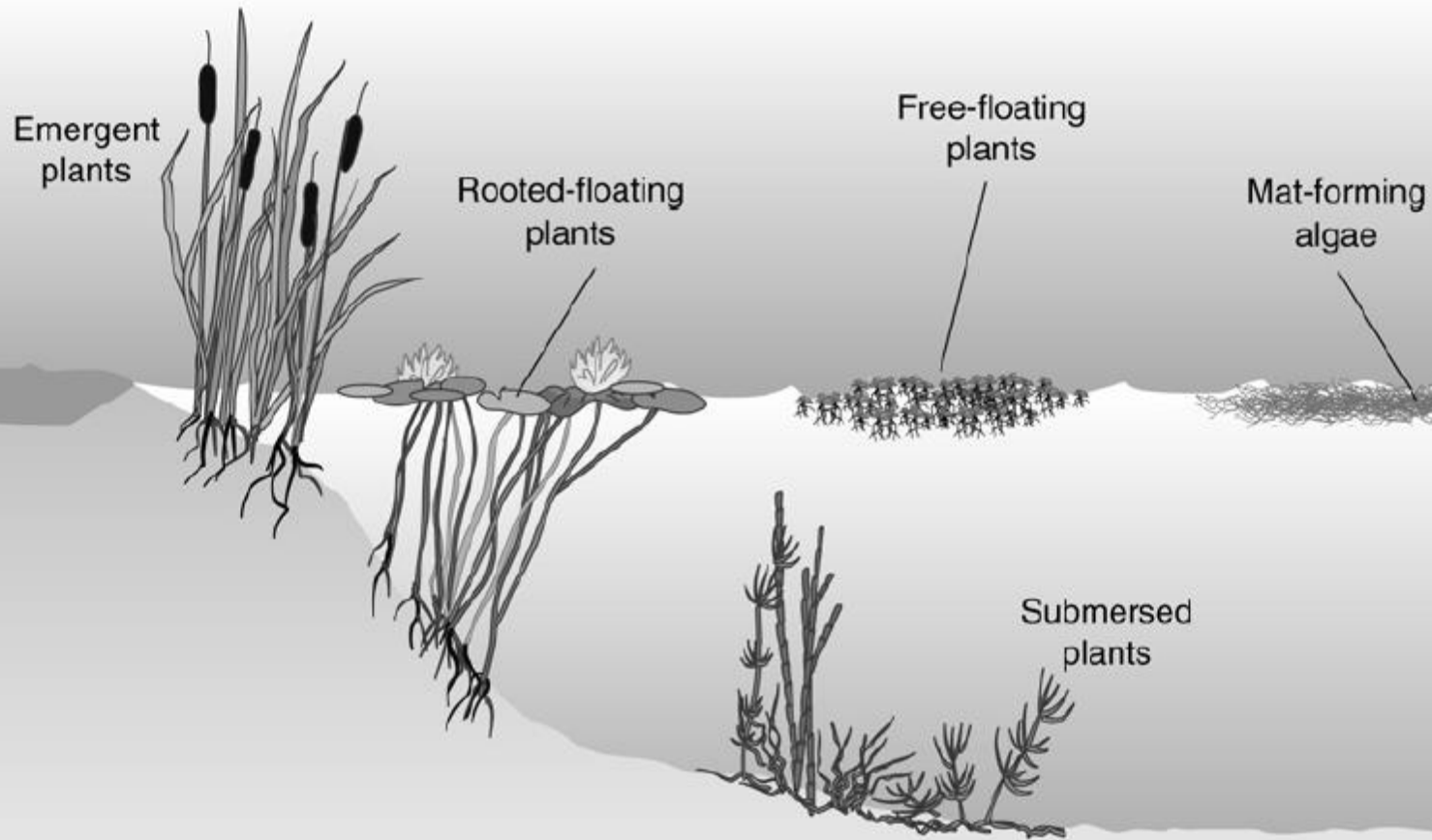
Can cause fish kill

Die off plants consume oxygen through decomposition

- **Looking for 10-20% of the pond area to have aquatic plants**



# Plant Types





# Vegetation Factors

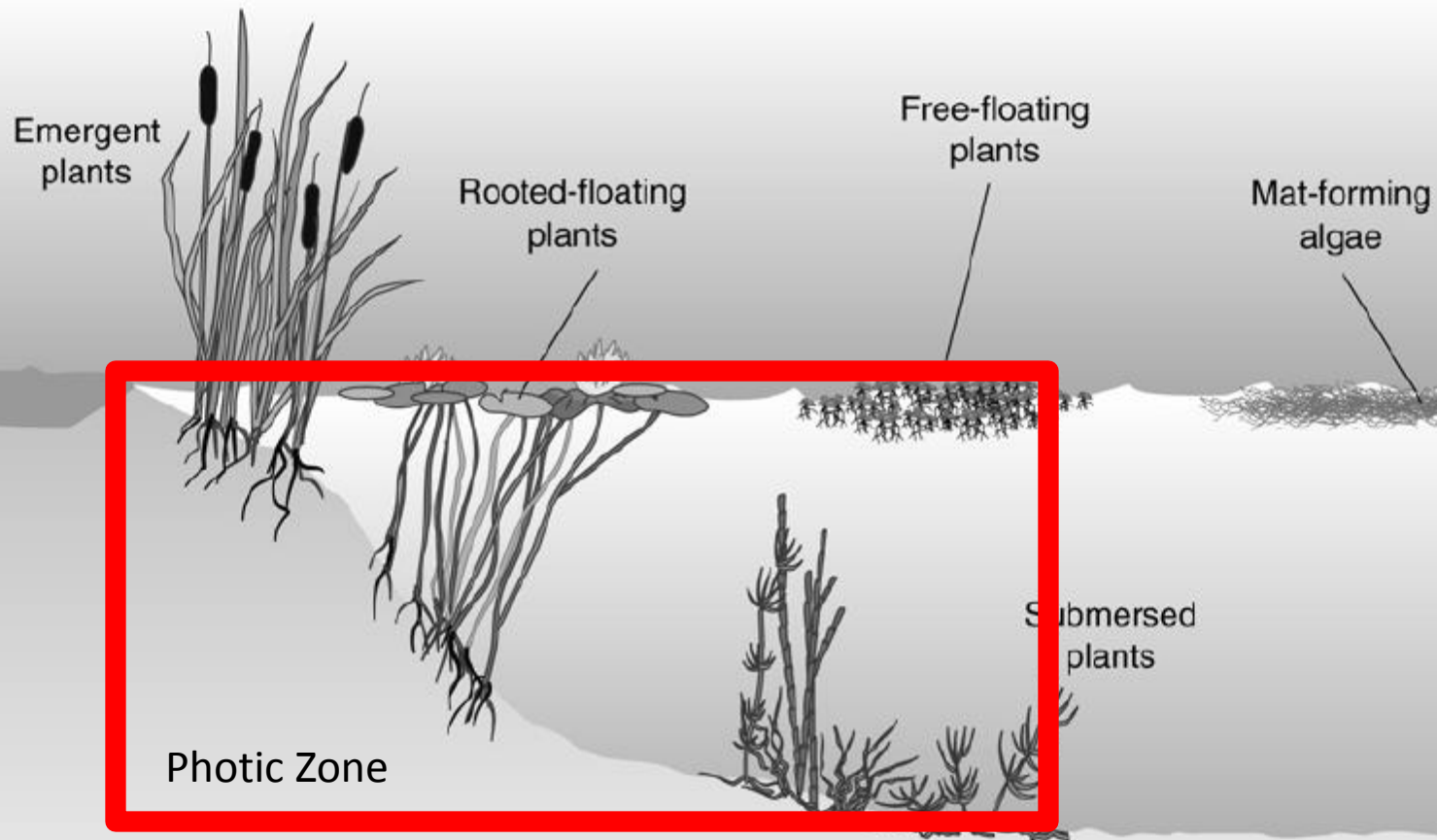
- 2 Major Factors that regulate Aquatic Plant growth

- Sunlight :

Area of the lake that receives enough sunlight penetration to support aquatic plants is called the **Photic Zone**

- Nutrients : Phosphorus

# Plant Types



# Watershed Management

- Sources of Sediment and Nutrients Agricultural runoff
  - Septic (Phosphorus)
  - Lawn fertilizer (Phosphorus)
  - Livestock feed lots or livestock entering pond (Phosphorus)
  - Geese (Phosphorus)
- **Limiting Phosphorus is the goal**
- Preventative Action Dry dams
  - Grass buffer strips
  - Lawn fertilizer with less or no 'P' (phosphorus)
  - Keep livestock from entering pond
  - 3 ft. wide tall grass buffer strip around pond (limits geese)



# Common Aquatic Plants





# Filamentous Algae: AKA Pond Scum



Primitive Plant, no true leaves or stems

# More Filamentous Algae





# Blue-green algae



- Blue-Green Algae will look like spilled green paint
- Typically associated with very nutrient rich waters



# Duckweed and Watermeal





# Coontail: Submergent





# Curly leaf Pondweed: Submergent



Early season weed, will die off in June or July  
Starts growing in late fall early winter

# Eurasian Water Milfoil: Submergent



Non Native, very invasive to native Aquatic plants



# Cattails: Emergent



# Treatment of aquatic vegetation

- Mechanical: hand removal, or cutting
- Chemical : Treatment with chemicals made in late spring
- Biological : Grass Carp



# Mechanical removal



- Be aware that some species of aquatic vegetation spread via fragmentation. You will be helping to spread them by Cutting.



# Chemical Removal

- For Recommendations on what chemicals to use please send a photo of the vegetation in question to your county IDNR fisheries biologist.
- Please put the vegetation on a white towel and take close-up pictures to help with identification.
- Treatments need to be done before **July 1**. Cool water holds more Oxygen than Warm Water.
  - Decomposing aquatic vegetation uses oxygen in the water as bacteria break it down

# When do I need to treat with Chemicals?

- When greater than 20% of your pond is covered with vegetation
- It interferes with your use of the pond
  - Swimming
  - Boating
  - Fishing



# NPDES

Due to a new court ruling with regard to the National Pesticide Discharge Elimination System, changes have been made in the pesticide permitting requirements. The court stated that an NPDES permit is required when pesticides are applied to, over or near waters of the US. This ruling applies to all private water owners, with dammed ponds or lakes having outflow to waters of the State. If the pond owner intends to treat ponds with outflows for algae and/or aquatic vegetation, they must fill out and submit a Notice of Intent (NOI) to the Illinois Environmental Protection Agency to receive coverage under the General Pesticide NPDES Permit. The Notice of Intent form must be completed and submitted electronically to the IEPA at least 14 days prior to pesticide application, although paper forms will be accepted. The NOI will be posted on the Agency's website for 14 days. If the applicant does not receive a Notice of Incompleteness within 30 days from the date the IEPA received the NOI, the applicant can assume approval and may treat the area(s) requested on the NOI. If the permit coverage letter comes before the 30 day period, the applicant can apply pesticides as of the date on the letter. There is an annual Threshold Level of 80 acres. If over 80 acres of water is treated in one year, a Pesticide Discharge Management Plan (PDMP) is required in addition to the Notice of Intent. **Please note: borrow pits, strip mines and quarries do not need any permit at all if there is no overflow.**



# NPDES

## Short Version:

- NPDES permit is required when pesticides are applied to, over or near waters of the US.
- Notice of Intent (NOI) must be submitted to the IEPA at least 14 days prior to the pesticide application.
- Forms and Information at:  
<http://www.epa.state.il.us/water/permits/pesticide/general-permit.pdf>

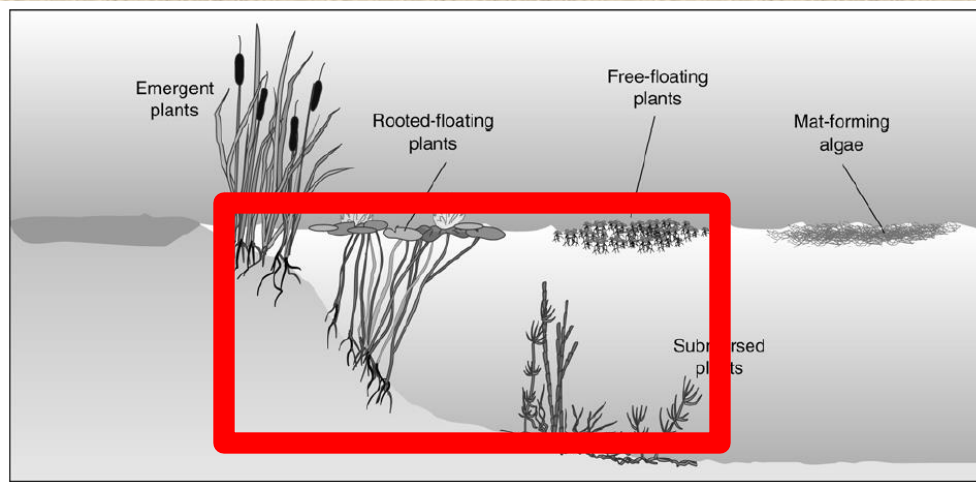
# General Guidelines

- ALWAYS READ THE LABEL
- Wear the required PPE
- Some Aquatic herbicides have restrictions on fishing, swimming, watering, etc.
- If multiple homeowners live on the lake an IL Dept. of Agriculture aquatic pesticide license is required
- Hire a professional when it is more than you can handle



# Pond Dyes

- Remember the Photic Zone:



- The area and depth in which sunlight reaches into your pond
- Pond dyes work by decreasing the depth the sunlight can penetrate into your pond
- Apply early in the year, before weeds start growing

# Pond Dyes

- Water outflow is the major problem
- Will need to maintain the dye throughout the year
- Very shallow areas 1.5 ft. depth will still have Algae and Vegetation
- Aquashade, Pond Master, Admiral
  - Blue or Black colors

# Algae Treatments

- Copper based products
  - Copper Sulfate (Granular)
  - Cutrine and Cutrine Plus (Liquid)
  - Clearigate
  - Many others
- My have to apply multiple times a year
- Grass Carp: will eat Filamentous Algae but not preferred:
  - Effective Control will be unpredictable.



# Watermeal Treatments

- Fluridone- Sonar, Avast, Whitecap
  - Long acting chemical, needs 45 day contact time
    - Can not use in a pond with heavy outflows
    - Have to treat the entire pond
    - Will kill all other Aquatic weeds
    - Can get two years out of one treatment

Some Watermeal populations can be resistant to Fluridone
- Flumioxazin – Clipper
  - Contact herbicide, very quick acting



# Duckweed Treatments

- Often found together with Watermeal
- Flumioxazin – Clipper
- Fluridone- Sonar, Avast, Whitecap
- If it is just Duckweed
- Reward (Diquat-chemical name)
- Use a nonionic surfactant

# Cattail Treatments

- Best to burn the cattails in the fall or winter
  - Removes the dead plant residue
  - Better access to the newly grown shoots in spring
- Use Rodeo, AquaPro, AquaNeat or similar product (Roundup is not registered for aquatic use)
- Use a nonionic surfactant

# Submerged vegetation treatments

- Chemical will depend on the Weed
  - Not all aquatic herbicides work the same
  - Check with your District biologist





# Diquat Dibromide Products

- Reward, Tribune, WeedtrineD, etc.
- Primarily used for submersed aquatic plants
- Some control of duckweed and watermeal
- Contact herbicide
- Spray or apply by boat



# Glyphosate Products

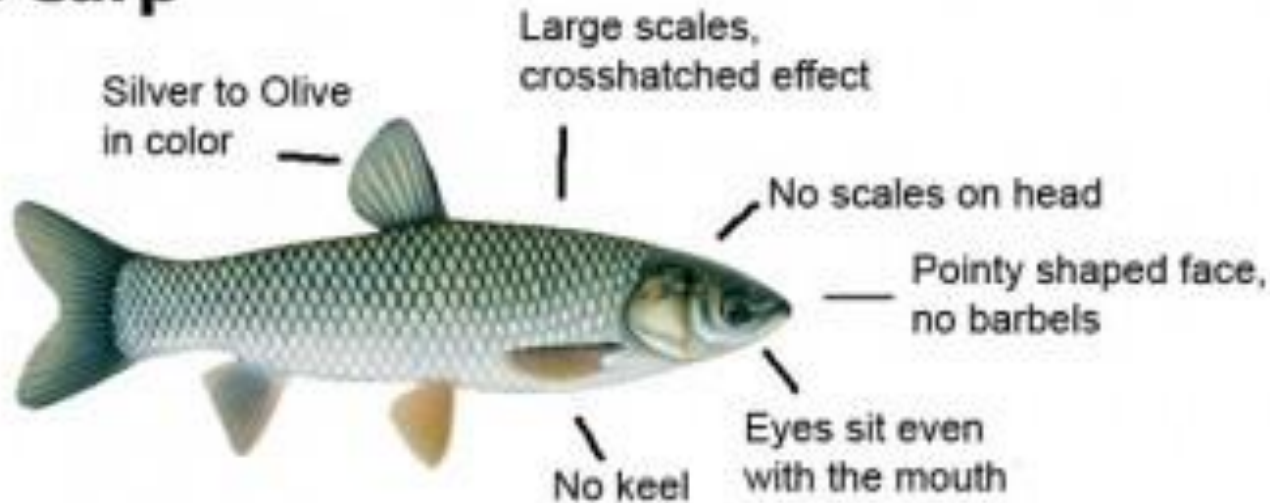
- Rodeo, Aquapro, Aquaneat, etc.
- Primarily used on emergent and some submersed aquatic plants
- Contact herbicide
- Add surfactant
- Spray application
- Roundup is not registered as an aquatic herbicide (the carrier can be toxic to fish)

# 2,4-D Products

- Aquacide, Navigate, DMA4\*IVM, etc.
- Most effective on emergent and some submersed aquatic plants
- Contact herbicide
- Spray or apply by boat

# Biological

## Grass Carp



Stocking rates based on percent plant coverage:

	South	Central	North
10-20	0	0	0
20-40	3	4	5
40-60	5	7	10
Over 60	7	10	15



# Grass Carp

- Pros
  - Cheap, Natural, can be effective for the right vegetation
- Cons
  - If overstocked, they can destroy all aquatic vegetation in the pond.
  - They have food preferences.
  - Depending on the productivity of your pond, you may see an increase in one kind of vegetation as you see a decrease in another. Phosphorus in Phosphorus out.
  - Escapement, Grass Carp are attracted to current and prone to pond escapement

# Grass Carp

- Common Aquatic Vegetation that is not controlled by Grass Carp:

- Filamentous Algae
- Cattails
- Duckweed
- Watermeal
- American Lotus

NOT A WATER GOAT, WILL NOT CONTROL ALL

# Aeration

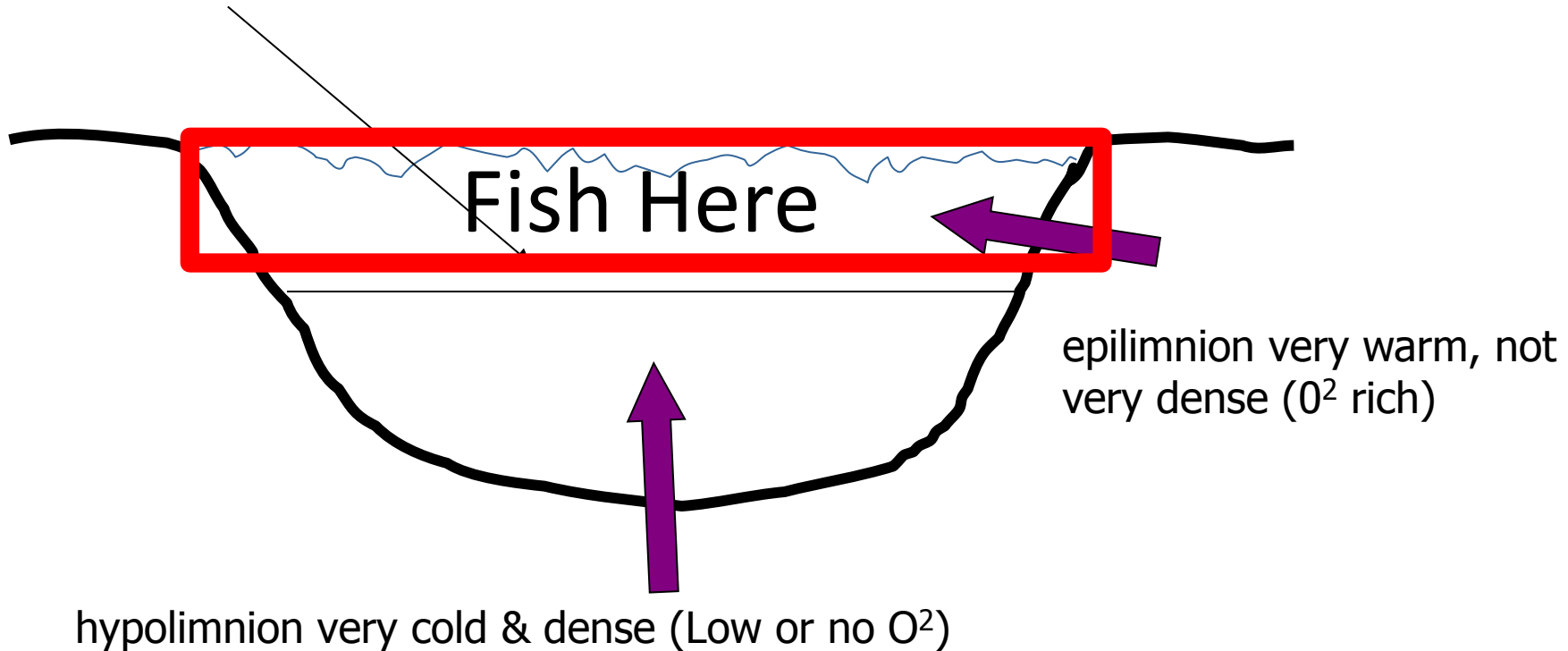
- Do I need an Aerator?
  - Maybe,
    - It depends on your maximum depth
    - If not 10 feet deep-YES
      - Less space for fish during summer months
      - Less oxygen buffering capabilities
    - Aeration can be the fountain of youth for older ponds that have filled in.
    - May be cheaper than dredging



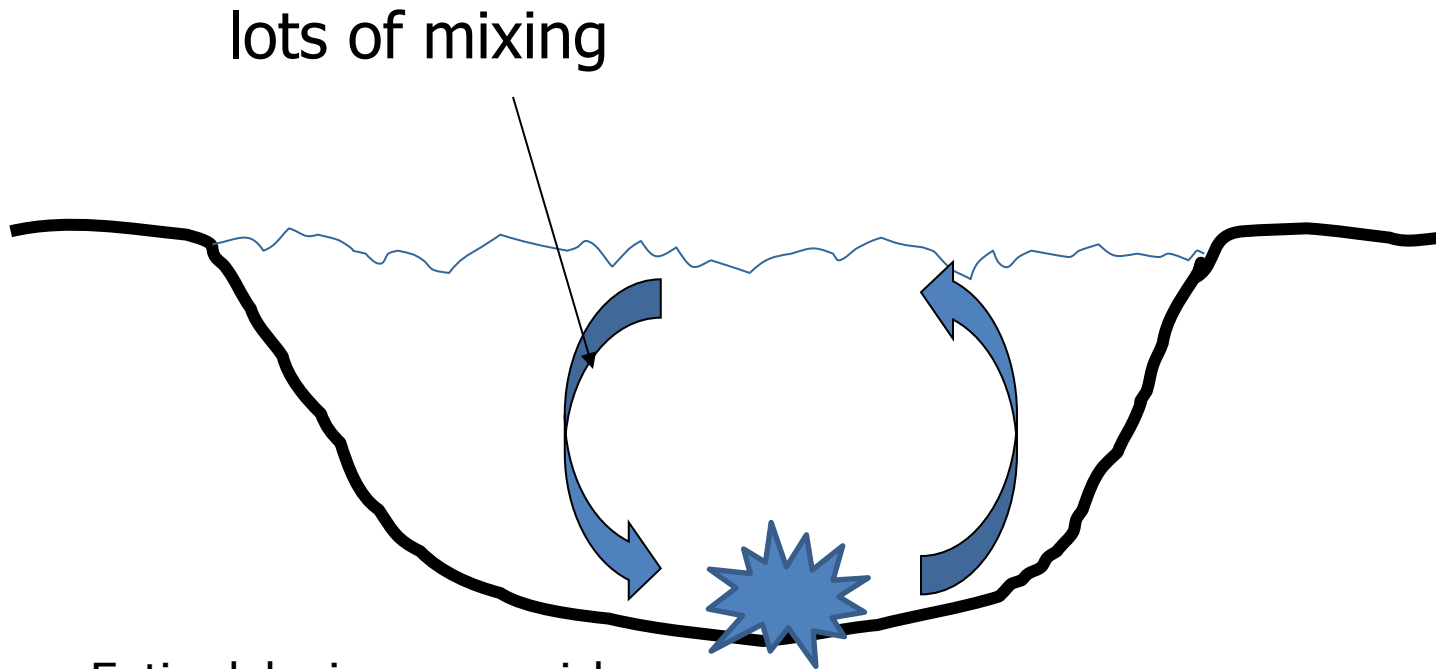
# What are the benefits?

## Summer Pond

very little mixing b/c different densities



# What are the benefits



- Entire lake is oxygen rich
- Increased space for fish, Growth is density dependent
- Increased oxygen buffering capabilities for oxygen dependent conditions (Phytoplankton die off)
- Allows for continued breakdown of organic sediments
- Can help to lock up Phosphorus in bottom sediments

# How do they work?

- Purpose is not to inject oxygen into the water
  - Although some oxygen is absorbed into the pond water
- They use air to create a lifting (mixing) action to the water
- Do not allow stratification



# Aeration

- Many types you will see available
  - Fountains , Surface mixing
  - Bottom release diffuser, with electric air pump
  - Bottom release diffuser, wind powered air pumps
- Not all of these work the same or have the same value to your pond

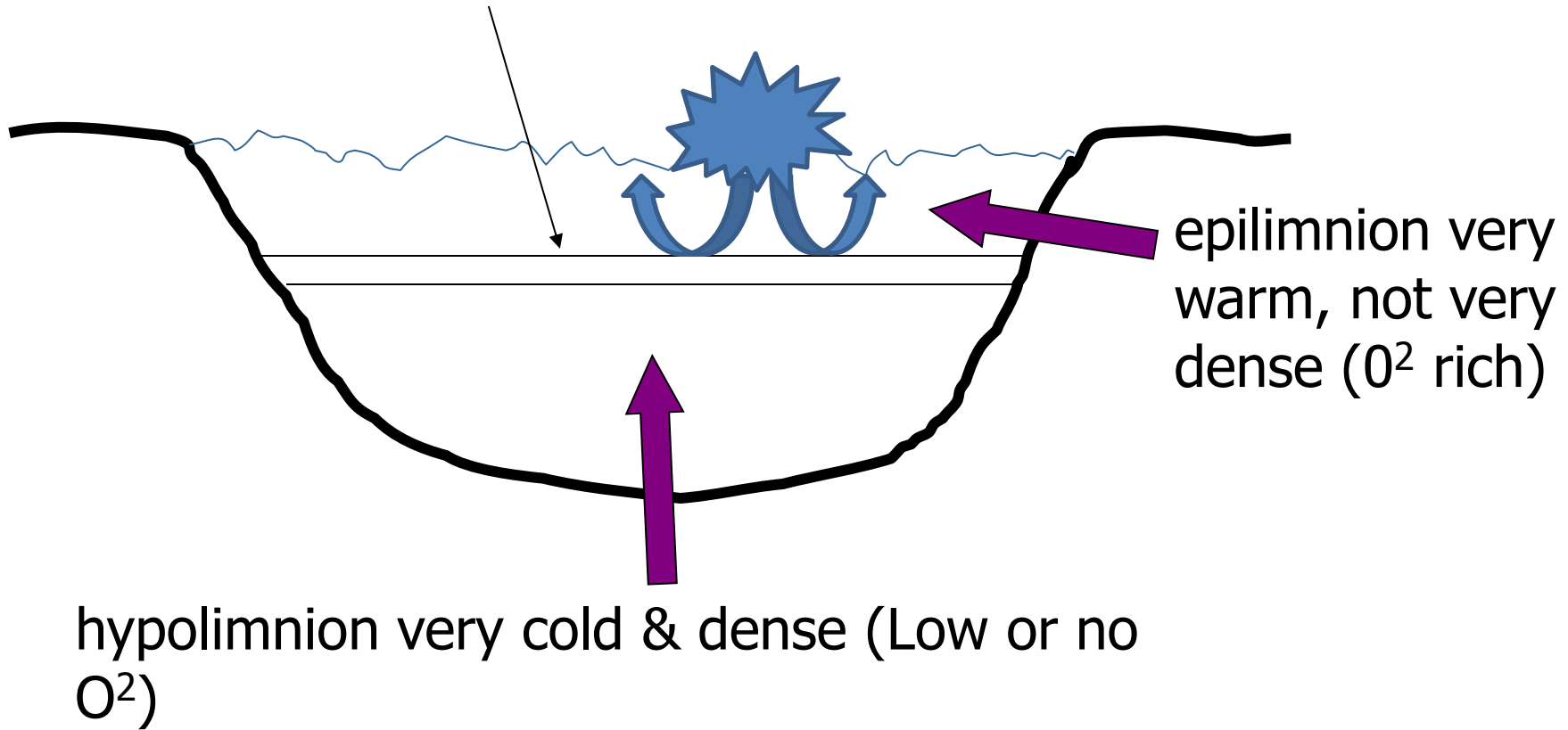
# Fountains types



- Non de-stratifying,
  - Remember the pond in Summer with the layers
- Only move water in the warm already oxygenated section of the lake.
- Designed for ornamental shallow ponds
- Do not buy these!!

# Summer

very little mixing b/c  
different densities



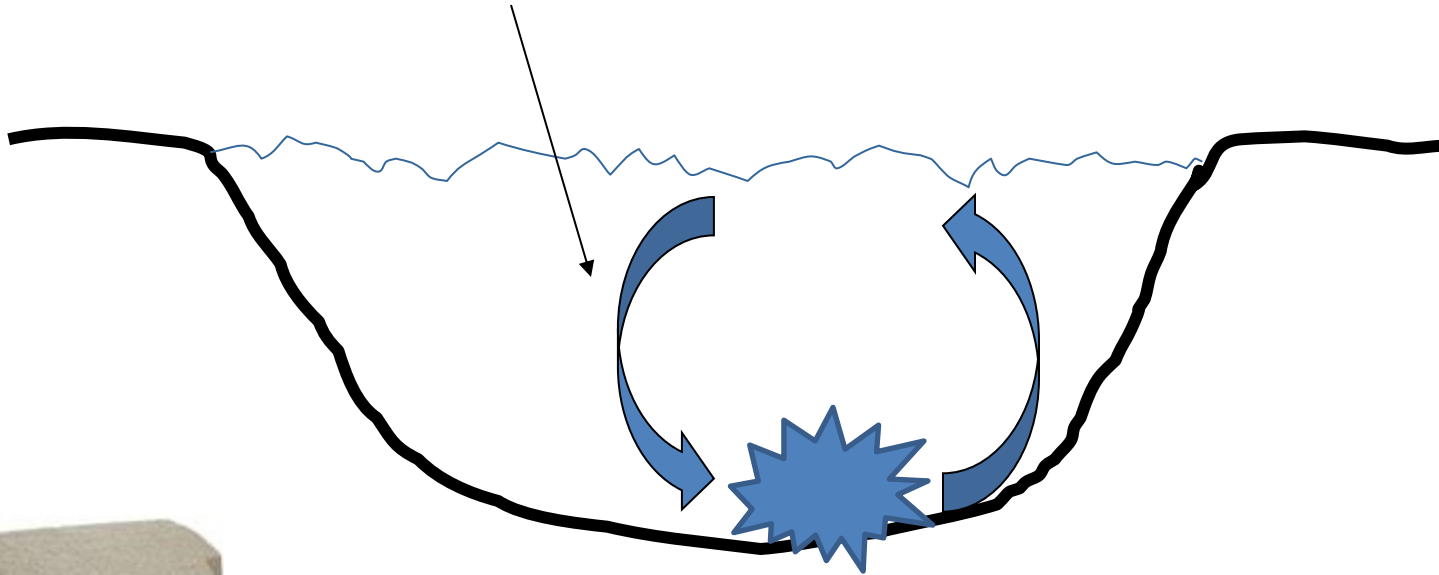
# Bottom release

- De-stratifying
- Mixes water from top to bottom of the lake
- Increased space for fish, Growth is density dependent
- Increased oxygen buffering capabilities for oxygen dependent conditions (Phytoplankton die off)
- This is what you want!



# Bottom release diffuser

lots of mixing



entire lake = Oxygen rich top to bottom

# Bottom Release

- Bottom mounted diffusers should be mounted on a stand and not dropped into organic matter
- Turn aeration on in April or May and run until October (Run 24/7)
- DO NOT turn on an aeration system mid-summer, recipe for a fish kill (Cause a turnover)
- Best to have a professional design them for you

# De-Icing

- Bottom release diffusers can be used in winter months to decrease the chances of a winterkill
- Turning on a bottom release diffusers will move water and create heat on the ice opening a hole in the ice
- This hole will allow oxygen to be exposed to the pond thus decreasing a chance of a winterkill

# Bottom Release models to avoid

- Wind driven (Windmill) pumps
  - Problem (Wind is unpredictable)
  - No wind or low wind conditions in July and August
  - No wind conditions for long period allow stratification to happen
  - Then wind conditions pick back up and cause a turnover and thus a fish kill due to oxygen dependent conditions
  - **I have more fish kill calls that are associated with these than ponds that do not have them**





# Other pond issues



04 6 16

# Fish Kills

- Most are caused by Oxygen related issues
- Summer Kill
  - Excessive Phytoplankton Die off
  - Die off of aquatic vegetation
  - Decomposition requires oxygen
- Winterkill
  - Shallow lakes are more susceptible
  - Heavy snow and ice coverage, decreasing photosynthesis, decrease oxygen



# Fish Kills

- If you only see one species dead?
  - These are bacteria or virus infections
  - Very typical with Crappie species and Bluegill during spawning time
  - Typical with Common carp during the spawn
  - These types of kills are normally a good thing, fish that die are in poor condition to start with.

# Muddy Ponds

- Presence of Common Carp or Bullheads
- Watershed too large
- Soil erosion
- Clay suspensions Simple test using a glass jar  
Gypsum (hydrated calcium sulfate)  
525lbs / acre-foot of water
- Not uncommon for ponds to be muddy during turnover events





# Geese



- Geese a problem?

Can cause extra nutrient loads to your pond

Geese eat grass which contains Phosphorus

Phosphorus in = Phosphorus out

- How to detour Geese

Allow a 3 foot wide or more tall grass buffer to grow around your pond

Geese hate tall grass = possible predator hiding

Many other options but start with the grass it is the cheapest



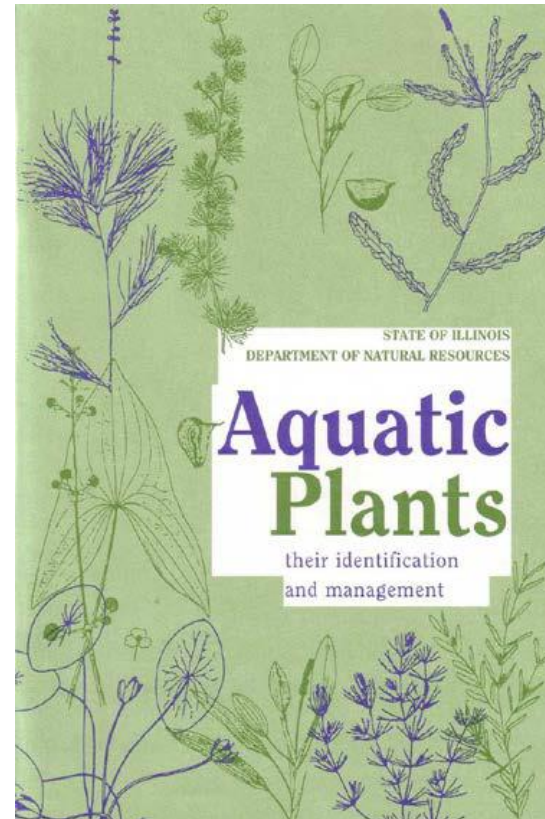
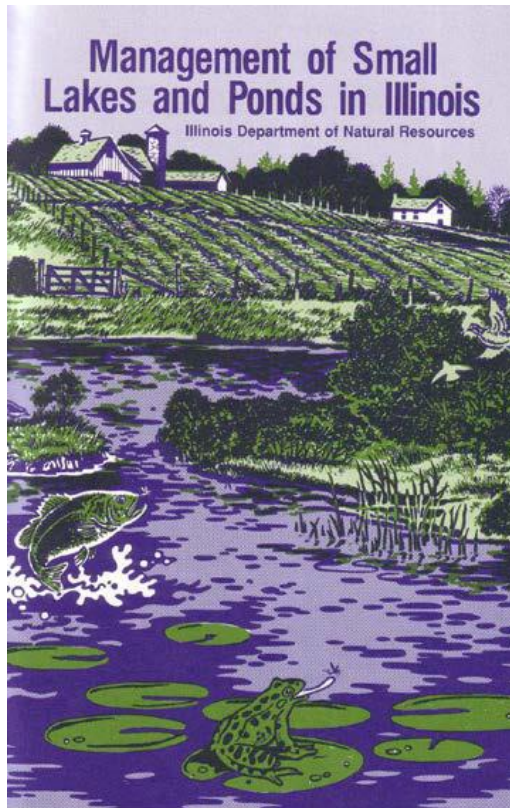
# Other Advice

## Be careful of the internet!

- Lots of pond management info available
- Lots of it is from places in the southern United States and will not work in northern parts
  - Pond fertilization a NO NO in Northern Illinois
  - Florida strain Largemouth Bass – again a NO NO
  - The list goes on and on.....
- Your state biologist is always just a phone call, text message or email away. [www.ifishillinois.org](http://www.ifishillinois.org) (Find my Biologist)

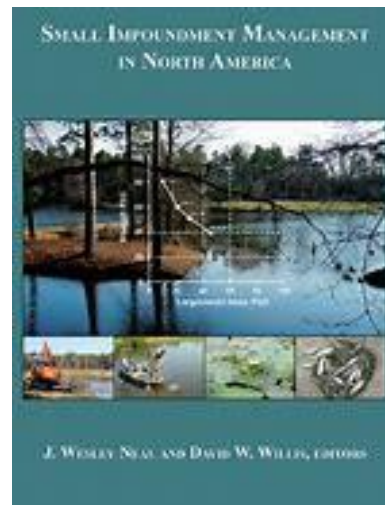
# IFISHILLINOIS.ORG Pond Management Resources

[https://www.ifishillinois.org/programs/aquatic\\_mgmt.html](https://www.ifishillinois.org/programs/aquatic_mgmt.html)



# Other Books

- Small Impoundment Management in North America





# District Biologist By County

- **David Wyffels: 630-360-4185**
  - Rock Island, Henry, Bureau, LaSalle, Whiteside, Lee and DeKalb
  - [David.wyffels@illinois.gov](mailto:David.wyffels@illinois.gov)
- **Brennan Caputo: 630-360-4181**
  - Jo Davies, Stephenson, Winnebago, Boone, Carrol and Ogle
  - [Brennan.caputo@illinois.gov](mailto:Brennan.caputo@illinois.gov)

