

The background features abstract, overlapping green geometric shapes in various shades of green, creating a modern and dynamic feel. The shapes are primarily located on the left and right sides of the slide, framing the central text.

DESIGNING WITH NATIVES

A few strategies to garner broad appeal

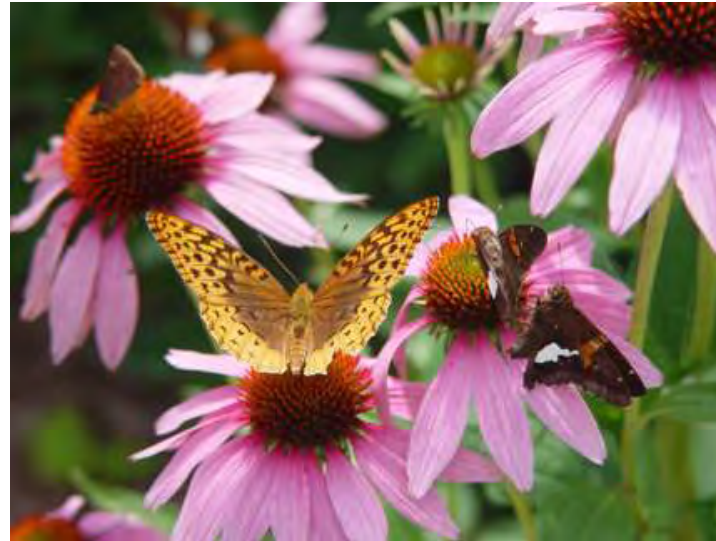
Native plants are a new aesthetic



HOW TO OVERCOME OBSTACLES

There are four basic strategies to helping improve public acceptance of native plantings:

- ▶ Massing and rhythm
- ▶ Keep it flowering
- ▶ Choose the right plants
- ▶ Control the edges
- ▶ IT'S ALL SUBJECTIVE



MASSES AND RHYTHM



MASSING: MONOCULTURE



MASSES AND RHYTHM

Basic Principles

- ▶ Plant in repeating groups of individual plants
- ▶ Use odd numbered groups: 3, 5, 7, 9, etc. of the same plant. Use multiple species but stay within scale of the site.
- ▶ The larger the group, the stronger the massing effect
- ▶ Stack by height. There's a lot of variation within a species, so think 1-2' versus 3-5' and so on.
- ▶ Be aware that plants move around: **MAINTENANCE IS KEY**

The result is that the eye recognizes a **SENSE OF ORDER** no matter how large the landscape.

KEEP IT FLOWERING



KEEP IT FLOWERING

Basic Principles

- Understand flowering periods and plan for overlap
- Cover the three growing seasons. Bonus points for winter interest!
- Keep in mind: many species bloom for LONG periods, so it's easy to create overlap with just a few species.

It's harder to complain about weeds when there are
FLOWERS AND COLOR!

CHOOSE THE RIGHT PLANT



CHOOSE THE RIGHT PLANT

How tall will it get?

How does it spread?

What do the leaves look like?

When does it flower and how long do the flowers last?

The key is knowing a plant's growth habit and **WHERE
IT WILL BE PLANTED.**

CONTROL THE EDGE



CONTROL THE EDGE



CONTROL THE EDGE

Basic Principles

- Use shrubs—even non-native shrubs—to frame and contain a planting with more diversity
- Short grasses can also be used: prairie dropseed and sideoats gramma are good choices. Native species work best.

A clean line suggests a **SENSE OF PURPOSE.**



You can also do none of these things and STILL HAVE A BEAUTIFUL, INTERESTING, HIGH FUNCTIONING LANDSCAPE.

(Know your client)

MAINTENANCE IS THE KEY

Thanks to Eco Logic for sharing these slides

Native Plant Communities *for Stormwater Solutions*



Wetland Mitigation

Indiana University
Bloomington, IN



Native Plant Communities

Monitoring & Management



Keys to Successful Monitoring

- First year seedling identification
- Early identification of noxious weed species
- 2nd and 3rd year seedling identification of more conservative species is necessary for establishing diverse plant communities

Native Plant Communities

Monitoring & Management



Maintenance Program:

Scenario # 1- Small Urban BMP High Visibility
6-12 site visits per season

Main Activities:

- Weed Management
- Mulching
- Plant replacements
- Trash Removal
- Maintaining Drainage

Native Plant Communities

Monitoring & Management



Maintenance Program:

Scenario # 2- Large Urban BMP Low
to Medium Visibility
3-4 site visits per season

Main Activities:

- Weed Management
- Mowing or Prescribed Burning
- Over-seeding/Plant Replacement
- Maintaining Drainage

Native Plant Communities

Monitoring & Management



Myths: About Native Plant Communities

- They require no maintenance once established
- They require the same knowledge, methods and equipment as traditional landscaping

FALSE!

FALSE!

Native Plant Communities

Monitoring & Management



Chemical Treatment of Invasive Plants

- Effective on a Broad Spectrum of Species
- Always Focus on Systemic Herbicides
- Does Not Cause Soil Disturbance
- Selective Herbicides can Protect Native Species
- Always Read and Understand the Herbicide Label

Native Plant Communities

Monitoring & Management



Questions for a Contractor:

- Experience with stormwater BMPs
- Knowledge of native and invasive plant species
- Experience controlling invasive plants
- Licensed by the Office of the Indiana State Chemist
- Ability to identify 1st and 2nd year seedlings

QUESTIONS?

LUNCH & LEARN

LUNCH & LEARN

Your LAWN CHOICES are CONNECTED to Clean Water

Grow Grass, Not Algae! Use Less
Fertilizer & Buy Phosphorus Free
to Prevent Water Pollution

YOU CAN MAKE A DIFFERENCE!



**Make a Difference
TAKE A PLEDGE!**



**PET &
OTHER POO**

LEARN MORE



**LAWN
FERTILIZER**

LEARN MORE



**CONSERVE
WATER**

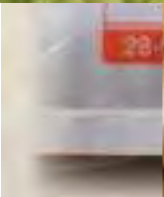
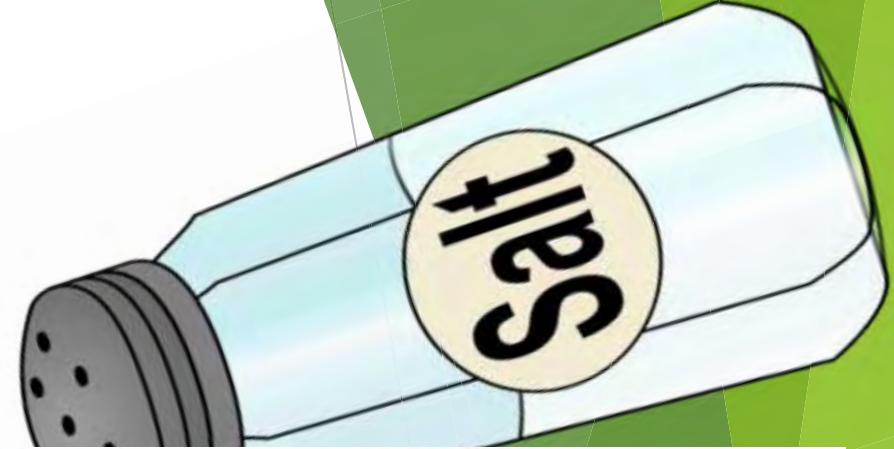
LEARN MORE



**VOLUNTEER
SERVICE**

LEARN MORE

Fertilizers!



Frequently Asked Questions about Fertilizers

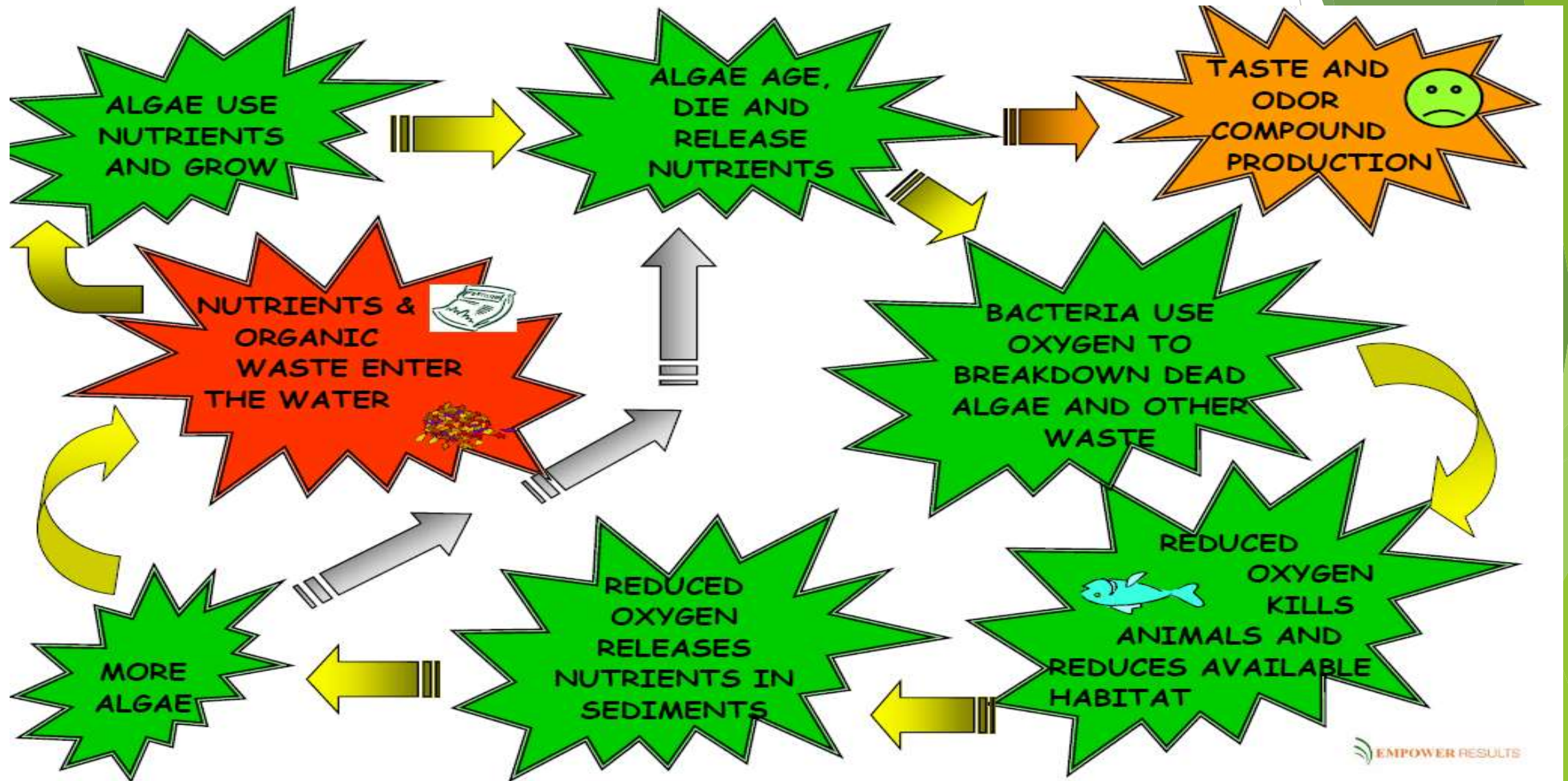
CLEAR CHOICES
CLEAN WATER
happy lawns, healthy water



- What is fertilizer?
- What is phosphorus?
- How do I know if the fertilizer is phosphorus free?
- Which number on the bag of fertilizer is phosphorus?
- Is "low phosphorus" the same as "no-phosphorus" in terms of protecting the environment?
- Is organic fertilizer the same as no phosphorus?
- What is soil testing and why should I care?
- Can I take my soil somewhere to get tested?
- To have a good looking lawn, do I even need to fertilize?
- Do I need phosphorus for my lawn to stay healthy/green?
- Do I need special equipment or different application method?
- Is phosphorus free fertilizer more expensive?
- Are there better times to fertilize? Time of day, time of year, weather conditions?
- What are the best practices for lawn care?
- How does fertilizer move around and affect our water quality?
- What are the levels in Indiana's waters?
- What is the government doing about phosphorus levels in our waters?
- What can I do as a homeowner that will help reduce phosphorus levels in our waters?
- Does bad taste or smell of my drinking water have anything to do with phosphorus in the water?

What is fertilizer?

THE CHAIN REACTION OF DEATH



PHOSPHOROUS AS A 'LIMITING FACTOR'

A 500 pound “batch” of wet algae requires:

- 1 pound phosphorus
- 7 pounds nitrogen
- 40 pounds carbon



Leaves = >50% of Annual
Phosphorus Load to Urban Stream

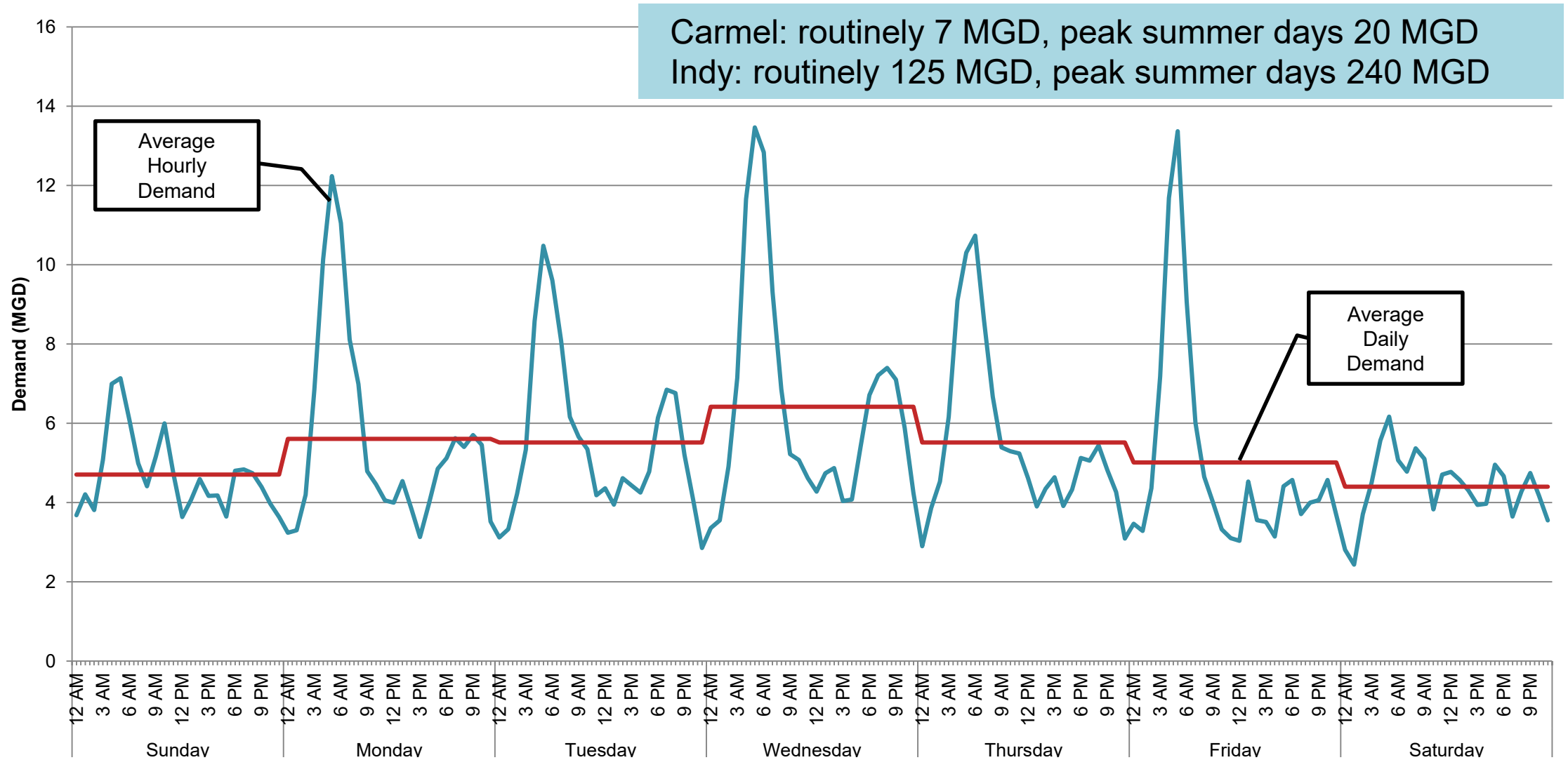


AHH, AND A LITTLE ABOUT IRRIGATION...



WESTFIELD WATER - SUMMER DEMAND PROFILE

MON, WED AND FRI PATTERNS



LAWN IRRIGATION CHALLENGES FOR PUBLIC WATER SUPPLY

- ✓ Lawn Irrigation = Biggest Driver of Peak Day Water Demand (50%-75%)
- ✓ Hourly Lawn Irrigation Patterns (2am - 6am)
- ✓ Daily Lawn Irrigation Patterns (Mon, Wed and Fri)
- Water System Stress (Max Pressure/Flow, Water Main Breaks, Elevated Storage, etc.)
RESULT: Lower Water System Reliability (Short & Long-Term)
- Reliable Long-Term Water Supply Requires New Resources & Infrastructure
RESULT: Higher Water Utility Costs and Customer Rates

OUTDOOR CONSERVATION ACTIONS

Please select each action you will or already do and be sure to fill out the additional information requested. Even if you don't water your lawn at all, please mark 'I already do' for the first 3 items below. This will allow us to acknowledge all the water savings from your efforts.

☐ Only water my lawn in the late evening (after 10 pm) or early morning (before 9 am).

☐ Not water my lawn on hot or windy days to avoid rapid evaporation and reduce water waste.

☐ Stop watering my lawn in late summer for the 6 weeks from early August to mid September.

☐ Put a layer of mulch around trees and plants because bark, peat moss and other types of mulch slows down evaporation.

☐ Not run the hose while washing my car. I'll use a bucket of water and a quick hose rinse at the end.


☐ Use a broom to sweep off driveway and/or patio instead of using the hose to avoid wasting water.

☒ Only water my lawn in the late evening (after 10 pm) or early morning (before 9 am).

I already do this ☐

I will do this ☒

My lawn is acres in size.

 Your water savings is 840 gallons per year!

☒ Not water my lawn on hot or windy days to avoid rapid evaporation and reduce water waste.

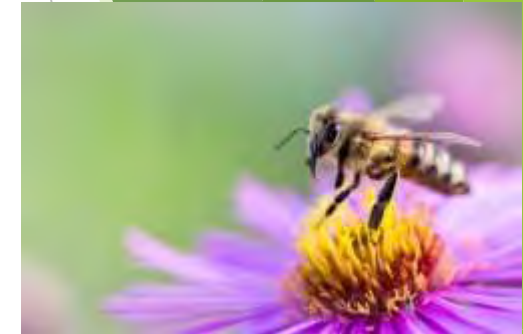
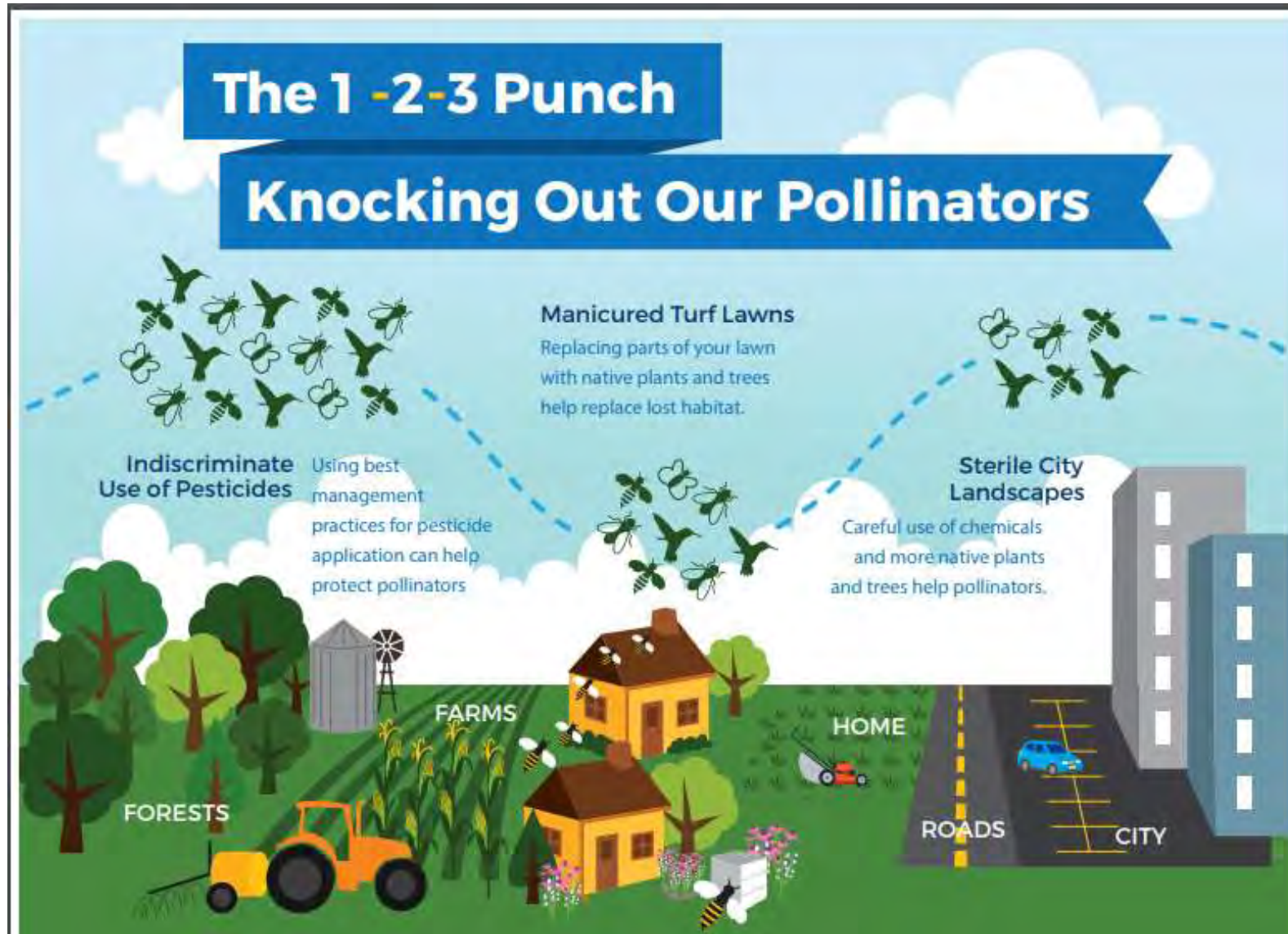
I already do this ☐

I will do this ☒

My lawn is acres in size

 Your water savings is 42,470 gallons per year!

AND ONE MORE ACTION THAT MATTERS...





PLEASE HELP PROTECT
OUR WATER SUPPLIES



Thank You!

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

POND DESIGN, FUNCTION, AND MAINTENANCE

OUTLINE

- ▶ Detention Pond Definition and Purpose
- ▶ How Much Water is the Site Generating?
- ▶ Why Does the Pond Fill Up?
- ▶ Additional Pond Design Requirements
- ▶ Water Quality Aspects of Detention Ponds
- ▶ Maintenance

DETENTION POND DEFINITION AND PURPOSE

- What is a detention pond?
 - Excavated hole or basin from a development project
- Why is a detention pond needed?
 - Flood Control: Traps the water for a period of time
 - Water Quality Filtering: Removes pollution from stormwater



HOW MUCH WATER IS THE SITE GENERATING?

Drainage Area

- ▶ Portion of the site that drains to the pond
- ▶ Should be entire developed area



HOW MUCH WATER IS THE SITE GENERATING?

GROUND TYPE



Low Site Runoff



High Site Runoff

HOW MUCH WATER IS THE SITE GENERATING? STORM SIZE

Storm Size (In a day)

- ▶ Water Quality = 2 year (1" rain)
- ▶ Conveyance System = 10 year (4" rain)
- ▶ Flood Control = 100 year (7" rain)



classroomclipart.com

HOW MUCH WATER IS THE SITE GENERATING? FLOW RATE

Flow Rate

- We use all of the previous factors to compute how much water flows from the site.



WHY DOES THE POND FILL UP?

- ▶ Flood control and water quality
- ▶ Inflow Versus Outflow
 - ▶ Water leaves the pond at the same time it comes into the pond.
- ▶ Release Rates
 - ▶ Water comes into pond much faster than it can leave the pond per local ordinances
 - ▶ The release rate of the pond is controlled by the outlet control structure of the pond.



WHY DOES THE POND FILL UP?

Storage

- The difference between the amount of water coming into and exiting the pond is the storage amount.

For example, this is equivalent to filling the bath tub with the drain partially closed such that the tub can slowly fill with water, but still have some water draining out.

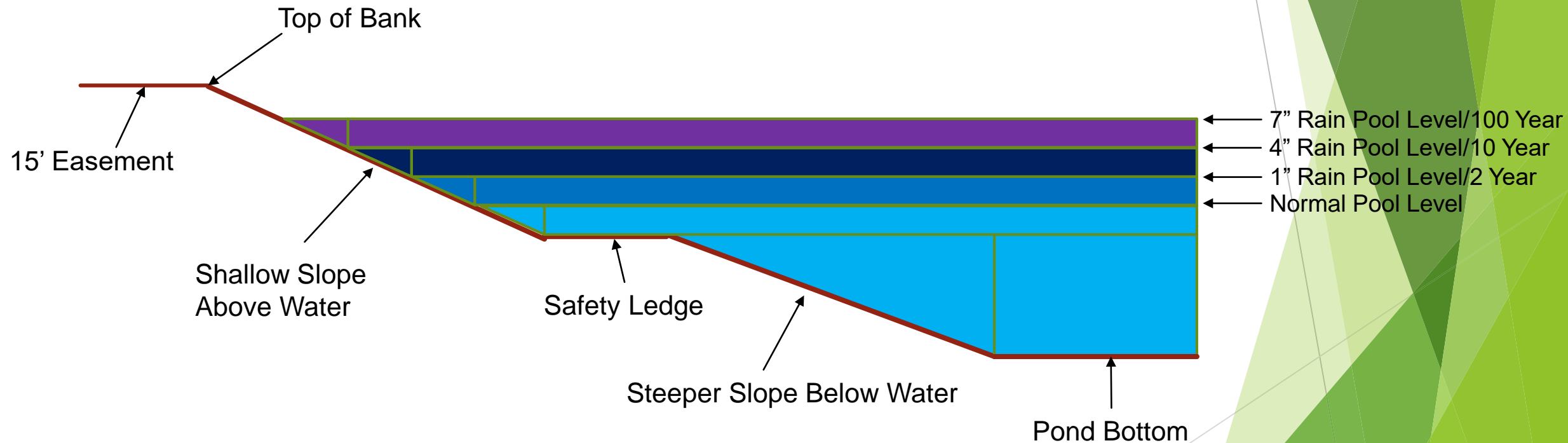


ADDITIONAL POND DESIGN REQUIREMENTS

- ▶ 10 foot wide flat safety ledge around the entire pond.
- ▶ Bank slopes below the water line and safety ledge can be steeper than the slopes above the water line.



ADDITIONAL POND DESIGN REQUIREMENTS-CROSS SECTION



ADDITIONAL POND DESIGN REQUIREMENTS- FLOOD ROUTING

Flood Routes

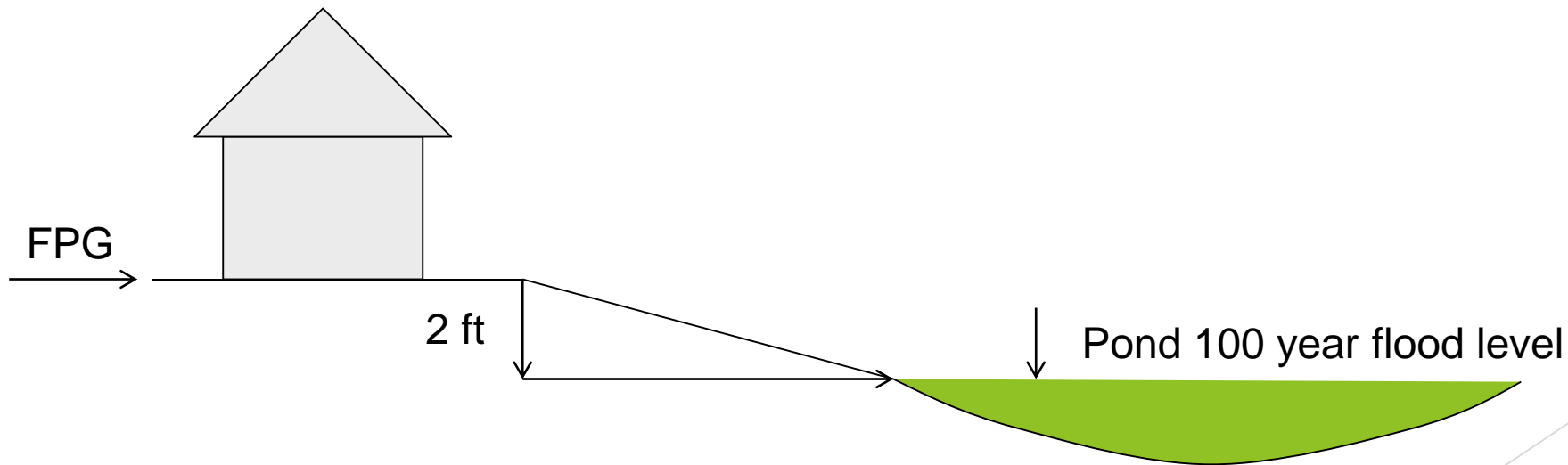
- ▶ Easements protect emergency flood routes if pond overtops
- ▶ Only happens during very extreme events or if the pond outlet becomes clogged



ADDITIONAL POND DESIGN REQUIREMENTS- FLOOD PROTECTION

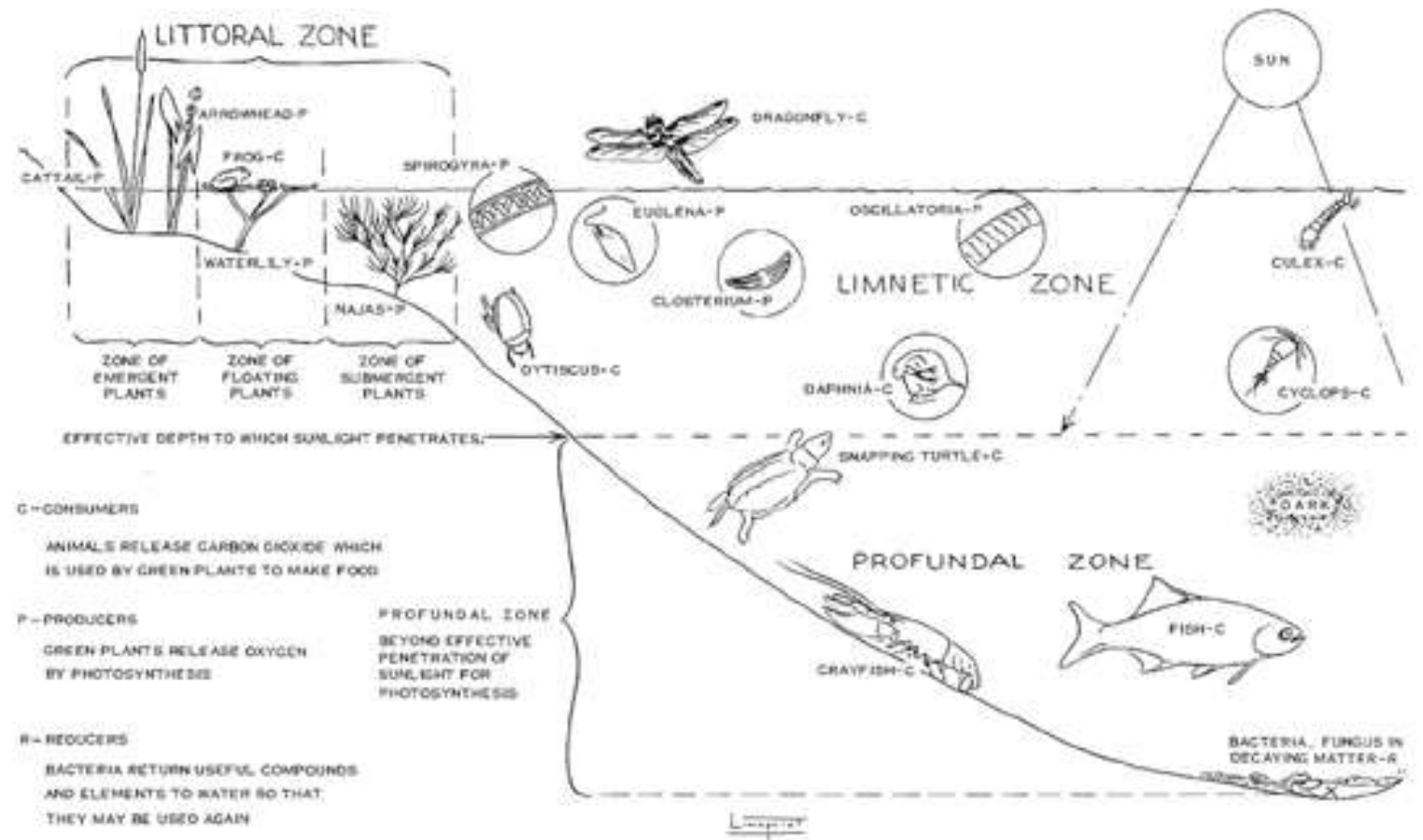
Flood Protection Grade

- ▶ Buildings must be 1 foot above grade of emergency overflow route
- ▶ Homes must be 2 feet above pond 100 year flooding height



WATER QUALITY ASPECTS OF PONDS

- ▶ 8 to 10 feet in depth
- ▶ Ponds remove 80% or more of Total Suspended Solids (TSS) as well as removal of nutrients, bacteria, and metals, oils, organics
- ▶ Pollutants settle out with retention time and decay
- ▶ Many biological processes occurring



REASONS WE NEED WATER QUALITY PONDS



REASONS WE NEED WATER QUALITY PONDS



REASONS WE NEED WATER QUALITY PONDS



MAINTENANCE ASPECTS OF PONDS

- ▶ Sedimentation
- ▶ Muck/sludge
- ▶ Aquatic Vegetation and Algae
- ▶ Trash
- ▶ Erosion and Bank Management
- ▶ Outlet Clogging



MAINTENANCE ASPECTS OF PONDS: SEDIMENTATION

▶ Harmful Effects

- ▶ Shallow Depths
- ▶ Vegetation Growth
- ▶ Less chemical trapping
 - ▶ Lower retention time
- ▶ Inlet Blockages/Flooding

• Treatment Options

- Mechanical Dredging/Excavation and Haul
- Hydraulic Dredging
- Biological Sludge Techniques



MAINTENANCE ASPECTS OF PONDS: SEDIMENT EFFECTS



MAINTENANCE ASPECTS OF PONDS: SEDIMENT LOCATIONS



MAINTENANCE ASPECTS OF PONDS: SEDIMENT REMOVAL



MAINTENANCE ASPECTS OF PONDS: AQUATIC VEGETATION/ALGAE

► Harmful Effects

- Offensive odors
- Discoloration/Unsightly
- Oxygen depletion due to decomposition
- Fish kills
- Bad drinking water tastes
- Toxic algae

• Treatment Options

- Chemical*
- Biological*
- Cutting
- Harvesting
- Dredging
- Aeration*

*More later!



MAINTENANCE ASPECTS OF PONDS: AQUATIC VEGETATION/ALGAE



MAINTENANCE ASPECTS OF PONDS: CHEMICAL TREATMENT



MAINTENANCE ASPECTS OF PONDS: AQUATIC VEGETATION HARVESTING



MAINTENANCE ASPECTS OF PONDS: TRASH

► Harmful Effects

- Unsightly
- Leaves pond into rivers and lakes
- Clog outlets causing flooding

• Treatment Options/Expectations

- Hand collection
- Most is probably near the shoreline
- May need waders or boat for difficult to reach trash



MAINTENANCE ASPECTS OF PONDS: TRASH



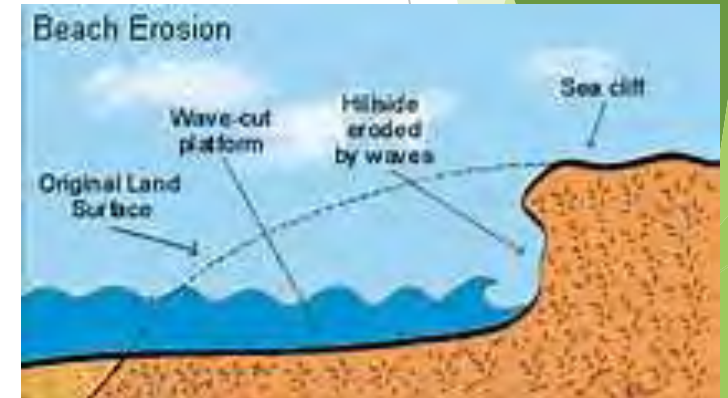
MAINTENANCE ASPECTS OF PONDS: EROSION/BANK MGT.

► Harmful Effects

- Deterioration of the pond bank
- Gullies or rills
- Storm sewer damage
- Shoreline creepage
- Animal burrows
- Maintenance access loss

• Treatment Options

- Fill in holes with soil and re-seed/blanket
- Animal trapping
- Stabilize shoreline with rip rap stone, glacial stone, sea walls, or native plantings
- Stabilize swales, channels, or sump pump discharge points
- Remove trees and woody vegetation



MAINTENANCE ASPECTS OF PONDS: EROSION/BANK MGT.



MAINTENANCE ASPECTS OF PONDS: EROSION/BANK MGT.



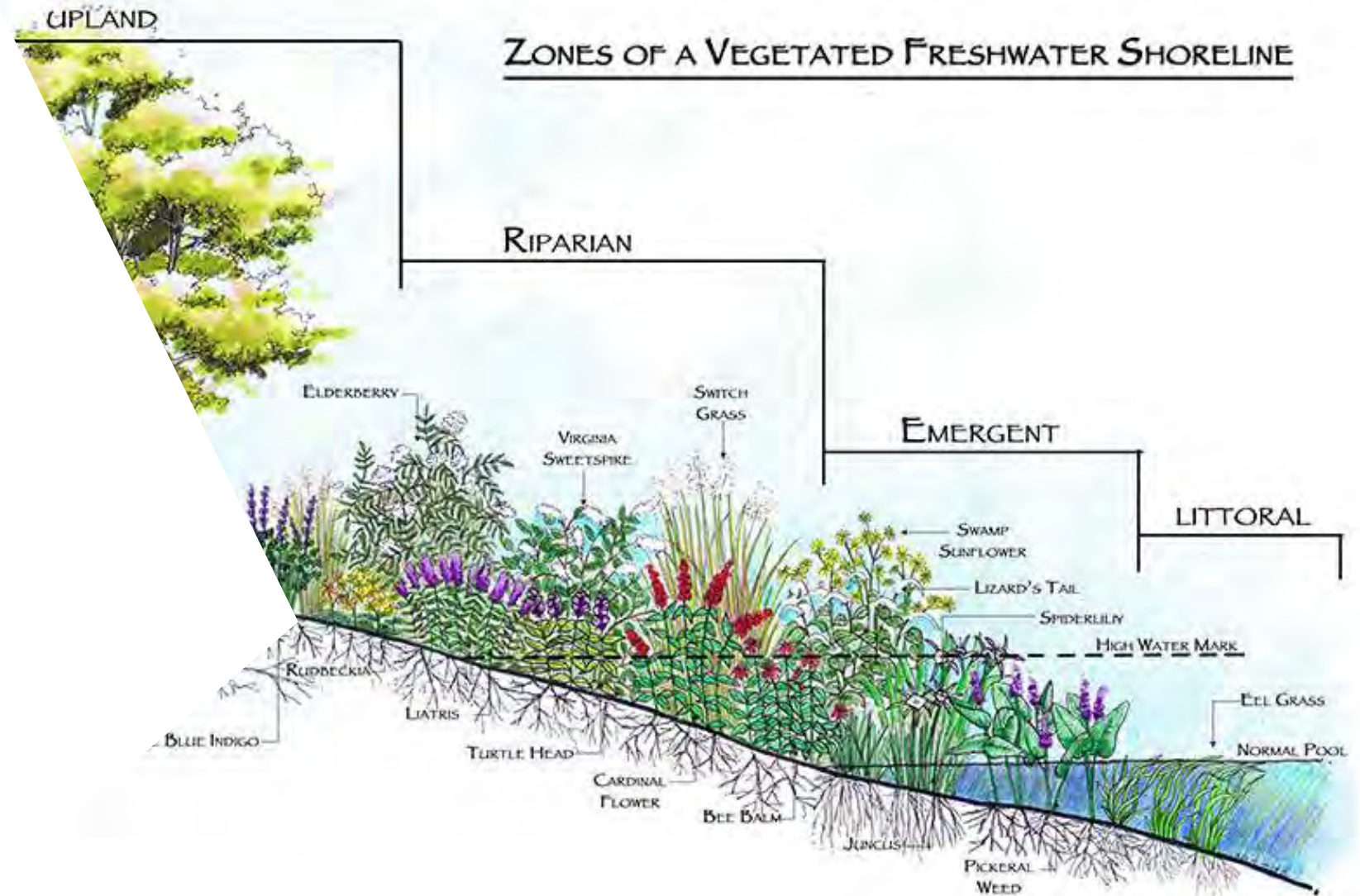
MAINTENANCE ASPECTS OF PONDS: EROSION/BANK MGT.



MAINTENANCE ASPECTS OF PONDS: SHORELINE PROTECTION

► Vegetation-

- Shoreline vegetation protects property naturally, effectively and inexpensively
- Nearshore water plants can help protect the shoreline against waves and provide excellent fish habitat

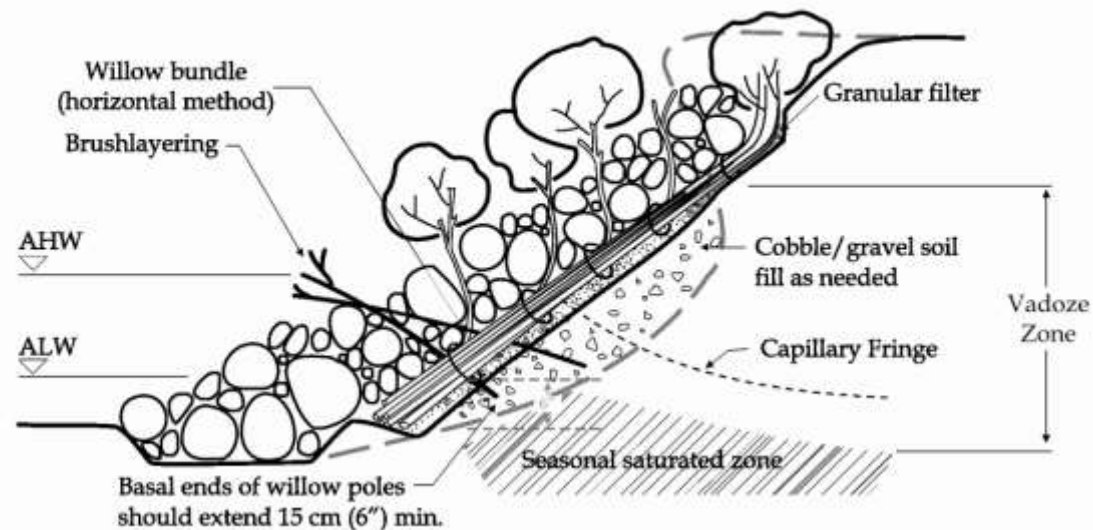


MAINTENANCE ASPECTS OF PONDS: SHORELINE PROTECTION

► Bioengineering

For steep bluffs or high wave energy

- Planting vegetation on slopes stabilized with blankets made of special, biodegradable fibers;
- Transplanting trees into stone or riprap (known as “joint planting”);
- Planting freshly cut willow limbs in the ground (known as “willow staking”); and
- Laying interlocking blocks with gaps designed to promote plant growth.



MAINTENANCE ASPECTS OF PONDS: SHORELINE PROTECTION

- ▶ Glacial Stone/ Riprap
 - ▶ Functional for erosion
 - ▶ Expensive
 - ▶ Negative effect to ecosystem
 - ▶ No Nutrient reduction





MAINTENANCE ASPECTS OF PONDS: SHORELINE PROTECTION

- ▶ Concrete or sheet piling
 - ▶ Functional for erosion
 - ▶ Very Expensive
 - ▶ Failure has very expensive repairs
 - ▶ Negative effect to ecosystem
 - ▶ No Nutrient reduction

MAINTENANCE SHORELINE

Comparison of Erosion Control Methods

	<u>Estimated cost per lineal foot*</u>	<u>Effectiveness</u>	<u>Maintenance</u>	<u>Appearance</u>	<u>Habitat Value</u>
<u>Vegetation</u>	\$5 to \$20, depending on type and maturity of plants selected.	Excellent at reducing erosion and stabilizing flat or moderate slopes.	Little maintenance required. Varies depending on desired effect.	Preserves natural scenic beauty of shoreline. Can provide a privacy screen for lake residents.	Reduces soil erosion and nutrient contamination of lake. Excellent habitat for fish and wildlife.
<u>Bioengineering</u>	\$30 to \$100, depending on method selected and severity of erosion.	Excellent at dissipating moderate waves, controlling erosion, and stabilizing most slopes.	If installed properly, requires little maintenance beyond aesthetic management.	Supports natural vegetation and scenic value.	Dampens wave action. Strength and habitat value for fish and wildlife improve over time.
<u>Glacial stone or riprap</u>	\$20 to \$40 for a shoreline with 8 feet between high and low lake levels.	Excellent at dissipating moderate waves and stabilizing slopes up to 2-to-1.	Occasional maintenance necessary to move and replace rocks.	Provides natural- appearing rocky shoreline. Allows native vegetation to grow between stones.	Dampens wave action. Good habitat for fish and wildlife, especially if plant growth is allowed.
<u>Concrete, steel or vinyl piling</u>	\$50 to \$200, depending on type of seawall.	Structural barrier against strong waves and ice. May stabilize bluffs. Increases erosion in lake and along nearby shoreline.	Requires regular maintenance to repair cracks and check for toe erosion. Must be completely replaced or refaced upon breaking.	Permanently alters shoreline contour and prevents establishment of native vegetation along lake shoreline.	Poor habitat value. Increases wave action. Reduces diverse feeding and spawning areas for fish and other aquatic animals.

MAINTENANCE ASPECTS OF PONDS: OUTLET PLUGGING

► Harmful Effects

- Flooding
- Erosion
- Outlet damage
- Blockages from tree roots (Willows) and debris

• Treatment Options

- Frequent trash removal and maintenance
- Call City or Contractor to remove outlet blockage
- Tree root cutting and tree removal



MAINTENANCE ASPECTS OF PONDS: OUTLET PLUGGING



MAINTENANCE ASPECTS OF PONDS: OUTLET PLUGGING



MAINTENANCE ASPECTS OF PONDS: MAINTENANCE FREQUENCIES

- ▶ Sedimentation - 5 to 10 Years
- ▶ Muck/Sludge - 5 to 10 Years
- ▶ Aquatic Vegetation and Algae - Yearly
- ▶ Trash - Yearly
- ▶ Erosion and Bank Management - Yearly
- ▶ Outlet Clogging - After storms

CITY OF FISHERS STORMWATER MANAGEMENT PROGRAM

JASON ARMOUR, PE, LPG, CFM, CISEC
STORMWATER ENGINEER/MS4 COORDINATOR

CITY OF FISHERS

DEPARTMENT OF PUBLIC WORKS-WATER QUALITY DIVISION

CONTACT: 317-595-3461 OR ARMOURJT@FISHERS.IN.US

NEXT PRESENTATIONS

Addressing Algae

Ginger Davis, Hamilton County SWCD

Physical Maintenance

Matthew Kerkhof, Hoosier Aquatic

Mechanical Dredging

Mark Zielinski, Valenti Held

Hydraulic Dredging

Ed Roe, Heartland Dredging

POND MANAGEMENT

Addressing Algae in Neighborhood Ponds is a Balancing Act

THE GOOD, BAD, AND UGLY: AN OUTLINE

- ▶ What is Algae?
- ▶ When/Why is Algae a Problem?
- ▶ Most Effective Ways to Control Algae
 - ▶ Structural Controls
 - ▶ Biological Controls
 - ▶ Chemical Controls
- ▶ Best Balance



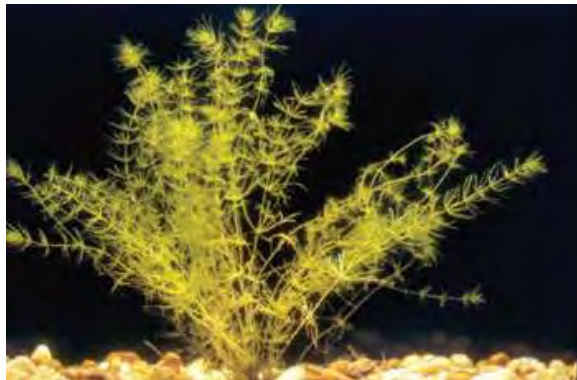
WHAT IS ALGAE? ANSWER: AQUATIC PLANTS

- ▶ Plants utilize sunlight, carbon dioxide, nutrients (nitrogen & phosphorous), and water to photosynthesize.
- ▶ New plant tissue (biomass) and oxygen. **Autotrophic**
- ▶ Algae can exist as
 1. single, microscopic cells;
 2. macroscopic and multicellular;
 3. live in colonies; or
 4. take on a leafy appearance as in the case of seaweeds such as giant kelp.
- ▶ Can live in both Marine and Fresh water
- ▶ Grow in the right conditions
 - ▶ adequate nutrients (mostly phosphorus but nitrogen is important too),
 - ▶ light levels,
 - ▶ pH,
 - ▶ temperature,
 - ▶ Other (non-toxic, etc.)
 - ▶ Lack of predator

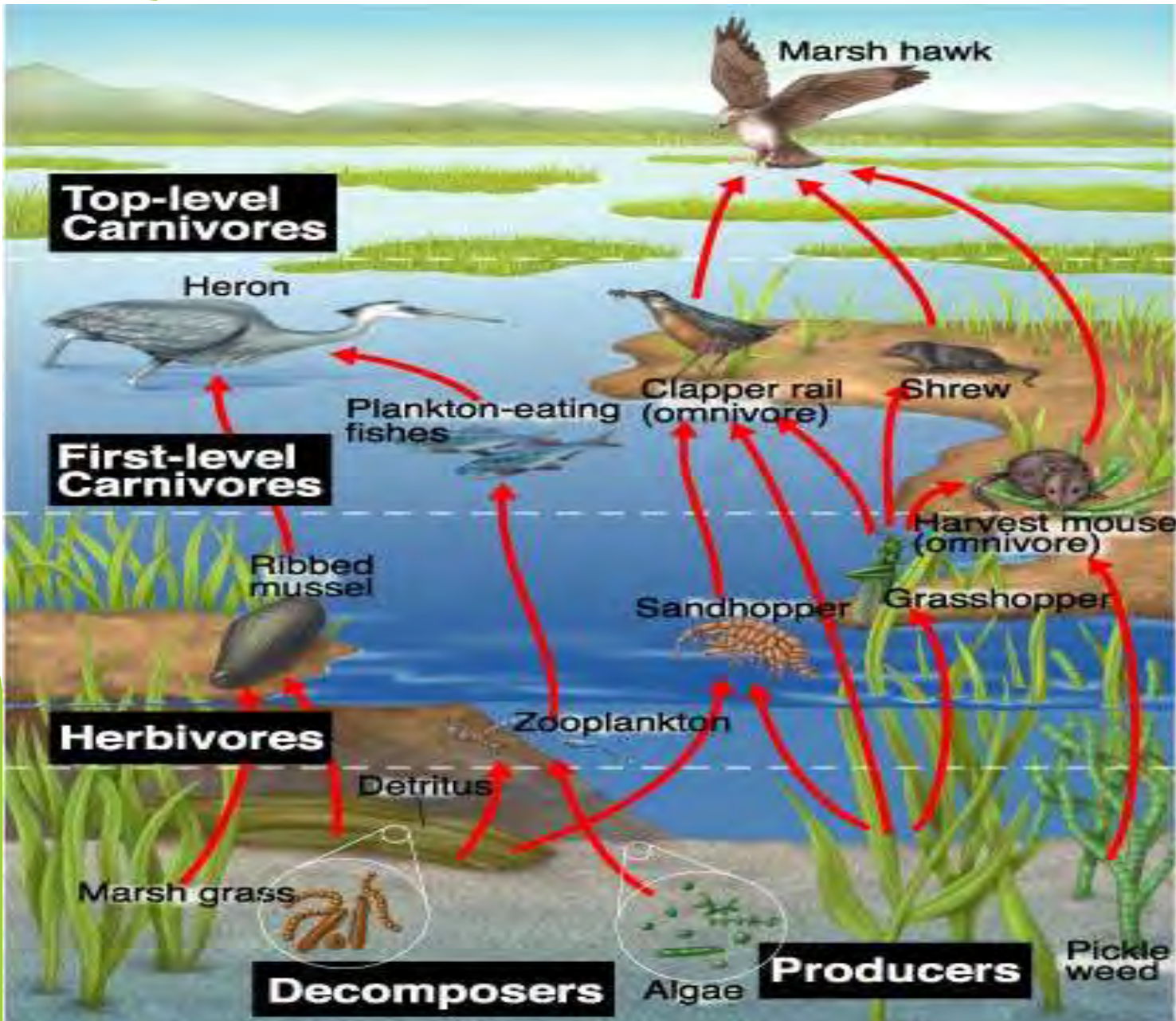


LOCAL ALGAE

- ▶ Planktonic single celled Microscopic plant free float include **green**, **brown**, and **red** algae, and others.
- ▶ Filamentous or mat-forming **green** algae form billowing clouds of slimy or stringy algae.
- ▶ Chara, Musk Grass or stonewort (Hard Water Seaweed)
- ▶ Cyanobacteria, or “**blue-green** algae” is actually a bacteria.
 - ▶ greater concern than true algae because some species can produce potent toxins
- ▶ Microscopic plants (algae) form the base of the aquatic food chain.



AQUATIC FOOD CHAINS





Brachionus



Asplanchna



Keratella



Filinia



Diaphanosoma



Cyclops



Diaptomus



Daphnia



Moina



Nauplius

Our Friends- Zooplankton

Consume Algae at a Ferocious Rate

WHEN/WHY IS ALGAE A PROBLEM?



Nutrient Rich Lakes or Ponds can cause Algae Blooms.

Aesthetically Unpleasing

Taste/Odor

Poor Recreation

Clogs Systems

Fish Kills

Toxic- Illness, Rashes, Pet Deaths





Control Algae Growth in Your Pond in 5 Steps

1. Protect the Watershed

from surface nutrients



POND WATER QUALITY

► Stratification

Fish Kills

Algae Blooms

Invasive Species

Monoculture

Storm Drain Inputs

Organic Matter

Trash

Asphalt, Sand, Salt, Dirt

Lawns

Fertilizer Nutrients

Pesticides

Pond Size and Depth



**Eutrophication
=
Gross Pond**

A photograph of a pond with several large green lily pads and dark reddish-brown stems. The water is dark and rippled with raindrops. Several bright red fish are visible swimming in the water. The text 'Redirect rain run-off' is overlaid in white on a dark rectangular background in the bottom right corner.

Redirect rain
run-off

CAPTURE AND STORE ROOF WATER

Rain Barrels



CAPTURE AND STORE ROOF WATER

Rain Gardens



A black and white cow is swimming in a pond, its head and ears visible above the water. The pond is filled with large, green lotus leaves and several green seed pods (receptacles) on long stems. The water is a murky brown color. The cow's head is white with black patches around its eyes and ears.

Keep farm ~~ANY~~
animals away
from water
sources





Reduce use of
fertilizers



Allow 1-3 metres from shoreline
to grow naturally around the
pond



INDIAN GRASS

G

LINE

TORAL

SK

EEL GRASS

NORMAL POOL



2. Install an Aeration System

to help add oxygen to the lake bottom

- **Lowens Aquatic Weed & Algae Growth**
 - **Reduces Bottom Sludge Buildup**
 - **Increase Area to exchange gases**
 - **Absorb Oxygen**
 - **Release carbon dioxide**
 - & hydrogen sulfide (ODOR sources)**
- **Reduces nuisance insect populations**

NATURAL AERATION

Overturn- Stratification



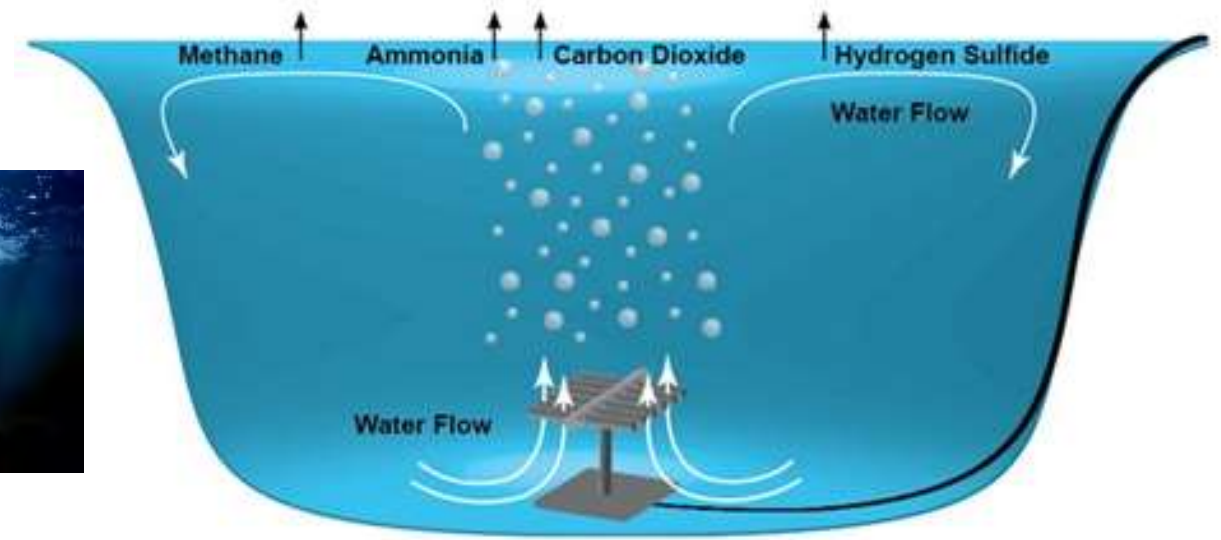
Photosynthesis



TYPES OF AERATION SYSTEMS

Diffused (Bottom) Aeration

- ▶ Diffusers
- ▶ Air Hose
- ▶ Compressor(s)
- ▶ Compressor Cabinet with Cooling Fan



Pros

- ▶ Energy Efficient-Can use windmill or solar power
- ▶ All of the water equal mixed
- ▶ All water comes in contact with atmosphere
- ▶ Improved Dissolved Oxygen Levels & Temperature
- ▶ Few parts/motors to maintain
- ▶ Reduce Mosquito Breeding

Cons

- ▶ Capital Expense
- ▶ Cannot Solve All Problems
- ▶ Maintenance



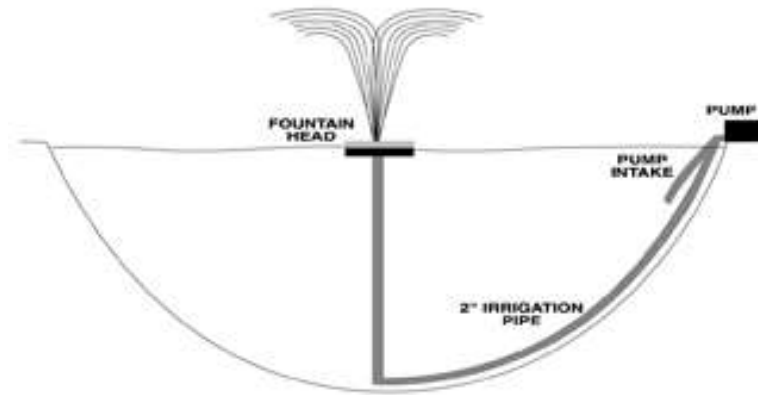
TYPES OF AERATION SYSTEMS

Fountains

- ▶ Pump
- ▶ Spray Nozzle
- ▶ Timer
- ▶ Float
- ▶ Filter

Pro

- ▶ Can be a Beautiful Display
- ▶ Variety of Spray Patterns
- ▶ Works on small or shallow ponds
- ▶ Reduce Mosquito Breeding



Cons

- ▶ Capital Expense
- ▶ Maintenance
- ▶ Must be designed for aeration vs Display
- ▶ Only Draw Water From Shallows
- ▶ High Electrical Usage
- ▶ Power Source Near Pond Needed
- ▶ Cannot Run at Night (Noise)

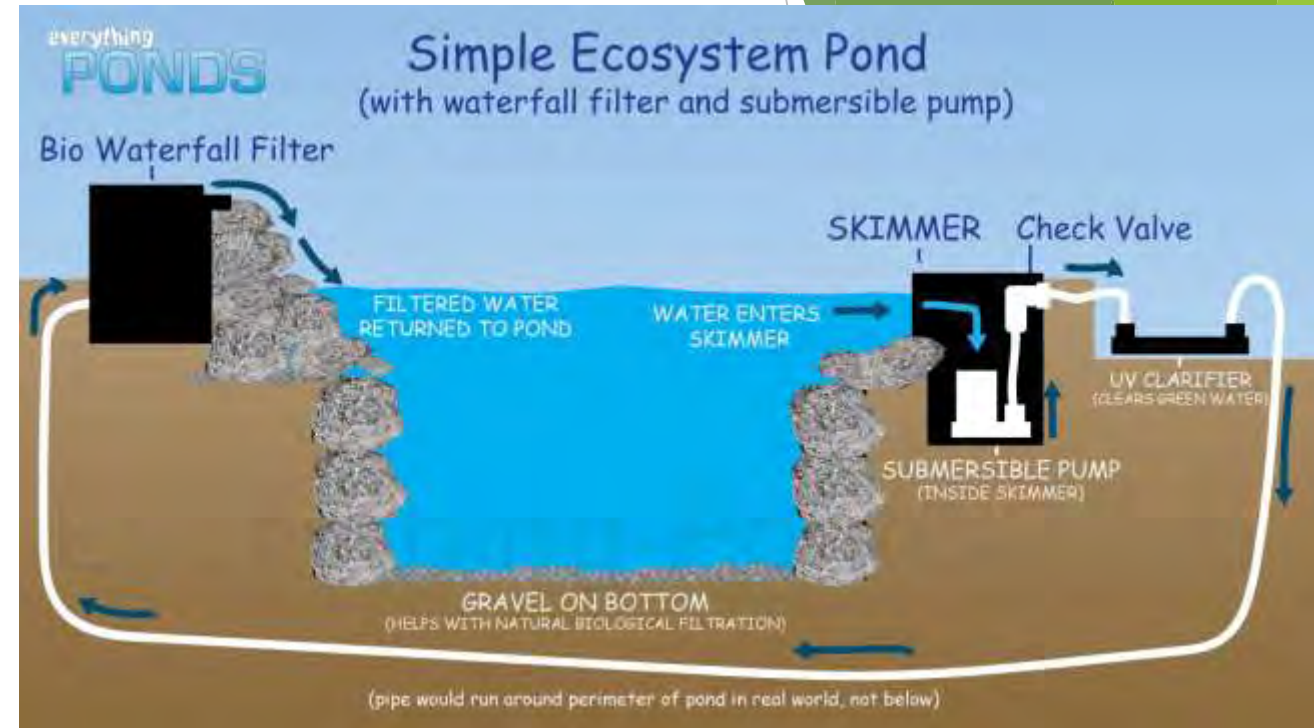


TYPES OF AERATION SYSTEMS

Waterfalls

Pros

- ▶ Beautiful Feature
- ▶ Great for very small ponds aeration
- ▶ Many variations
- ▶ Can draw water from any area
- ▶ Can include filter



Cons

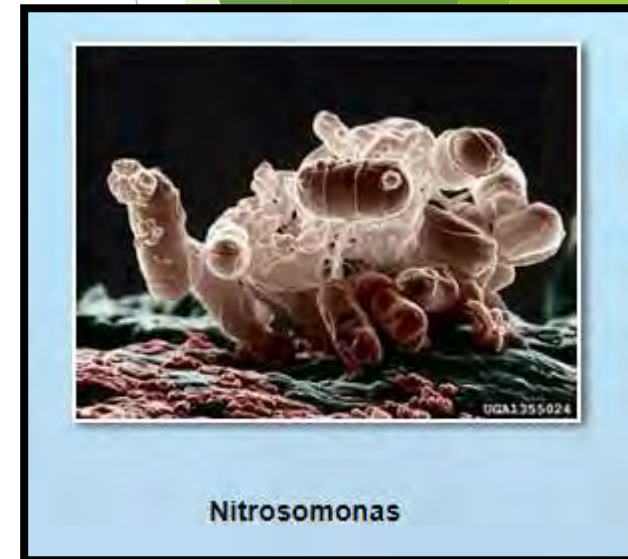
- ▶ Often too small to affect whole pond
- ▶ Capital Expense
- ▶ Maintenance
- ▶ High Electrical Usage
- ▶ Power Source Near Pond Needed

3. Use Bacterius Beneficial Bacteria to reduce organic sediments in the pond



BENEFICIAL BACTERIA, ENZYMES & ACTIVATORS

- ▶ Eats Organic Matter
- ▶ Many different kinds of Bacteria
- ▶ Some take up Nutrients (fertilizers)
- ▶ Bacteria break down organic sludge into basic elements and remove it as a food source that would otherwise be used by algae
- ▶ Bacteria are living organism & have specific environmental requirements
 - ▶ Oxygen!!!
 - ▶ pH
 - ▶ No Toxins
- ▶ Enzymes & Activators- Feed the Bacteria already in place
- ▶ Pros- Natural non-chemical option, no permit needed, control odor Turns nitrogen (algae engine) into gas, Converts phosphorus (algae fuel) into a form that algae can't use
- ▶ Cons- Environmental Requirements (if they were there you have them already), algicide will kill these guys, compounds produced can feed the algae



Source: SolitudeLakeManagement.com

4. Consider Using an Aquatic Dye to help block UV rays



DYES

- ▶ Blocks light for certain colors to prevent photosynthesis, work as shade
- ▶ Non-toxic varieties exist
- ▶ Must physically remove filaments after treatment
- ▶ **Pros-** No harmful residue, inexpensive
- ▶ **Cons-** can have strange appearance, can affect desirable plants, flushing



PEROXIDES

- ▶ Fast acting algaecide primary for Filamentous algae
- ▶ Bubbles like the medical grade releasing oxygen
- ▶ Must physically remove filaments after treatment
- ▶ **Pros-** good for spot treatments, no harmful residue, cleans: tanks & aerators
- ▶ **Cons-** does not treat microalgae, hard to treat larger lakes, mechanical removal



Copper/Copper Sulfate



- ▶ Treats microalgae, Filamentous, in granular form, attached in liquid chelation
- ▶ Not as effective in high hardness waters- so more is often used
- ▶ Permit Required
- ▶ **Pros-** Inexpensive, controls current bloom
- ▶ **Cons-** Builds up Bottom, kills natural control, heavy metal may leach into groundwater, persistent, Toxic to fish (minnow and salmonid family), zooplankton, and bacteria

Diquats

- ▶ Powerful herbicide
- ▶ Restricted for fish harvesting
- ▶ Permit Required
- ▶ **Pros-** Effective, Safe for consumption after 1-3 days (typically)
- ▶ **Cons-** Chemical Treatment, Accumulates in Sediments, contains trace carcinogen



Other Techniques

- ▶ **Ultraviolet Sterilizers**- zaps microalgae but expensive
- ▶ **Barley Straw**- Natural alternative to algaecides creates peroxide but varied results and can be unsightly
- ▶ **Ultrasonic Sound Waves**- kills the algae by tearing them apart- encourages invasion of other types of algae
- ▶ **Skimmers**- Filters for smaller water gardens, to practical at large scale
- ▶ **Fish**- Grass Carp don't eat microalgae and prefer other food to filamentous and help create nutrients
- ▶ **Physical Removal**- only for filamentous and very labor intensive
- ▶ **Binders**- Aluminum Sulphate (Alum) removes phosphorous but can get expensive





5. Accept Some Algae

after all, your pond is not a pool!



ALGAE FOR BIOFUELS/PRODUCTS



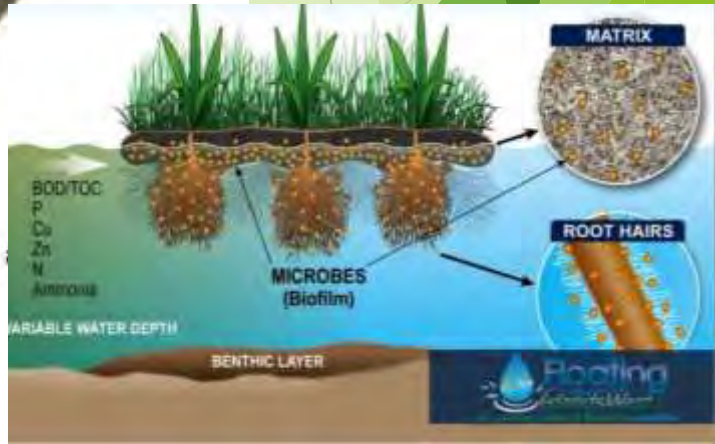
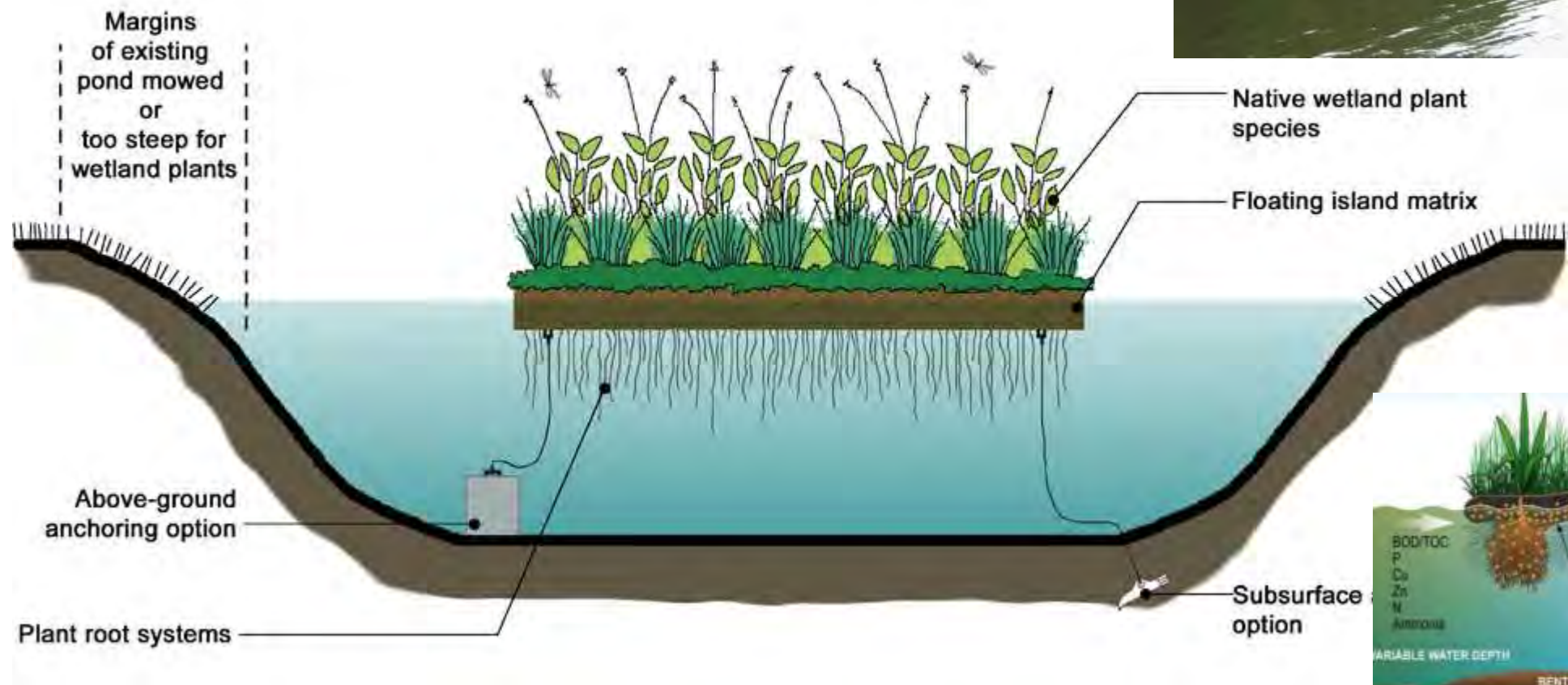
beta-1,3-glucan

algaeon
WHICH HAVE PRODUCTS FROM ALGAE

Algaeon, Inc.
www.algaeon-inc.com
7601 E 88th Pl
Indianapolis, IN
USA
Commercial Production

NEW TECHNOLOGY

Floating Wetlands



Ginger Davis



Conservation Administrator

Hamilton County Soil and Water Conservation District

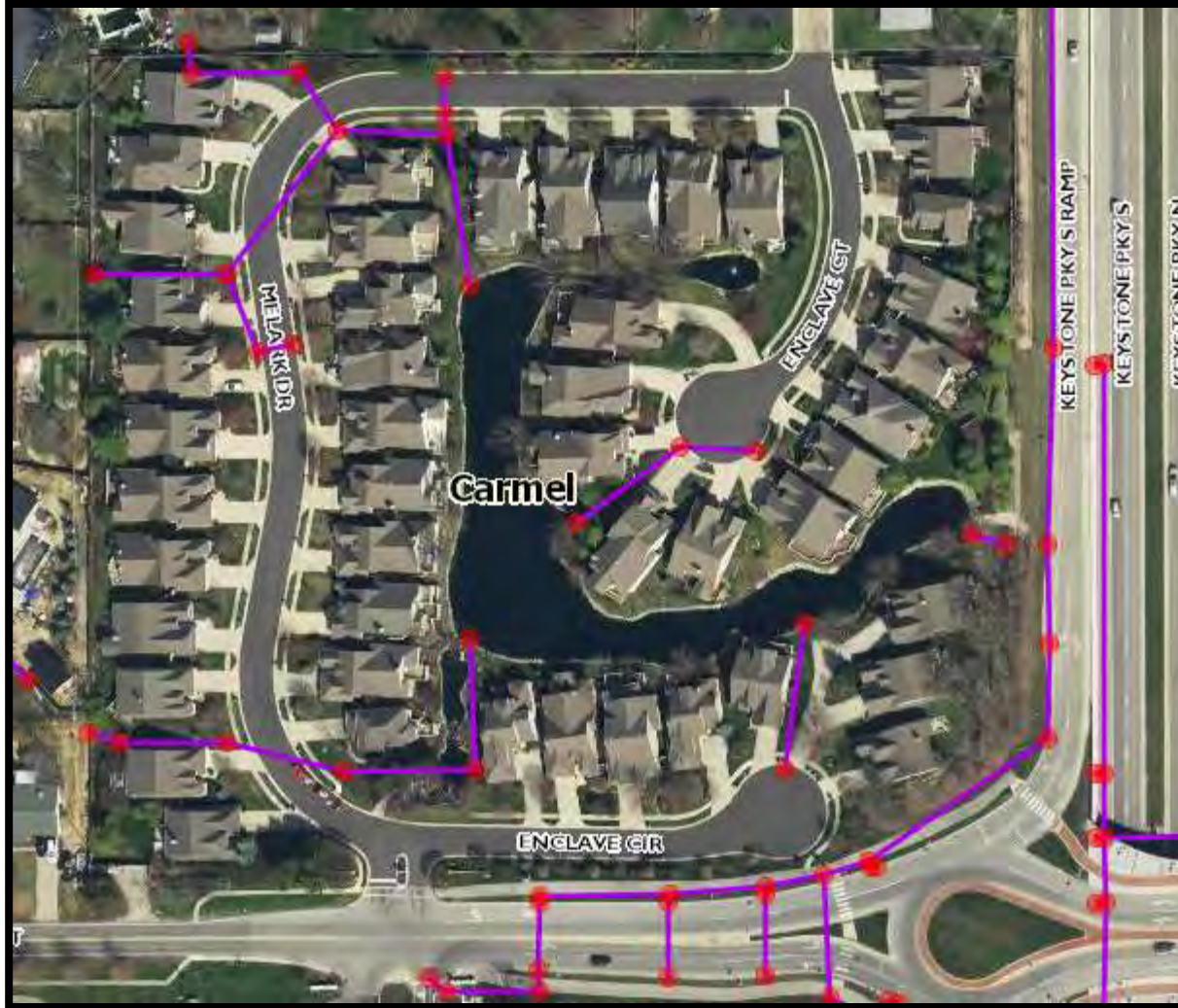
1717 Pleasant St. Noblesville, Suite 100

ginger.davis@hamiltoncounty.in.gov

(317) 773-2181

Helping Landowners have Positive Affects on Soil and Water Resources

CASE STUDY: THE ENCLAVE OF CARMEL



BENEFICIAL BACTERIA

IS IT RIGHT FOR YOUR POND?

What are you trying to achieve?

- ▶ Odor Control
- ▶ Algae Reduction
- ▶ Invasive Species Reduction
- ▶ De-mucking

FIRST STEPS

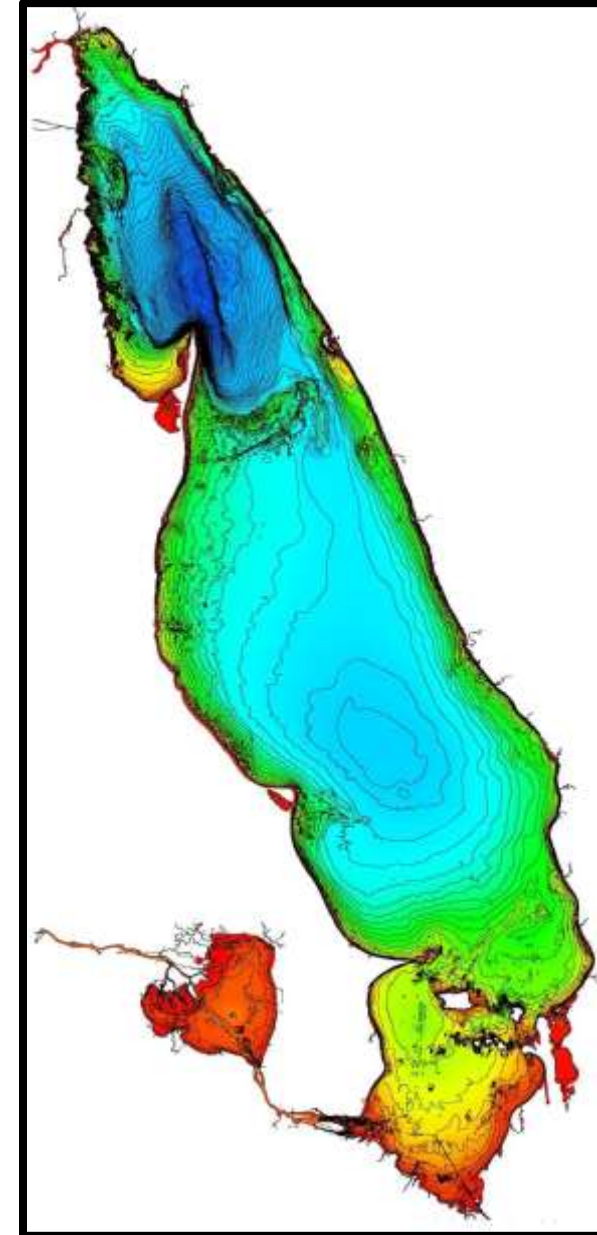
Evaluate

- ▶ Bathymetric Survey
- ▶ Pond Specialist
- ▶ What's filling up you pond?
 - ▶ Sediment
 - ▶ Organics

THE ENCLAVE OF CARMEL

Pond Management Plan

- ▶ Pond Specialist
- ▶ Bathymetric (MUCK) Survey
- ▶ Invasive Species Management
- ▶ Photosynthesis Inhibitor
- ▶ Aerators - Diffusers
- ▶ Storm Drain Cleaning
- ▶ Education
- ▶ Beneficial Bacterial Application



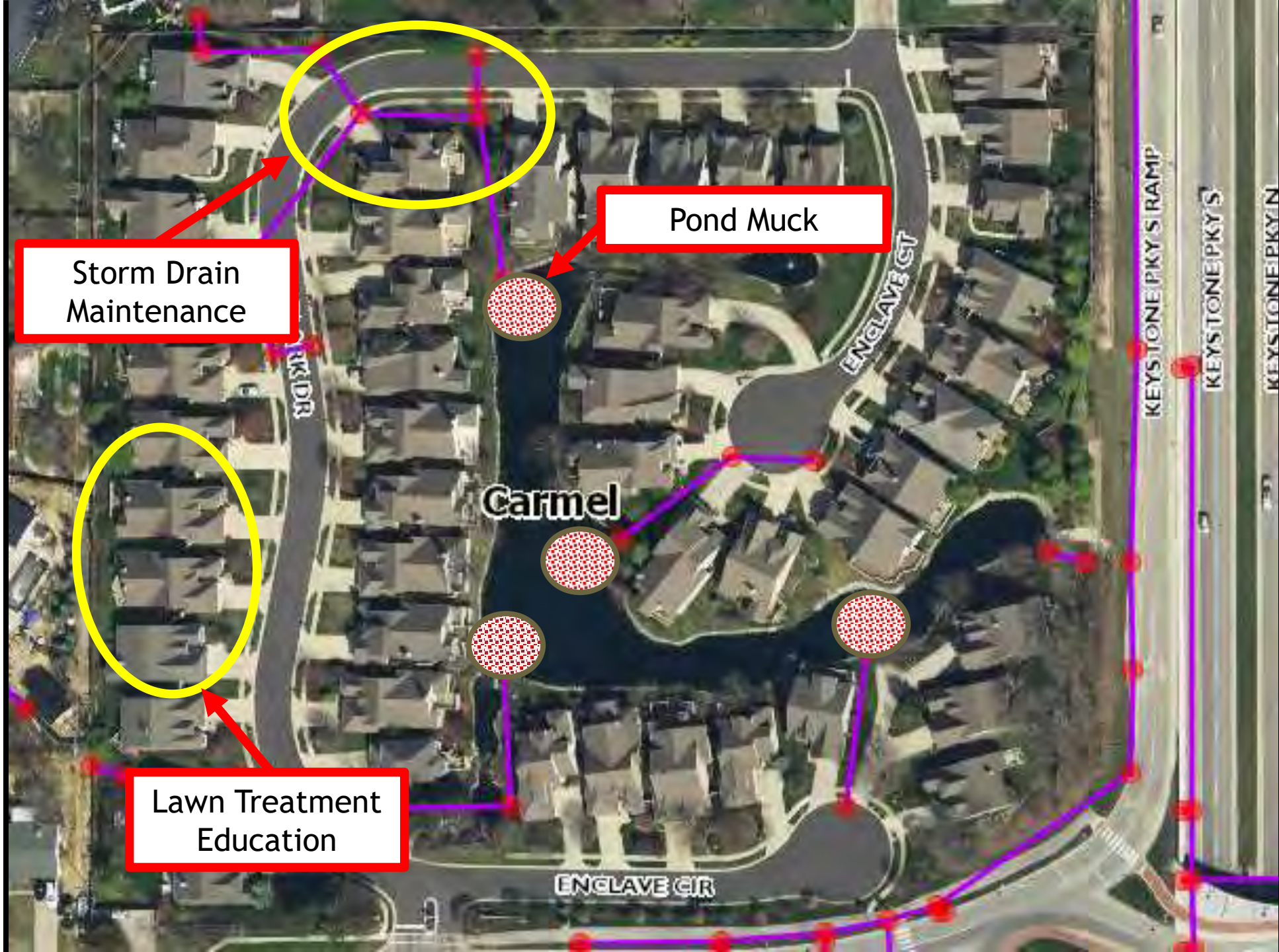
THE ENCLAVE OF CARMEL

▶ 2012

- ▶ Weed and Algae Could not be Controlled by Chemical Treatment
- ▶ Hired Pond Specialist
- ▶ Found 3-4 Feet of Muck on Bottom of Pond

▶ 2013-2014

- ▶ Implemented Comprehensive Pond Management Plan
 - ▶ Spot Treatment of Invasive Species
 - ▶ Dye to inhibit algae
 - ▶ Aerator Installation
 - ▶ Carp Species
 - ▶ Beneficial Bacteria



Storm Drain
Maintenance

Pond Muck

Lawn Treatment
Education

Carmel

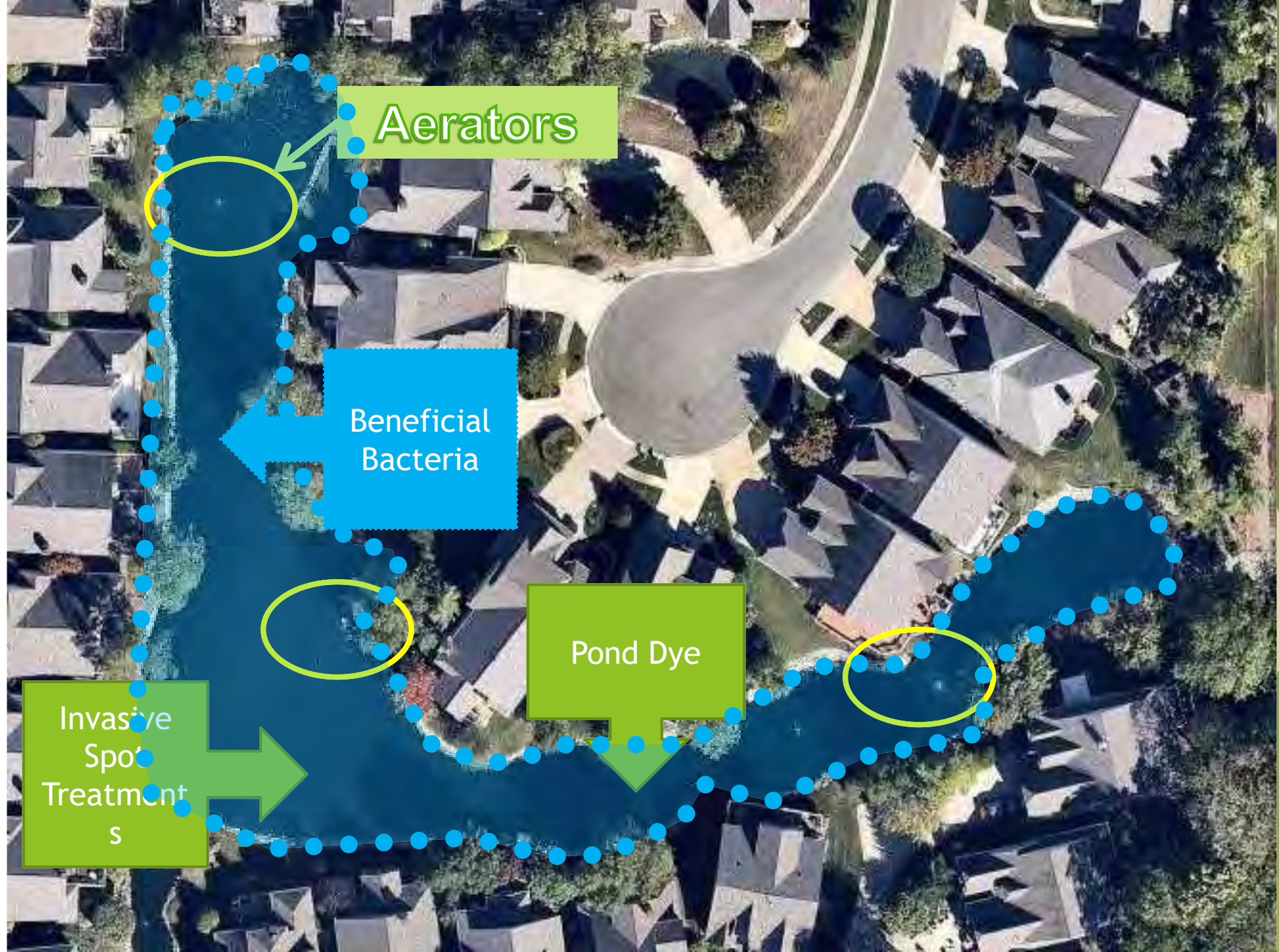
KEYSTONE PKY S RAMP

KEYSTONE PKY S

KEYSTONE PKY N

ENCLAVE CIR

ENCLAVE CT



Aerators

Beneficial
Bacteria

Pond Dye

Invasive
Spot
Treatments

MANAGEMENT PLAN RESULTS

- ▶ 2014
 - ▶ 2' of Muck Digestion
 - ▶ Lots of Bubbles
- ▶ 2015
 - ▶ 1-2 more feet of Muck Digestion
 - ▶ More Bubbles
- ▶ 2016 forward
 - ▶ Comprehensive Pond Management Plan

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

CASE STUDY: FISHERS INSPECTION AND COMPLIANCE PROCESS

FISHERS INSPECTION AND COMPLIANCE PROCESS

- ▶ Outline
 - ▶ Database
 - ▶ Inspection Documentation
 - ▶ Process
 - ▶ Statistics and Trends
 - ▶ Maintenance Frequencies
 - ▶ Drainage and Water Quality Matching Grant

FISHERS INSPECTION AND COMPLIANCE PROCESS


Geographic Information Systems Mapping

- ▶ iPad ArcGIS Online Mapping with unique identifier codes
 - ▶ Ponds
 - ▶ Wet
 - ▶ Dry
 - ▶ Hydrodynamic Separators
 - ▶ Other BMPs
 - ▶ Rain Gardens, Pervious Pavements, Storm Drain Inserts, etc.



FISHERS INSPECTION AND COMPLIANCE PROCESS - Inspection Forms



- ▶ Work Order Tracking
- ▶ Inspection Forms
 - ▶ Site specific drawings for Ponds
 - ▶ Other BMP forms
 - ▶ Notes
- ▶ Representative Photos
- ▶ On site meetings with Owner
 - ▶ Site meetings are preferred
 - ▶ Can see actual issues with inspector
 - ▶ Otherwise inspections results are emailed



City of Fishers Detection Pond Annual Inspection Form

Date: _____ Inspector: Lutz "Mina" Phone: Office 317-567-8364, Cell 317-515-3358
Email: ljones@fishers.in Location ID: _____ GRP #: _____ Pond #: _____ GS#: _____

North



South

Deficiency	Location	Comments
1. Erosion Area		
2. Algae in Pond		
3. Rip Rap Rock Needed		
4. Animal Burrowing Area		
5. Trash in Area (land or pond)		
6. Storm drain end section detachment		

Deficiencies Legend

- Erosion Area
- Algae in Pond
- ⊕ Rip Rap Rock Needed
- ⊙ Animal Burrowing Area
- ★ Trash in Area (land or pond)
- ⚡ Storm drain end section detachment

Recommendations Legend

- Erosion Area
- Algae in Pond
- ⊕ Rip Rap Rock Needed
- ⊙ Animal Burrowing Area
- ★ Trash in Area (land or pond)
- ⚡ Storm drain end section detachment

*The above noted deficiencies (hollow map symbol areas on map) should be addressed within 30 days to avoid fines. If a reasonable extension period is required, please notify Inspector well ahead of the due date. **See back of page for possible additional notes and comments.**

FISHERS INSPECTION AND COMPLIANCE PROCESS

Process

- ▶ Work Order Created
- ▶ Owner Determined
 - ▶ County Parcels, Title Co. Lists
- ▶ Owner Contacted
- ▶ Inspection Completed
- ▶ Inspection Results Issued
 - ▶ Contractor Lists
 - ▶ Compliance Timelines
 - ▶ Potential Fines
- ▶ Communication
- ▶ Follow up and Extensions

EAM

Work Order 4275751
Storm H2O pond inspection #118/pond#67

Status Ready to Schedule
Created By LUISNINO
Created 07/16/2018

**\$100
Initial
Fines
Possible**

Parent WO
Class
Priority
Warranty
Safety
Equipment Criticality
Assigned To
Reported By
Assigned By
Campaign
Campaign Event

Equipment 273028
Stormwater Pond
Manufacturer
Model
Serial Number

Activity Task Plan Description Trans Date Supplier
10 INS ECTOR 07/16/2018 07/16/2018

Reasonable
Extensions
May be
Granted if
Warranted

**30 Day
Compliance**

FISHERS COMPLIANCE PROCESS CASE STUDY

Matching Grant Dollars

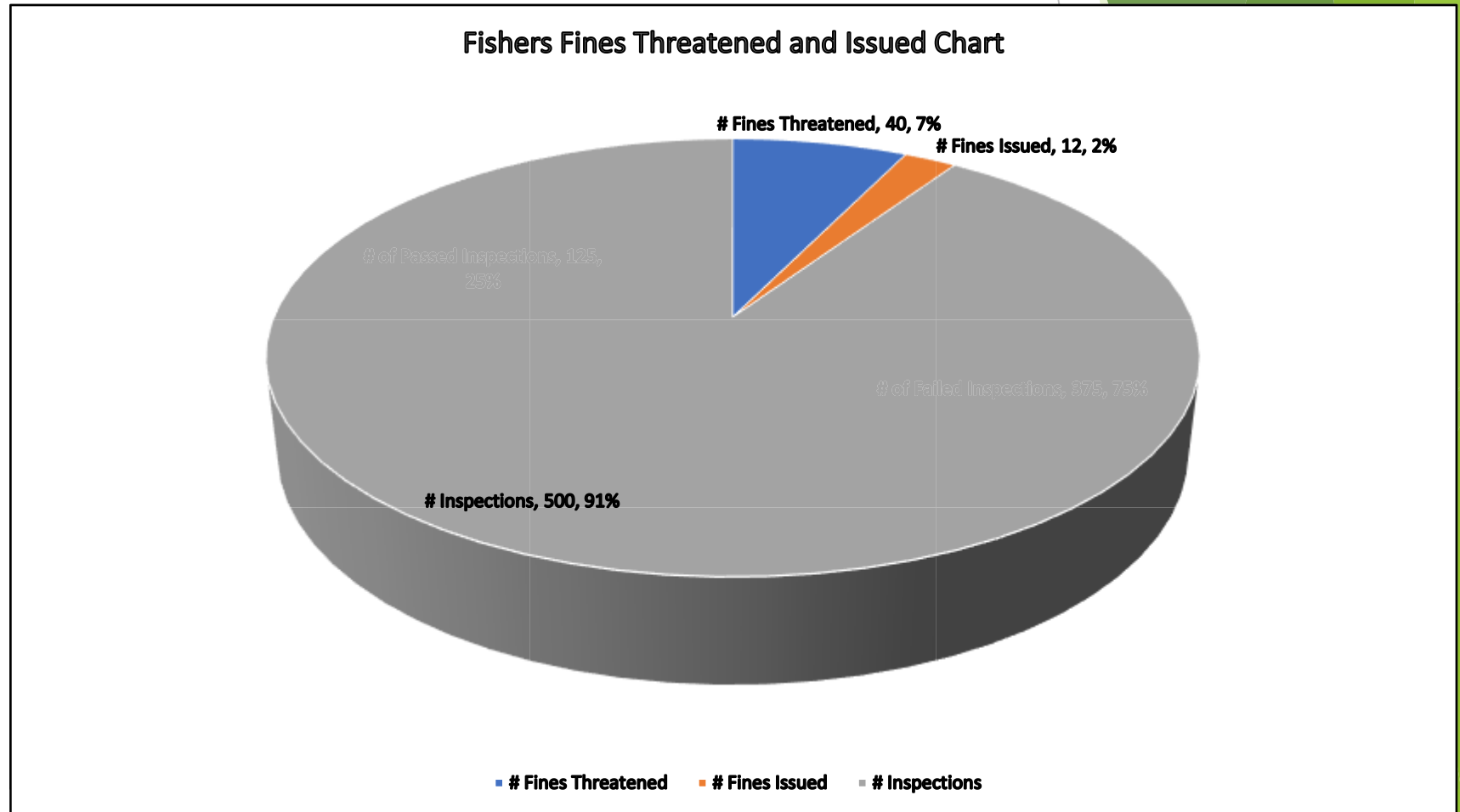
- ▶ 50% Match
- ▶ Dredging
- ▶ Erosion
- ▶ Vegetation/Algae Control
- ▶ Aeration
- ▶ Apply at <http://www.fishers.in.us/866/Drainage-and-Water-Quality-Matching-Grant>



FISHERS INSPECTION AND COMPLIANCE PROCESS - STATS

Statistics

- Inspections to date
 - 300 for Ponds
 - 200 for BMPs
 - 500 total
- Inspections Passed (125)
- Inspections Failed (375)
- Fines Threatened (40)
- Fines Issued (12)
- Most observed issue
 - Erosion and Trash
- Least observed issue
 - Dredging



FISHERS INSPECTION AND COMPLIANCE PROCESS

Maintenance Frequencies

- ▶ Mechanical Units (Manhole BMPs)
 - ▶ Yearly
- ▶ Rain Gardens and Bioswales
 - ▶ Quarterly
- ▶ Pervious Pavements
 - ▶ Monthly or Quarterly Sweeping
- ▶ Storm Drain Filter Inserts
 - ▶ Quarterly to Yearly



A hydraulic excavator removing sediment from a stormwater system

City of Fishers Stormwater Management Program

Jason Armour, PE, LPG, CFM, CISEC
Stormwater Engineer/MS4 Coordinator
City of Fishers
Department of Public Works-Water Quality Division
Contact: 317-595-3461 or armourjt@fishers.in.us

QUESTIONS?

THANK YOU
FOR COMING!