WEED REDUCTION IDEAS:

MECHANICAL

- Onshore conveyor + water plow
- RC collection
- Manned collection

LONG-TERM

- Buffer zone
- Partial pre-rain drain
- Aeration
- Nitrogen addition

GOAL: 1MECH + 1 0R MORE LONG-TERM

ONSHORE CONVEYOR + WATER PLOW

Type: Mechanical

CONVEYOR BELT COMPONENT…

Description/Plan:

Build a small lightweight conveyor belt to gather aquatic weeds quickly and efficiently

Estimated Time (of use or maintenance):

- 5-7 hours for pond cleaning
- Little maintenance

Estimated Cost (of creation or maintenance):

$250-750 range depending on material used

Evidence for Effectiveness/Sources:

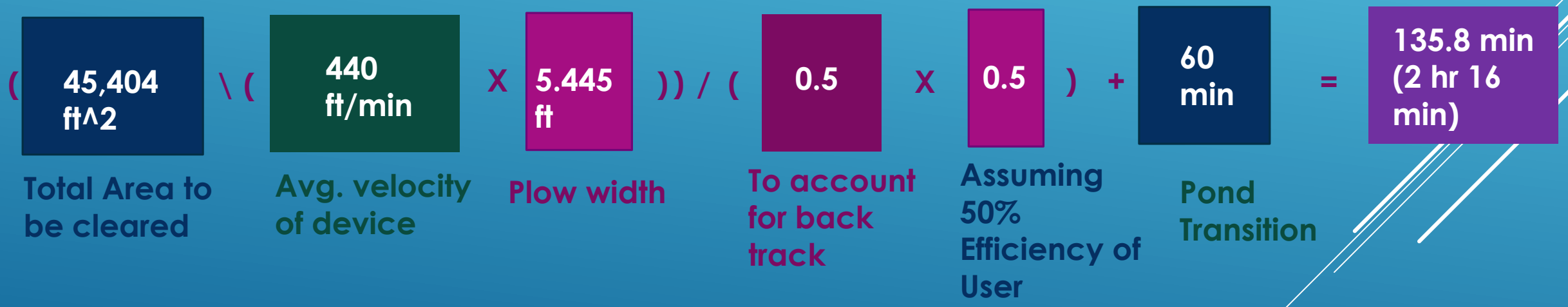
- Most common method of removing aquatic weeds via herding
- Moves weeds quickly
- Easy to move to other areas of pond when needed

WATER PLOW COMPONENT…

Description/Plan:

- Device pushes weeds to shore using large bucket
- Device pushes weeds to onshore conveyor belt to be swept out of water
- Or: device pushes weeds to confined location for man removal

- Large RC boat for sale online goes 37-47 mph.
- We design ours for 10mph (880 ft/min) max! (Assume avg. of 5 mph or 440) ft/min.
- Area pond 1: 24,102 ft^2
- Area pond 2: 21,202 ft^2
- Total area to be cleared: 45,404 ft^2
- Plow span=5.445 ft

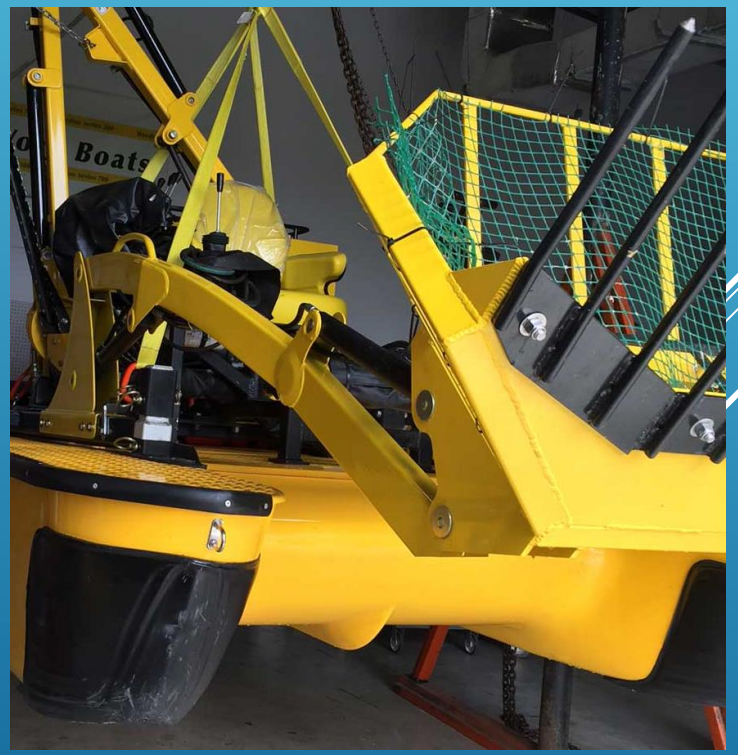


TIME ESTIMATE

Evidence for Effectiveness/Sources:

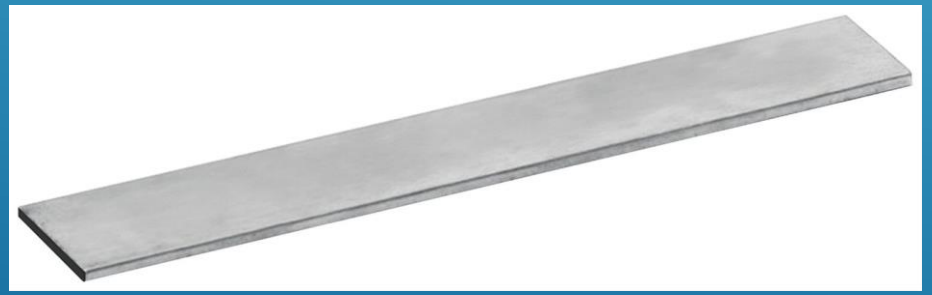
Weedoo is industry's lead manufacturer of aquatic weed harvesters; they use similar technology
http://www.weedooboats.com/

Huge RC boat-
https://www.youtube.com/watch?v=hiTDHShRZHU



Estimated Cost (of creation or maintenance): **$610**

$60 aluminum stock



Large RC boat $500

$50 Wire Mesh

REMOTE CONTROLLED COLLECTION

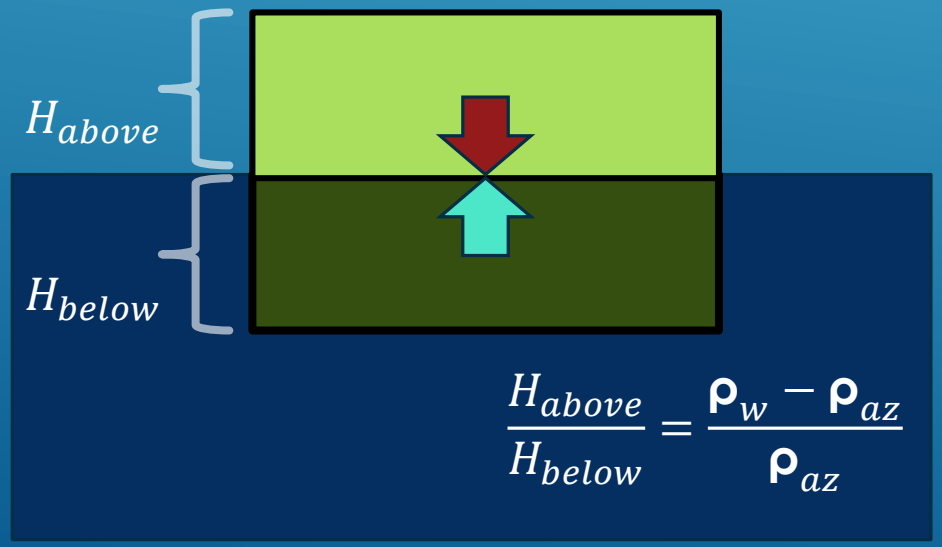
Type: Mechanical

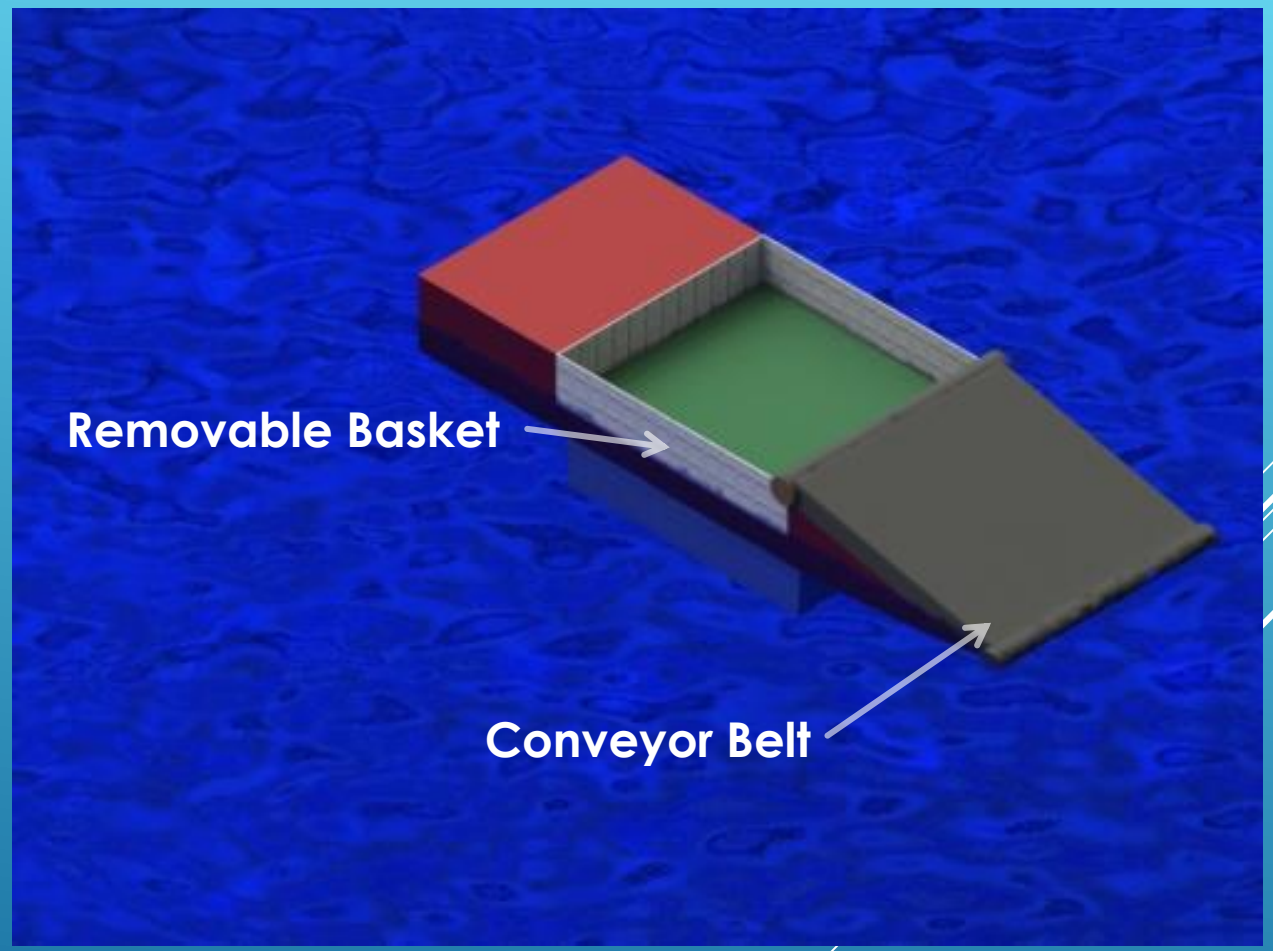
Description/Plan:

- RC boat collects floating weeds
- Main challenge: buoyancy
- Main components:

  -- Conveyor Belt

  -- Wire Basket allows weeds to bear their own weight (increases capacity)



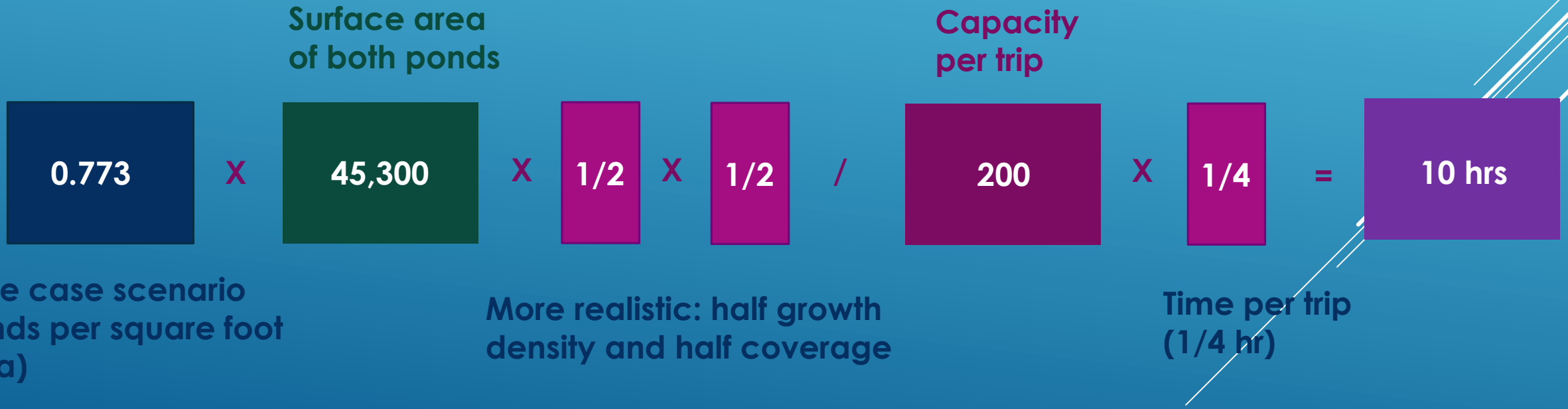


Evidence for Effectiveness/Sources:

- Similar to larger weed boat designs, but adapted to small size.
- Many similarly scaled RC boats are built and documented by hobbyists online.

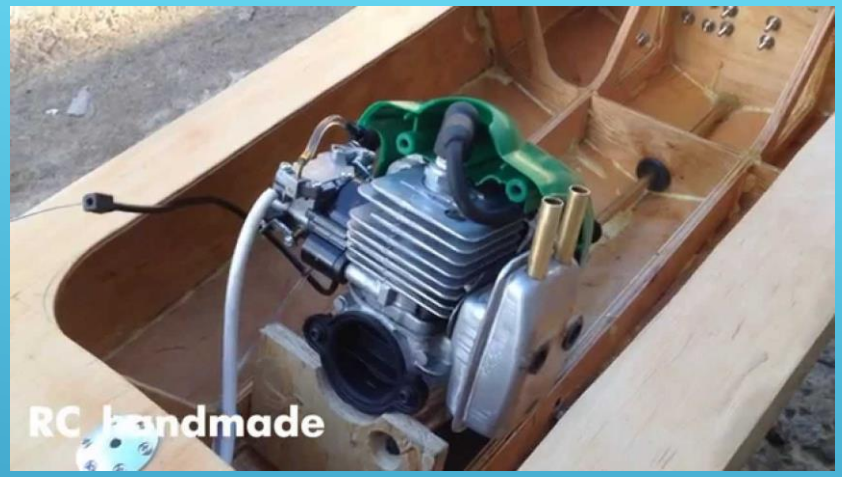
Estimated Time (of use or maintenance):

- If the boat is constructed with a 200 lb *Azolla* capacity, and each trip of the boat takes 15 min, estimated 10 hrs to clear both ponds.
- Volunteer friendly



Estimated Cost (of creation or maintenance):

- Estimated under $1,000
- Many hobbyist RC boats constructed for under $150 – budget extra to allow for quality components and addition of conveyor.
- Some component cost range estimates:
  - RC components: $40 - $120
  - Engine $40 - $150
  - Servo (for rudder) $5 - $25
  - Hull (wood covered with fiberglass? Or other ideas: does not need to move fast.) $50-$150
- If concept is attractive, more detailed estimates can be made.



Hobby King

MANNED IN WATER COLLECTION

Type : Mechanical

Description/Plan: This is a multi piece mechanical solution that would have to be operated my someone from a boat in the water. One piece would be a waterproof conveyer belt with a Y shape opening, that would grab the weed and transfer it into a boat, the boat being the second piece of the machine.

Evidence for Effectiveness/Sources: Based on the idea of an Aquatic weed harvester, these machines are very effective when removing vegetation from waterways

Estimated Time (of use or maintenance): The time that this solution would take to remove all the weeds from both ponds has the potential to vary a lot depending on factors such as the parameters of the conveyor belt and the size of the boat (how much weed holding capacity it has). Proto types would be needed to determine the most practical parameters.

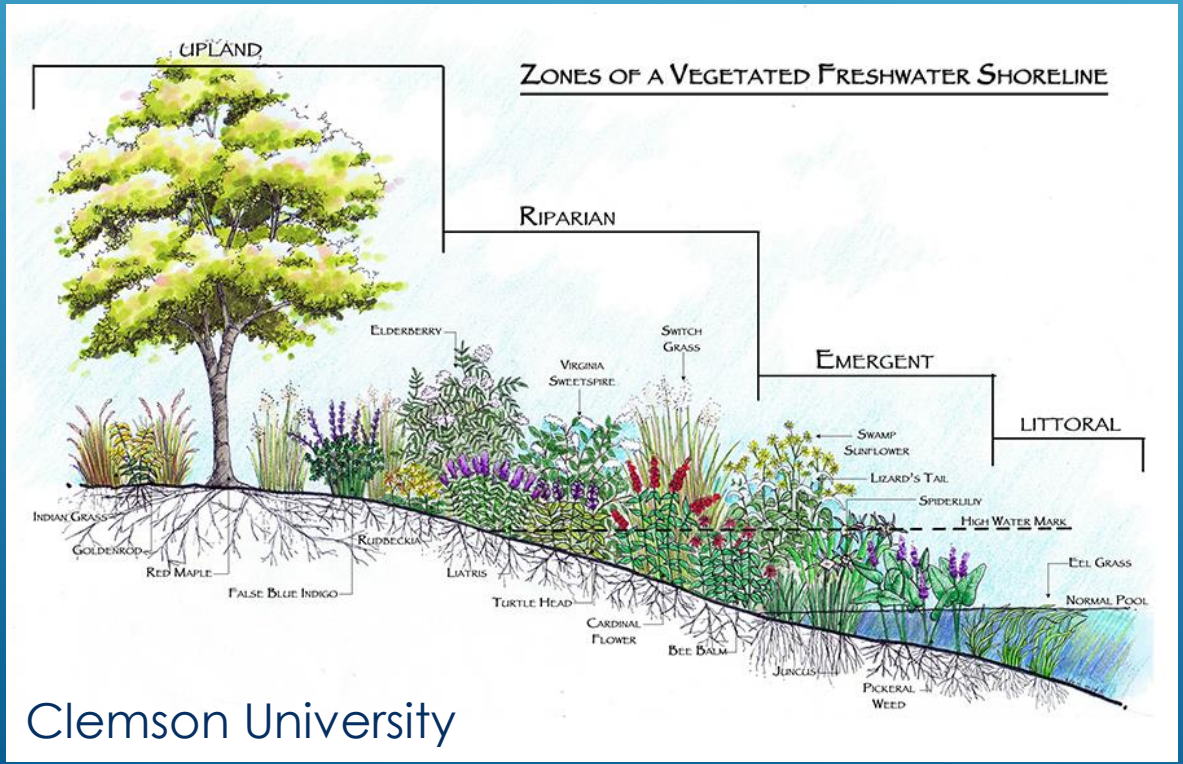
Estimated Cost (of creation or maintenance): Cost has a huge potential to vary as well, depending on quality and efficiency. ~$1000-$5000

BUFFER ZONE

Type: Long-Term

Description/Plan:

- Plant / allow long-rooted grasses or flowers to grow around or between ponds.
- Possibly remove foliage in fall to remove nutrients
- Controls sediment and nutrient input to pond.



Clemson University

Evidence for Effectiveness/Sources:

Multiple respectable sources list this as a water health improver. For example:

- University of Kentucky Extension
- Audubon International
- Solitude Lake Management

Estimated Time (of use or maintenance):

- Simple Grass Buffer:
  - No tilling: Low time investment, long-term project
  - Tilling: Around 20 hrs to go around both ponds, less to do a section between ponds.
- Flowering Buffer: Variable, but could be justified as a new arboretum display. (Just don't fertilize.) Good plant types listed online.

Estimated Cost (of creation or maintenance):

- For grass: very low, range from $0 if transplanted to less than $30 worth of seed (estimated from greatbasinseeds.com)
- For flowering buffer: Variable
- Could add a wooden platform if desired.

PARTIAL PRE-RAIN DRAIN

Type: Long-Term

Description/Plan:

- Partially drain ponds prior to heavy rains, allowing them to be replenished with fresh water.

Evidence for Effectiveness/Sources:

- Alabama Aquaculture Best Management Practice: water drained from ponds contains more sediment/nutrients than that released in storm overflow. Pond drainage (full or partial) is listed as a water quality improver.

- Intentionally releasing water prior to rain will decrease concentration of nutrients in pond.

Estimated Time (of use or maintenance):

1 hour per heavy rain: just turn the pump off for a calculated period.

Estimated Cost (of creation or maintenance):

No cost

AERATION

Type: Long term

Description/Plan:
Implementing more aerators in the ponds will increase the dissolved oxygen in the bottom of the pond.
This will create more aerobic bacteria at the bottom of the pond which will break down the organic matter at the bottom and help to reduce the phosphorous concentration.
This will also reduce the foul odors caused by the anaerobic bacteria.
Increasing aeration also increases water clarity, reduces algal blooms, and reduces buildup of toxic gases and sludge.

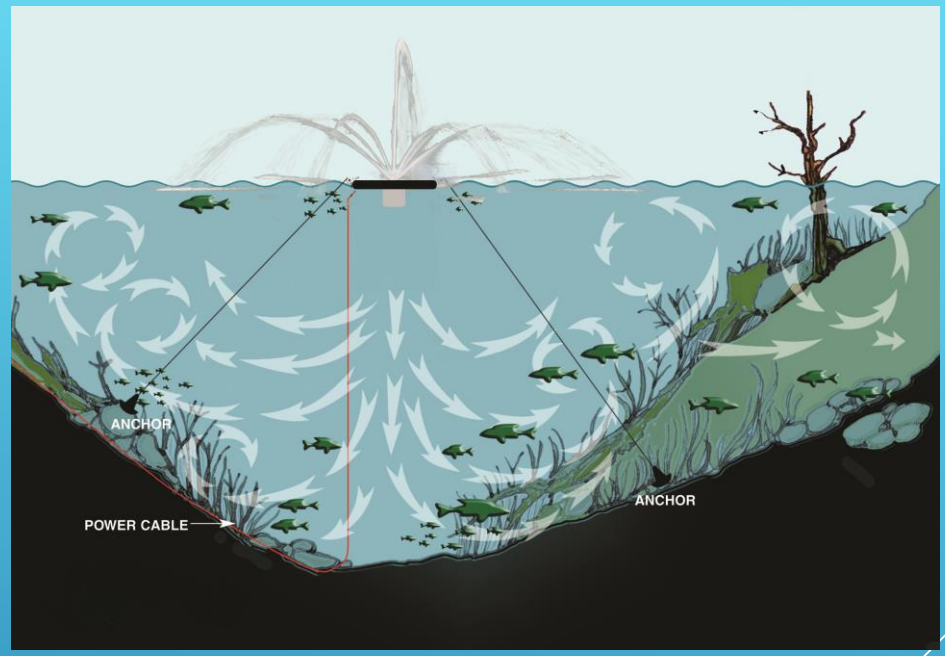
Evidence for Effectiveness/Sources:
http://www.watergarden.org/Pond-Info/Aeration-Basics

Estimated Time (of use or maintenance):

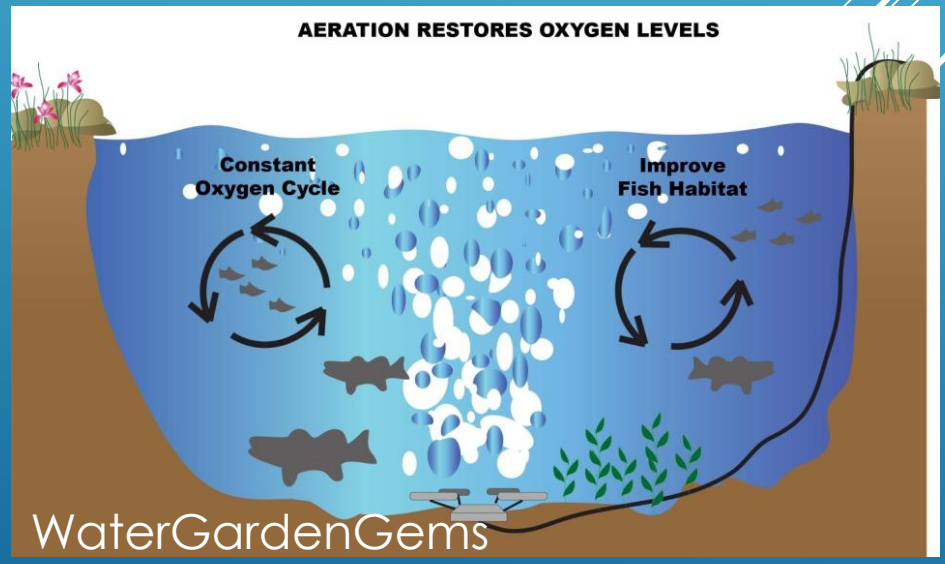
2-3 hours to install
Runs 24/7

Estimated Cost (of creation or maintenance):
Upper pond- two diffusers can be added to existing compressor and power and will cost $150-300

Lower pond- Already has four diffusers so entire new system will cost $1000-2000



If you want something really wild…



NITROGEN ADDITION

Type: Long term

Description/Plan: The idea behind this solution is that by adding nitrogen to the ponds, the nitrogen to phosphorus imbalance is restored, taking away the competitive advantage nitrogen fixing plants (Azolla) currently have in the ponds. This would give other plants in the pond the nutrients they need to grow, removing the phosphorus in the pond, which is the limiting nutrient for nitrogen fixing plants. This, theoretically, would eliminate Azolla growth.

Evidence for Effectiveness/Sources: Before moving forward with this solution an experiment would need to be done with the pond water to ensure we minimized potential unknown outcomes.

Estimated Time (of use or maintenance): Ammonium Phosphate, or another nitrogen containing fertilizer, would have to be added regularly until the phosphorus to nitrogen ratio was balanced and then it would only have to be added to maintain a healthy balance of the nutrients.

Estimated Cost (of creation or maintenance):
Ammonium Phosphate = $415/ton

PLAN:

Incorporate feedback, in-depth research on best ideas

- Gather feedback:
  - Which solutions are most appealing to you?
  - Are there any you are not open to?

December 9:
Choose solutions

January 31:
Final design ready for review/construction

April 1:
Complete: construction/basic testing, plan for long-term

April 22:
Finished product with documentation