

## Report, Proposal and Estimate for Pond remediation

### Background

- Pond area: 1.25 acre
- Average water depth: 6 feet
- Max. water depth: 12 feet
- Pond Volume: 7.5 acre-feet
- Source: primarily spring-fed, some surface runoff from surrounding land.
- Outlet: fixed standpipe ~ 5" inside diameter.
- Muck layer is not excessive in most of the pond and rests over a hard bottom.
- Receiving stream/drainage: unnamed tributary to Mill Creek.

### Observations from site visit (September)

1. Watermeal (*Wolffia spp.*) and Duckweed (*Lemna minor*) – 80% of the surface of pond is currently covered with a Watermeal-dominant blend of the two plants.
2. Leafy Pondweed (*Potamogeton foliosus*) – growing under the Watermeal and Duckweed. Shallower pond bottom areas were covered with a dense stand of this species, which appears to be suffering from a lack of sunlight penetration.
3. Eurasian Watermilfoil (*Myriophyllum spicatum*) – interspersed with the Leafy Pondweed in the shallow areas of the pond.

**Control Strategies** – explanations follow regarding the physical, biological and chemical control options available for the species of plants observed.

### 1 - Watermeal and Duckweed

Watermeal and Duckweed are treated in the same manner. Of the two, Duckweed is easier to deal with so we'll limit the discussion to Watermeal. It is one of the most difficult aquatic weeds to control and its presence provides information as to the nature of the pond itself. Watermeal is most often found in very nutrient-rich ponds that have little water flow. The pond often has a mucky bottom indicating a thick layer of organic material. These ponds do not readily turn-over and can become starved of oxygen at the pond bottom, which slows decomposition of the organic matter and feeds vegetative growth.

#### Physical/Mechanical controls:

- Aeration – installation of a surface aerator can be very beneficial for the pond and will distribute the pond's water temperature. It can help control Watermeal and improve the overall health of the pond. Adding oxygen to the pond bottom will hasten the decomposition of the nutrient-rich (currently anaerobic) bottom debris, where Watermeal over-winters. It will also encourage phosphorous to bind within pond sediments, making it unavailable for weed and algae use and growth. An aerator will provide turbulence at the surface, which inhibits the growth of Watermeal and forces it to the edges of the pond where it could be more effectively removed using seines. I would highly recommend the purchase of a diffuse aerator, which would need a source of electricity at the pond.

- Skimming – Watermeal can be physically removed from the pond using skimming techniques, such as seining. This is a very labor-intensive method and if used as sole management, would need to be repeated throughout the season. It has the advantage of removing the nutrients bound in the plant matter removed.

#### Biological controls:

- Grass carp may provide very limited control of Watermeal and better control of Duckweed, but only after more preferred forage (pondweed) is eliminated.
- Deter all waterfowl from using the pond – harassment with paintballs works well!

#### Chemical controls:

- A relatively new herbicide with flumioxazin as the active ingredient (trade name Clipper<sup>®</sup>) is supplanting fluridone (trade name Sonar AS<sup>™</sup> and others) as the most effective chemical treatment for the control of Watermeal.
- Clipper<sup>®</sup> is a fast-acting contact herbicide whereas Sonar AS<sup>™</sup> is a slow-acting systemic herbicide.
- Clipper<sup>®</sup> has an added advantage in that it provides non copper-based control of some forms of filamentous algae, making it possible for use in the presence of grass carp.
- Also note that any method that results in a weed kill will reduce the oxygen level in the pond due to decomposition, which could also result in a fish kill. This makes the use of an aerator an attractive proposition. Sonar<sup>™</sup>, however, is not prone to causing fish kills due to its slow-acting nature.
- Also note that the use of Clipper<sup>®</sup> or Sonar<sup>™</sup> AS will affect a number of other aquatic plants currently inhabiting the pond, including cattails growing at the perimeter.

**2 - Leafy pondweed (*Potamogeton foliosus*)** – short grass-like leaves which measure one to three inches long and branch freely on a slender stem. Leaves arranged on the stem are attached alternately. Clumps of four to eight fruiting bodies attached to a center stem by a short reed stalk that rises above the water surface.

#### Physical/Mechanical controls:

- Can be removed by raking or cutting, especially in the spring before seeds appear above the water. Plants removed from the pond should be disposed of away from the pond edge so that wind or runoff cannot transport the plants or seeds back into the pond.

#### Biological controls:

- Grass Carp find Pondweeds to be a preferred food and will provide control.

#### Chemical controls:

- Many chemicals provide effective control of Pondweeds, including Clipper and Sonar AS.

### **3 - Eurasian Water Milfoil (*Myriophyllum spicatum*)**

Eurasian Water Milfoil is an invasive, nonnative, nuisance plant that prefers fine organic sediment on the pond bottom. Overabundant growth of Water Milfoil is an indication of excessive nutrients in the pond system.

#### Physical/Mechanical controls:

- Harvesting or raking is not recommended because milfoil can reproduce rapidly from fragments.
- Drawdown may be used during the winter to freeze the rootstock but this presents a risk in spreading the milfoil to deeper areas of the pond during the drawdown.

#### Biological controls:

- Grass Carp find milfoil to be a moderately preferred food and will provide some level of control.

#### Chemical controls:

- Many chemicals provide effective control of milfoil, including Clipper® and Sonar™ AS mentioned above.

Long-term, the best approach to control overabundant growth is to reduce or redirect nutrient sources from the pond. Examples are:

- Run-off from lawns - limit the use of fertilizers on the lawn around the pond
- Septic systems – maintain septic system properly
- Waterfowl – should be discouraged from utilizing the pond
- Leaf litter – should be removed in the Fall before submerging, if possible

Please take time to assess any other potential sources of nutrients.

Please review the following Proposal and Estimate. Although the proposal has several steps and all the steps are recommended, steps **A** and **B** would be the minimum for achieving desirable results next season. If you'd like to discuss any of these items in detail, feel free to give me a call.

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## Proposal and Estimate

The following strategies are proposed in order of recommended timing.

### **A. – Biological Control - Stocking of Grass Carp for control of Pondweed and Eurasian Watermilfoil (this Fall)**

Coon Hollow Lawn & Pond Services, LLC will do the legwork to secure a permit to stock Grass Carp. The permit should be processed within 40 days and will indicate the maximum number of grass carp recommended.

- I will purchase twelve (12) Triploid Grass Carp from a PA-approved dealer and stock the pond this Fall, if possible.
- Please note that Grass Carp are very sensitive to copper-based algacides and will not tolerate their use for algae control in the future.

Twelve Grass Carp incl. tax:	\$260.00
Grass Carp permit fee:	\$75.00
Service charge:	<u>\$250.00</u>
Total:	<b>\$585.00</b>

### **B. – Chemical Control – Clipper<sup>®</sup> herbicide for Watermeal (next Spring)**

Coon Hollow Lawn & Pond will provide chemical treatment of the pond – primarily for Watermeal and Duckweed but other pond weeds will also be eradicated. Includes:

- One application of Clipper<sup>®</sup> herbicide used at a concentration of 200 ppb.
- Please note that Watermeal can be very difficult to control and may require treatment during in successive years.
- The treatment will require 8 lbs. of herbicide with a wetting agent (adjuvant), diluted and applied by sprayer.
- Clipper<sup>®</sup> is not harmful to any aquatic invertebrates and there are no water use restrictions following its use, except temporarily for irrigation purposes.

Charge for 8 lb. of Clipper <sup>®</sup> :	\$1600.00
Charge for adjuvant:	\$25.00
Service charge:	<u>\$300.00</u>
Total:	<b>\$1925.00</b>

### **C. – Chemical Control – Use of an aquatic glyphosate-based herbicide in spot treatments for shoreline plants as desired by homeowner. (next Spring/Summer)**

Coon Hollow Lawn & Pond will provide chemical treatment of the pond for any undesired vegetation (cattails, reeds, sedges) growing at the margins. Includes:

- Securing the necessary permits from the PA Fish & Boat Commission and DEP.
- Two treatments of undesirable vegetation as directed by pond owner using an aquatic glyphosate-based herbicide.

Charge for herbicide	\$50.00
Service charge:	<u>\$150.00 per treatment</u>
Total:	<b>\$350.00</b>

**D. – Physical/Biological Control – Continuous Aeration combined with application of microbes – (next Spring/Summer)**

Due to its depth, I recommend purchasing a diffuse aerator for the pond. Initially it should be run continuously in combination with using microbial additives to set-up good circulation and promote break-down of the bottom sediments. After time, the aerator can be put on a timer and used primarily at night or whenever desired.

- Unfortunately, pond aerators are typically on the expensive side, especially for a large pond like yours. You can go with a pre-packaged aerator and spend quite a bit more (especially when you add-in the weighted tubing), or I can put together a robust system for you. This is what I would recommend:
  - ¾ HP rotary vane pump supplying ~6.5 cfm
  - 500' of 5/8" ID self-weighted air tubing
  - 3-valve PVC manifold
  - 3 - 9" membrane disc diffusers
  - excluded from estimate: (some type of ventilated enclosure for the air pump, like a faux rock or equivalent)

Charge for the purchase and installation of this system according to the sketch below

**\$2,650**

- Once the aerator is installed, I would outline a maintenance program to apply specific microbes (bacteria and enzymes) to the water column for additional plant control, reduction of the bottom muck layer and the overall good health of the pond.

