Aquatic Plants In Ponds and Lakes: Making Good Management Choices

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Ponds and lakes are a source of great fun for fishing, boating and swimming. Farm ponds are also useful for watering livestock and collecting runoff from fields and outbuildings. Unfortunately, the plants associated with shoreline and pond bottoms are too often lumped together, summarized as "weeds" and eradicated. However, not all plants are weeds. Aquatic plants are an interesting and diverse part of all pond and lake systems. They provide a wealth of important services. Therefore it is important to distinguish between perceived and real problems with aquatic plants and to carefully choose an appropriate management strategy.

Aquatic plants include an incredibly diverse array of types and species. These plants can be broadly organized into several different groups based on whether they are either: a) vascular plants which have true roots, stems and leaves, or algae, which do not, and b) whether their leaves and roots occur in the water column or sediment. Phytoplankton are microscopic, single-celled algae that float in the water column. When in high densities, phytoplankton give water a translucent greenish, brownish, or even reddish color. Filamentous algae form thick, stringy mats that attach to rocks or float on the water surface. Duckweed is the common name for a suite of tiny plants whose leaves float on the water surface and whose tiny roots drift in the water below.

There are also numerous plants that are rooted in the substrate. Submersed plants, such as elodea and Eurasian milfoil, have all of their leaves below the water surface and most have flexible leaves and stems. Stoneworts, including *Chara* and *Nitella*, are two branched algae that form extensive submersed beds. Emergent species, like cattails, have more rigid stems so that their foliage can protrude above the surface even as water levels go up and down. Floating leaf plants, which include most of the attractive water lilies, have their leaves on the surface but are rooted in the sediments.

These diverse groups of plants perform an amazing number of functions that are important both to the health of the pond or lake and to humans who use them. Good management of aquatic plants is important to make sure that these jobs are achieved.

- Plant stems and leaves provide protective nursery areas for young fish.
- Plant leaves shade and cool the bottom of the lake.
- Plant stems and leaves provide food and habitat for aquatic insects that are a primary source of food for fish and other wildlife.
- Plant leaves put oxygen into the water column where it is used by fish and other organisms.
- Plant stems and leaves rock gently back and forth, absorbing wave energy and reducing shoreline erosion.
- Plant roots bind the sediment, which reduces erosion, and also filter out contaminants from groundwater before it enters the lake.

Given all these functions, when is an aquatic plant a weed? Sometimes plants are just perceived to be a problem because they interfere with a landowner's view of his pond or they make it difficult to access the lake for boating or swimming. Plants really become a problem when excessive growth clogs out all other plants. This may be the spread of duckweed across the surface of the entire pond thereby shading out all submersed species, or the invasive spread of an exotic species that outcompetes many native submersed plants for space, nutrients and light.

What causes this growth? The abundance, types and species of aquatic plants in a given pond are controlled by a complex suite of factors. The two main factors appear to be the availability of light and the availability of nutrients. These nutrients can be directly dissolved in the water column, bound to the sediments, or draining into the lake along groundwater seepage areas. Secondarily, fish, waterfowl and other animals will eat many plant species, often to the point of controlling their abundance and distribution. Excessive wave action along some shorelines can severely impact the ability of plants to get established and grow. Finally, some plants are absent from a lake simply because there has been no opportunity for their seeds or vegetative propagules to get transported there.

Choosing a Management Strategy:

If you decide you need to manage aquatic plants in your pond or lake, it should be a careful, thoughtful choice. It is wise to remember that, if you remove what is currently there, something is sure to grow back in its place. **Three key steps are needed before choosing which is the appropriate management strategy.**

The first step is to **clearly define your overall goals, both immediate and long-term, for the lake or pond**. Do you like to use the pond for fishing and recreation? Do you need the pond for livestock and farm runoff? Is the lake also a source of drinking water? Is your goal to provide access to the lake for boats or swimming? Depending on your goals, different management options are appropriate.

Next, it is very important to **accurately identify what type and species of plants are being targeted.** Some plants are problems; others are not. Different management strategies work for different plants. Some exotic weeds have native counterparts that are very similar in appearance. Ask representatives from the Soil and Water Conservation District, Natural Resource Conservation Service, or Cornell Cooperative Extension to help identify your plants.

The third step is to **consider the following criteria when selecting the most appropriate management strategy** for your lake or pond:

- *size of the lake or pond*: Large lakes require considerably more resources than smaller systems. Multiple ownerships require getting permission from all lakeshore owners before certain methods can be used.
- *residence time of water*: Water flows through the pond at different rates depending on the number and size of inflowing and outflowing streams, the depth of the pond, and the contribution of groundwater. Fast flows mean short residence times, and therefore techniques such as herbicide application may be less effective since they may be flushed out before they can do their job.
- *species of other plants present:* Generally ponds support a mixture of different plant species. It is important to identify both the problem species and any co-dominant plants in order to anticipate results the selected management strategy.
- *spatial extent and location of the problem plant:* Problem plants located in small patches, between docks, or otherwise isolated, can be treated differently than large patches widespread along the shoreline.
- *side effects to animals and water quality*: Several methods have side effects which can impair the quality of water for drinking, fishing or swimming.

- *your lakeshore neighbors' perspective*: Many strategies will impact much more than a selected stretch of shoreline. Neighbor perspectives will need to be considered.
- *cost and resources available;*
- *regulatory limitations:* Use of herbicides, grass carp and some other methods require a permit from the NYS Dept. of Environmental Conservation.

Choose the best strategy:

Once you have evaluated these criteria relative to your goals, you have a number of management options. There are seven different general approaches: limiting nutrient inputs, physical removal, bottom barriers and shading, chemical treatments, biological control agents, winter drawdown and barley straw application. The following is a brief summary of these management options, including a description of the technique and some of the advantages and disadvantages. This summary is not intended to be comprehensive.

(1) Nutrient input control:

Frequently the main factor allowing excessive aquatic plant growth is an overabundance of nutrients in surface water. Algae blooms are a good indicator of excess nutrients. These nutrients can enter from streams and from groundwater seeping into the pond. Over time, these nutrients may also accumulate in the sediments.

Mgmt tool: Use best management practices (BMP's) for agriculture and use streamside buffers to reduce nutrient loading transported in tributary streams. Consider sewering to reduce inputs from septic systems and minimize the use of lawn fertilizers and pesticides. For small ponds, dig a small catchpool within the stream just upstream of the pond to trap sediments before they enter the pond.

Limiting nutrient inflow in streams or groundwater will not address nutrients that have accumulated in the lake sediments. In some cases, repeated harvesting of plants over successive years can reduce the nutrient load in the sediment.

Limitations: This strategy may require considerable involvement from the landowners and non-lakeshore community in order to reduce nutrient loading.

(2) Physical Removal Methods

Hand harvesting:

Mgmt tool: Perhaps the simplest method is the manual removal of the plants using a scythe, rake, hoe or other tool. This technique works well for small patches of weeds, for patches located in-between docks and other hard-to-reach places, and in very large lakes or high flow lakes where chemical treatment is impractical. Hand removal allows the selective removal of certain plant species, leaving others intact. If a hoe is used, then the method is also fairly permanent because it allows the removal of roots. A pool skimmer will work well for removing duckweed and floating filamentous algae. Wait until a windy day is

piling the duckweed along one shoreline for easiest removal from land. This technique can be inexpensive unless you have to pay diver wages.

Limitations: Cutting up some species creates lots of leaf fragments that easily float away, re-root and get established elsewhere. This method is labor intensive and therefore not practical for large patches. It also works along shallow shorelines but is difficult where water depths are greater than 3 ft. In such areas, it may require personnel with diving abilities.

Machine harvesting:

Mgmt tool: For larger lakes and large beds of aquatic plants, a mechanical harvester may be needed. Small portable versions are available for attachment to small boats.

Limitations: Commercial harvesters are expensive, specially designed boats that generally require agency or government financing and operation. The technique is not species-specific and also produces lots of small plant fragments. For species such as Eurasian milfoil, these plant pieces are easily dispersed and get established elsewhere in the lake. Harvesters do not remove roots so regrowth and reharvesting is often necessary within the same season. This technique also results in large amounts of harvested biomass that requires disposal. This material can be easily composted into a good crop fertilizer.

Dredging:

Mgmt tool: The most permanent form of management is to remove the entire plant, including roots. This can be accomplished for submersed plants using underwater suction dredges. Emergent plants such as cattails or giant reed grass can be removed along some shorelines using a large backhoe and dredging out the sediment to a depth of approximately 30 cm.

Limitations: The equipment generally requires skilled operators and is expensive to operate. Backhoes require a solid and extensive shoreline for maneuverability.

(3) <u>Bottom barriers:</u>

Mgmt tool: Laying down dark burlap, plastic fabric, or geo-textiles across the bottom in late spring prevents light from penetrating and therefore inhibits plants from growing. It is a useful technique for small patches and in-between docks.

Limitations: The cloth is hard to handle and secure; divers are frequently needed. Gas bubbles from the sediment can build up under the cloth and can cause it to float to the surface. Small holes need to be punched into the plastic at intervals of 2 feet. The cloths also tend to migrate down steep banks and need to be anchored with stakes or rocks. Over time, sediment may accumulate on top of the cloth and new plants will establish themselves there.

(4) Chemical treatments:

Chemical shades:

Mgmt tool: There are several different chemical dyes available for controlling aquatic plant growth. They are usually inert and work by reducing the penetration of plant-preferred light wavelengths to the plants. These are inexpensive and have no negative health impacts.

Limitations: Chemical shades are ineffective for floating leaf plants, such duckweed and for pondweeds which rapidly get their foliage up to the surface to obtain light. Shades are also not useful for water bodies with a high flushing rate. Most chemical shades require a permit for their use.

Chemical herbicides:

Mgmt tool: A multitude of different herbicides are commercially available although they are generally based on only seven active ingredients (Table 1). The herbicides can be fairly species-specific and are easy to apply. Pellet forms are good for more localized use.

Limitations: Most herbicides require some delay before water can be used for swimming, fishing or drinking. Herbicides, especially in liquid form, do not work as well in systems with a high flushing rate. Rapid decomposition of the treated plants may result in algae blooms or "pea-soup" conditions within the lake. A few studies are linking herbicides to impacts on amphibians. Permits are required and a certified pesticide applicator must do the application.

(5) Biological control agents:

Sterile grass carp:

Mgmt tool: Grass carp are an introduced fish species that consume large quantities of plants and are useful in the control of some weed species. Generally fish are stocked at 5 to 15 fish per acre of pond, using fish of 10 -12" in length. The cost is relatively inexpensive, generally 15$ per fish. Younger, and therefore smaller and less expensive, grass carp are available however they tend to be preyed upon by larger fish. Only grass carp that have been artificially sterilized are permitted for use in New York in order to ensure that they don't escape, reproduce and invade other aquatic systems.

Limitations: The grass carp have plant preferences and if offered a range of plant options, they may not eat the targeted species. The carp convert the plant biomass into fish biomass and excrete large quantities of nutrients, which may result in a bloom of microscopic algae. As the fish get older, the carp tend to grow less and excrete more, therefore harvesting and restocking is generally needed after five years. Carp are carefully regulated by NYSDEC and a permit is needed for their release.

Biological control - insects:

Mgmt tool: An aquatic moth, *Acentria*, and an aquatic weevil, are being shown to be useful in the control of E. milfoil. The insects are species-specific

and have no impacts on other plants, fish or water quality. Densities of the insects have to be fairly high for control to occur.

Limitations: Research is not yet complete regarding the success of this method. Insects tend to be very host-specific so accurate identification of the plants is critical. Availability of the insects is also limited and costs can be high. The insects show natural cycles of high and low population density among years and therefore plant control is also not always consistent.

(6) Winter drawdown

Mgmt tool: Consistent lowering of the water level to expose the shoreline over successive winters will result in killing the seeds, rhizomes and other reproductive propagules of many shoreline plant species.

Limitations: This method is not useful for floating plant species. It requires intensive water level management techniques and therefore works best in ponds having a dam, drain, or stand-pipe.

(7) Barley Straw

Mgmt tool: Several studies have shown that barley straw will reduce growth of phytoplankton and filamentous algae in farm ponds. The method works best when the straw is loosely placed in net bags and floated on the surface. It should be placed early in the season. The cost is minimal and there are no known health effects.

Limitations: The scientific basis for the effectiveness of the barley straw is still uncertain and its effectiveness is inconsistent.