

## Review of Management Techniques

The following sections describe common lake management techniques and their applicability to the current invasive species problem in Locustville Pond.

### Herbicide Treatment

*Recommended*

US EPA registered and state-approved herbicides can be highly effective in areas where mechanical methods are impractical, or when invasive species that spread quickly through fragmentation are of concern. Herbicides manage vegetation by degrading plant structures such as cell walls or inhibiting vital processes such as photosynthesis. This allows for relatively long-term control and limits or eliminates the chance of reproduction through fragmentation. Use of herbicides can also effectively manage aquatic plants without adverse effects to non-target organisms.

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), herbicides must pass a rigorous review process by the Environmental Protection Agency (EPA), which includes more than 100 different scientific studies and tests from herbicide manufacturers. The results must show that the herbicide can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment when used according to label specifications (EPA 2009). Products registered by the EPA undergo a continuous review process to ensure that the highest standards are met. Use of these EPA registered products is further regulated by the individual states, which may require their own approval process. As in many states, Massachusetts' pesticide laws are more restrictive than those of the EPA.

There are two main categories of herbicides – contact and systemic. Contact herbicides such as diquat affect only the portion of the plant that comes into contact with the herbicide, while systemic herbicides are taken up and translocated throughout the plant. As a contact herbicide, diquat manages populations of aquatic vegetation by eliminating or greatly reducing the seasonal growth of the target species. If treatments occur before the plants are able to reproduce, the population in subsequent years will be reduced; however, plants are only affected if they are present in the water column at the time of herbicide application. As a result, plants that have not yet matured or germinated continue growth throughout the year and contribute to additional growth in subsequent years. Conducting follow-up treatments later in the summer season may help to curb this re-growth.

Systemic herbicides such as fluridone or triclopyr work more slowly than contact herbicides, as the herbicide moves throughout the plant; however, the entire plant, along with the root system is affected, limiting the possibility of re-infestation. Large reductions in distribution and density typically result from use of systemic herbicides. Although systemic herbicides are generally more costly than contact herbicides, these reductions may be enjoyed for a longer period of time and subsequent growth is limited.

### Mechanical Harvesting (hydro-rake, weed harvester, etc.)

*Not Currently Recommended*

Mechanical operations involve the use of vessels specially designed to remove biomass from water bodies. Cutting (without collection of material) can be used in open water locations where the goal is to maintain access; however, these operations are akin to mowing a lawn and must be carried out on a regular basis (every one to two weeks). Raking and collecting (referred to here in general as 'harvesting'), is beneficial as it removes the plants, including root systems, from the water column; thereby reducing negative impacts to dissolved oxygen by limiting nutrient release. Desiccation of this biomass contributes to the amount of nutrients available for the remaining vegetation within the water body. Therefore, removal of roots and rhizomes is also beneficial.

Although this management technique is not currently recommended due to the presence of invasive species which spread via fragmentation, once these species are effectively managed, mechanical harvesting for biomass removal may be considered.



### Hand Harvesting

*Not Currently Recommended*

Hand harvesting is the removal of aquatic plant growth manually by a person from the surface, using snorkel or SCUBA gear. For submersed vegetation such as *M. heterophyllum*, the process is labor intensive and best suited for small or sparse density areas.

Hand harvesting is not a recommended method for removal of the target species; however, as density and distribution is reduced, these methods may be successful.

### Benthic Barrier

*Not Currently Recommended*

The use of benthic barrier to restrain growth is an effective management technique in lakes or coves with small pioneer infestations, or locations where only a small area (typically <1 acre) is targeted for management. Benthic barriers block sunlight from reaching the bottom sediments; thereby inhibiting photosynthesis and preventing growth of the plants they cover. The cost of screening, installation, and maintenance, as well as possible disruption of substrate-dwelling aquatic organisms, especially if used on a larger scale, does not make this technique a viable option for control of aquatic vegetation in Locustville Pond.

### Lake-level Drawdown

*Not Recommended*

Drawdowns allow for the desiccation, freezing, and physical disruption of plants, roots, and seedbeds. This method may be useful in situations where the margins of the water body are dominated by nuisance vegetation that is susceptible to drawdown.

The species targeted for management are largely present in shallow areas. In order for these plants to be affected by the drawdown, a significant portion of the pond must be dewatered. Sustained drawdowns in shallow bodies of water may be detrimental to the aquatic fauna; particularly fish, invertebrates, and amphibians, whose oxygen supply may be significantly reduced with low water levels and ice cover. These organisms also experience increased mortality under these conditions due to freezing.

### Biologic Control

*Not Recommended*

There are no biological control measures recommended for use in Locustville Pond.

### Watershed Management

*Not Feasible*

Once invasive species inundate a water body, there are no watershed management options that will lead to control. Limitation of non-point source pollution including sediment and nutrients can reduce the speed of spread throughout the water body; however, this will not eliminate its eventual spread. Watershed-scale alternatives such as land protection and neighborhood management (lawn fertilizer, buffer zones etc.) should be considered in combination with the recommended in-lake management procedures.

### No Action

*Not Recommended*

Allowing invasive species growth to continue growth should not be considered a viable option. These species are currently present throughout the water body's littoral zone and coverage such as this not only limits the pond's recreational resource value, but also degrades valuable habitat. Seasonal decay of excessive vegetation will degrade water quality, increasing the rate of eutrophication. Furthermore, there is great potential for increased spread of these invasive species to other water bodies in the area if management is not conducted.

