

October 6, 2010

Mr. Larry Levine, Chairman
Arlington Pond Protective Association
PO Box 308
Salem, NH 03073

**Re: 2010 Vegetation Survey Report and Management Alternatives for Arlington Mill Reservoir –
Salem, NH**

Dear Larry:

In 2009 the Arlington Pond Protective Association (APPA) contracted Aquatic Control Technology, Inc. to survey the aquatic vegetation on Arlington Pond (Arlington Mill Reservoir). During this survey the extent of nuisance vegetation, in particular non-native fanwort (*Cabomba caroliniana*), and management alternatives were assessed. A deeper winter drawdown was the principal short-term management recommendation.

In the summer of 2010 Arlington Pond Protective Association (APPA) contracted Aquatic Control to re-survey the aquatic vegetation in Arlington Mill Reservoir and update management recommendations. The following report summarizes our findings from the 2010 vegetation survey of Arlington Mill Reservoir performed on August 19, 2010.

LAKE DESCRIPTION

Arlington Pond is located in North Salem south of Route 111. It has a reported total surface area of 238 acres, and maximum and mean depths of 39 feet and 9.5 feet, respectively. The primary inlet is at the northern end of the lake. Big Island Pond is located immediately upstream. The dam and outlet structure are located in the southeast corner of the lake. The outlet stream combines with other streams to form the Spicket River. Arlington Pond has a large watershed, over 14,000 acres, and a reported flushing rate of 7.2 times per year. The majority of the lake shoreline moderate to heavy residential development.

AQUATIC PLANT SURVEY

Methods:

Aquatic Control Technology Biologist, Erika Haug and a field technician slowly toured the entire littoral zone (the region of the lake where enough light penetrates to the lake bottom to allow for plant growth) of Arlington Mill Reservoir by boat. Weather conditions on the day of the survey were mostly sunny, with low wind providing very good to excellent conditions for visual observation of the pond bottom with the use of polarized lenses. Where visibility of the pond bottom was obscured, an AquaVu underwater camera and throw-rake were used for the assessment of vegetation identification and density. GPS locations were taken with a handheld device to mark the locations of fanwort (*Cabomba caroliniana*) growth (figure1).

Results:

Fanwort Distribution:

As observed in 2009 fanwort was widely distributed throughout the littoral zone, particularly in the coves along the northern, western and southern shorelines. The most notable difference in distribution was the increase in fanwort density and distribution along the eastern shoreline. Along the eastern shore in 2009 fanwort was only observed in the marina and in four to five small isolated patches along the remainder of the eastern shoreline. In 2010 fanwort was prominent in the majority of the coves along the eastern shore and was also observed in several small patches and one larger patch growing along the exposed eastern shoreline. Fanwort growing along the exposed or open shoreline is more likely to be fragmented and spread by boat traffic. The majority of the fanwort observed was found growing in water depths of four to eight feet with the exception of the large exposed patch along the eastern shore, which was most dense in depths of nine to fifteen feet. The lack of fanwort in depths less than four feet is likely indicative of good control resulting from drawdown efforts. With the exception of a few plant fanwort in Arlington Mill reservoir had not reached the surface and was not flowering by August 17th 2010. The total coverage of fanwort throughout Arlington Pond in 2010 was estimated between 9 and 12 acres.

Variable Milfoil Distribution:

Concerns have been raised regarding the potential spread of variable milfoil (*Myriophyllum heterophyllum*) into Arlington Mill Reservoir from upstream sources. During the survey no variable milfoil was encountered.

Dominant Native Aquatic Vegetation:

The following table summarizes the density and distribution of the dominant native plant species in Arlington Pond observed in 2010.

Table 1: Dominant Native Vegetation 2010

Macrophyte Species	Common Name	Type/ Notes	Photograph
<i>Potamogeton pusillus</i>	Thinleaf Pondweed	Submersed; Common throughout coves and in shallow waters of exposed shorelines	
<i>Utricularia sp</i>	Bladderwort	Submersed; Common in coves and in water depths greater than 4 feet along exposed shorelines.	

<i>Vallisneria americana</i>	Tapegrass	Submersed; scattered patches in coves	
<i>Potamogeton gramineus</i>	Variable-leaf pondweed	Submersed; sparse growth in coves	
<i>Eleocharis sp.</i>	Slender spikerush	Submersed; sparse patchy growth	
<i>Myriophyllum humile</i>	Lowly watermilfoil	Submersed; sparse growth	
<i>Najas flexilis</i>	Slender naiad	Submersed; sparse and distributed widely	

The Majority of the native plant growth was low density growth (10-25% cover) reaching heights of 2-4 feet below the surface. This type of growth does not likely impact boating and improves fishing; however it may have some negative impact on swimming. In particular thinleaf-pondweed and bladderwort appeared to be encroaching on some of the swim areas in both the coves and along the exposed shorelines. Variable leaf pondweed and tapegrass, though lower in density could hinder some of the recreational use of the pond as both of the species were observed reaching the surface near or within swim areas within some of the coves, particularly along the eastern and southern shoreline.

MANAGEMENT CONSIDERATIONS AND RECOMMENDATIONS

Fanwort Control

Fanwort is generally considered to be a highly invasive, non-native plant in the Northeast. They are canopy forming species capable of out competing more desirable, native plants. Both plants primarily reproduce through vegetative fragmentation. The plants can auto-fragment through wind and wave action, and be cut up by boats, swimmers and other in-water activities. The fragments develop adventitious roots as they float in the pond, before eventually settling to the bottom and becoming reestablished.

Mechanical control strategies such as harvesting (cutting and collecting) and hydro-raking are usually not recommended for the control of fanwort. Mechanical controls only provide temporary control of the weed growth (weeks or months at best) and escaping plant fragments from the operation, which are inevitable, can spread and aggravate the infestation. Physical controls such as hand-pulling, diver-assisted suction harvesting, or use of bottom weed barriers are effective for small areas and should be considered for some of the low density patches along the exposed shorelines. These methods are impractical and usually cost-prohibitive for areas >0.5 acres. Drawdown or water-level lowering during the winter months to expose fanwort to freezing and drying conditions seems to have been effective in shallow water areas. Finally, there are no known biological controls (i.e. herbaceous insects) that are known to feed exclusively on fanwort and variable watermilfoil and triploid (sterile) grass carp are not permitted for use in Rhode Island.

This leaves aquatic herbicide treatment as the most cost-effective and least-disruptive means of controlling fanwort in waters where the drawdown has proven ineffective and in areas where the density is too high for effective hand-pulling. However, the current fanwort cover at Arlington Mill Reservoir may be difficult to manage effectively, given the heavy waterflow through the system and the distribution of the fanwort. A discussion of the aquatic herbicides that should be considered for use at Arlington Mill Reservoir is provided below.

Sonar (Fluridone): Systemic herbicide for the control of Fanwort

Fluridone is the only active ingredient currently registered for use in aquatics that controls fanwort. Fluridone is most effective for whole-lake applications. Partial lake treatments often have reduced effectiveness and higher per acre unit costs. Fluridone does have a systemic action that kills the entire plant and its root system, usually resulting in 2 or more seasons of control over susceptible plants. The success of fluridone treatments is not so much a function of dosage rate, but instead how long the herbicide can be kept in contact with the target plants. Considering the flow through Arlington Mill Reservoir, probably the only way to maintain the necessary Sonar concentrations would be to perform a series of applications using the time-release pellet formulations Sonar. Usually 3-4 times the target dose must be applied in these scenarios, resulting in a very high treatment cost. Downstream water use would also need to be carefully inventoried to see if there are any possible impacts. There is a 30-day restriction on using treated water for irrigation following each application, which would extend for the majority of the summer during a multiple application program.

Flumioxazin (Registration Pending): Contact herbicide for the control of fanwort

A new herbicide is currently in final review by the EPA and is expected to be registered for aquatic use in early 2010. We would expect that this product would be registered in New Hampshire a few months thereafter, and may be available for use in 2011. The State of New Hampshire funded a research project by the U.S. Army Corps of Engineers a few years ago that showed fanwort to be susceptible to flumioxazin. It has been evaluated under Experimental Use Permits for the past several years, with reportedly good results on fanwort. Flumioxazin is a contact acting herbicide that will not require the extended contact time that is needed for fluridone. We are unsure what the specific water use restrictions will be, but we understand that this product has a very favorable toxicology profile.

Nuisance Native Plant Species Control:

The majority of the plant growth observed along the shoreline of Arlington Mill Reservoir was low density (10-25% cover) and does not require chemical treatment. We understand that this growth may impact individual shoreline swim areas, however we do not feel chemical treatment is the most appropriate method of control at these densities. Due to the fact that the fanwort infestation appears to be expanding we would caution against the removal of large plots of native species as this would leave these areas vulnerable to infestation by fanwort. When chemically treating an area it is near to impossible to treat less than an acre of growth as dilution effects are too high. It should be noted that given the current densities of native species it would be difficult to secure a permit for treatment. The focus of the chemical control program should be on the control of fanwort; however some thinning of native species is likely to be a by-product of chemically treating fanwort. In areas of low to moderate density growth where residents feel swimming or other recreational uses are being negatively impacted, we would recommend hand-raking swim areas during the period of drawdown.

Summary of Recommendations:

- Variable Milfoil Control:
 - We recommend continuing to diligently search for a pioneer infestation. Early detection will be crucial to controlling this species should it be discovered in Arlington Mill Reservoir.
- Fanwort Control:
 - The density and distribution of fanwort is expanding and should be watched closely.
 - We recommend continuing with the annual drawdown but caution against lowering too early in the fall as this may encourage fanwort to expand into deeper waters.
 - Due the size of the Lake and the resulting costs associated with a whole lake treatment we do not recommend a Sonar treatment at this stage of infestation.
 - We do recommend keeping a close watch on the registration status of flumioxazin and consider filing a permit for spot treatment of fanwort for 2011 should the herbicide be registered by January or February 2011.
- Native Plant Control:
 - We recommend controlling nuisance native species encroaching on recreational uses with hand-raking during the drawdown.
 - Some thinning of native species may occur as a results of a spot-treatment of fanwort.

We hope this will assist you with your nuisance aquatic plant management efforts at Arlington Mill Reservoir. Please feel free to contact our office to further discuss recommendations outlined in this report.

Sincerely,

AQUATIC CONTROL TECHNOLOGY, INC.



Erika Haug
Biologist



Marc Bellaud
Senior Biologist