



Community Preservation Committee

Littleton, Massachusetts

The CPC was established by Town Meeting in 2007. The CPC has the powers and responsibilities specified by Massachusetts General Law Chapter 44B, section 5(b), the Community Preservation Act.

Community Preservation Application for Funding

Date: 03.15.24

Project Title: Eco harvesting of In-water Invasive Plants in Long Lake

Name of Applicant: Jonathan Folsom, CLC Chair

Name of Organization: Clean Lakes Committee (CLC)

Address: c/o Littleton Water Department, 39 Ayer Rd, Littleton MA 10460

Telephone: (978)501-6173 **Email:** ifolsom56@gmail.com

CPA Category (circle all that apply):

Open Space

Historic Preservation

Recreation

Community Housing

CPA Funding Requested: \$27,000

Total Project Cost: \$27,000

Please attach answers to the following questions. Include supporting materials as necessary.

1. **Project Description:** Please give a detailed project description, including specific objectives.
2. **Goals:** How does this project accomplish the goals of the Community Preservation Plan for Littleton? (See Guidelines for Project Submission for general criteria)
3. **Timeline:** What is the schedule for project implementation, including a timeline for all critical milestones? Will this be a multi-year project?
4. **Budget:** Please provide a full budget including the following information, as applicable. (NOTE: CPA funds may not be used for maintenance):
 - a. Total amount of the project cost, with itemization of major components.
 - b. Additional funding sources. Please include those that are available, committed, or under consideration.
 - c. Describe the basis for your budget and the sources of information you used.



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5. **Support:** Have the appropriate Town Boards and Commissions expressed support and/or approved the project? What is the nature and level of community support for this project?

Submit this form and accompanying materials to:

Community Preservation Committee
c/o Town Clerk Office
Town Offices
37 Shattuck Street
P.O. Box 1305
Littleton, MA 01460
978-540-2401
townclerk@littletonma.org

Please provide one paper copy as well as an electronic (pdf) file.

Curly-leaved Pondweed: An Invasive Aquatic Plant

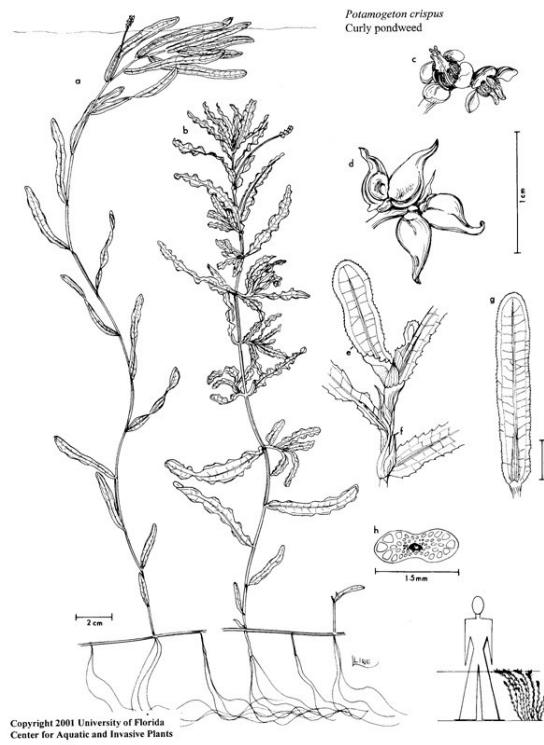
Potamogeton crispus



Description

- Curly-leaved Pondweed is a hardy, aggressive non-native invasive plant.
- The oblong light to dark green leaves are distinctly serrated, wavy, and typically 3" long.
- The hard leaves have rounded tips and a prominent, reddish midvein. Leaves are sessile (no petiole/attached directly to the stem) and are arranged alternately along the stem.
- The stems are lighter in color and generally flattened.
- Stolons, rhizomes, burr-like winter buds and small reddish/brown fruits are produced annually.
- *P. crispus* is usually the first macrophyte to emerge in the spring, but dies back by July.

Curly Leaf Pondweed



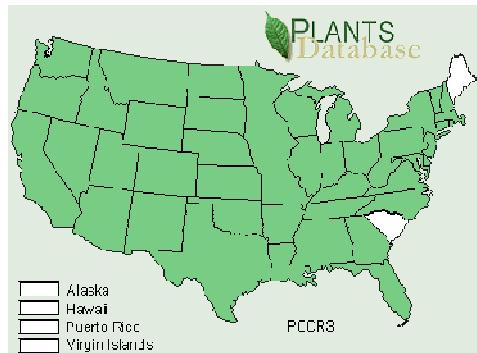
Habitat

P. crispus has become established in a wide range of habitats across the United States.

- *P. crispus* prefers alkaline, brackish and nutrient rich waters, however; it can tolerate a wide range of conditions including low light and low temperature.

Distribution Map

Potamogeton crispus



Reproduction

P. crispus reproduces mainly by turion production, but also reproduces from rhizome growth.

- *P. crispus* has a rather unusual life cycle. Fruits, turions and seeds are produced in late spring/early summer and by July, *P. crispus* has died back. The fruits and turions survive all summer and germinate in the fall. The new plants grow to a few centimeters tall and over-winter in a dormant stage, even under the ice. In spring the small plants have a head start on other native macrophytes and can quickly form dense stands.
- *P. crispus* forms seeds; however, the importance of seeds in the overall maintenance of the population is uncertain. *P. crispus* can also form new colonies from rhizome growth.

Impacts and Threats Posed by Curly Leafed Pondweed

P. crispus is a highly competitive plant that is capable of rapid growth and spread. *P. crispus* can displace native species, reduce biodiversity, impede recreational activities and alter water quality.

- *P. crispus* can form dense single species stands that may not provide ideal habitat or food for native wildlife, and these native wildlife populations are often forced to relocate or perish, ultimately resulting in a loss of biodiversity.
- *P. crispus* can impede boaters, fisherman, water skiers and swimmers, and these limitations on water use can negatively impact real estate values.
- *P. crispus* dies back in July, and when dense mats decay, the available oxygen in the water may be depleted. The resulting low oxygen conditions (anoxic) can lead to fish kills and harm other aquatic organisms. Nutrients released from the decaying plants may also contribute to algal blooms.

Management Methods

Management methods include mechanical removal, herbicides, drawdowns and physical barriers. No biological controls are known. Management of *P. crispus* is season specific and management needs to be completed prior to the formation and dropping of seeds.

- Pulling and cutting of *P. crispus* can help reduce the biomass, however most forms of mechanical harvesting are not species selective. Hand pulling *P. crispus* is very time and labor intensive and is a technique that is best applied to pioneer infestations.
- Treatment with Endothal, Diquat, and Fluridone has proven effective, especially when applied early, prior to the production of turions. Partial control has been obtained with 2,4-D. By law, aquatic herbicides can only be applied by a licensed applicator and permits are required.
- Drawdowns can be an effective mode of *P. crispus* control if the drawdown is extensive enough to prevent re-growth from seeds, however, drawdowns may affect reptiles, amphibians, other aquatic organisms and alter downstream conditions.
- Benthic barriers may be used in small areas including swimming beaches, boating lanes and around docks. The barriers restrict light and upward growth but can have a negative impact on benthic organisms trapped beneath the barrier, need to be properly anchored and routinely maintained.

Other Information

- Curly-leaved Pondweed is on the Massachusetts Prohibited Plant List (January 1, 2006)
- Informational websites:
<http://aquat1.ifas.ufl.edu/> (Center for Aquatic and Invasive Plants)
www.ProtectYourWaters.net (Aquatic Nuisance Species national web site)
<http://has.er.usgs.gov/queries/plants/PlantState.html> (USGS- Exotic species by state)
- *P. crispus* was first introduced to the US during the 1800's and was a popular aquarium plant.
- Due to the conspicuous serrated and rippled leaf margins, *P. crispus* is not easily confused with many other species.



Undulating / rippled leaves, serrated leaf margins and distinct midvein.

References:

1) Literature:

<http://www.mass.gov/dcr/waterSupply/lakepond/geir.htm> (Generic Environmental Impact Report)
http://hua.huh.harvard.edu/cgi-bin/Flora/flora.pl?ACT=desc&FLORA_ID=12395&TAXON_ID=200024690 (Flora Online)
http://www.ppws.vt.edu/scott/weed_id/ptmcr.htm (Virginia Tech Weed I.D.)
<http://www.wes.army.mil/el/pmis/plants/html/potamogete.html> (Army Corps of Engineers)

2) Photographs were obtained from:

http://botit.botany.wisc.edu:16080/images/veg/Wetlands_1_Plants/Potamogeton_crispus_1_VK.php?28_0.192 (cover photo of *P. crispus*)
<http://plants.ifas.ufl.edu/egdepic.html> (line drawing and close up of *P. crispus*)
http://www.ppws.vt.edu/scott/weed_id/ptmcr.htm (second close up of *P. crispus*)

3) The distribution map was taken from:

http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=POCR3 (USDA Plant Data Base)

For more information please contact:

D.C.R Office of Water Resources, Lakes and Ponds Program

Michelle Robinson at: michelle.robinson@state.ma.us

Or visit the Lake and Pond Web Site at: www.mass.gov/lakesandponds

Prepared by Michelle Robinson: February 2002

Species Taxonomy and Identification

Fanwort, *Cabomba caroliniana* is a submerged perennial aquatic plant. Fanwort is fully submerged except for occasional floating leaves when the plant grows to the water's surface. The vertical shoots or stems of fanwort are actually extensions of the fragile, horizontal rhizomes. The stems are branched, can reach a length of 10 meters, and are covered with white or reddish-brown hairs. Submerged leaves are finely divided and arranged around the stem in pairs. The submerged leaves are about 5 centimeters across and fan-shaped. Floating leaves are small, diamond-shaped, and arranged alternately on flowering branches. Flowers are solitary, less than 2 cm across, float on the surface of the water, and are usually white (sometimes yellow or pink). The fruit is a leathery, indehiscent, 3-seeded follicle (Crow and Hellquist 2000).

According to Crow and Hellquist 2000, the following taxonomic characteristics are used to identify *Cabomba*:

- Submersed leaves opposite, dissected into linear segments; floating leaves small, inconspicuous, oblong to linear-elliptic, peltate, less than 2 cm long, subtending flowers; submersed portions of the plants lacking mucilaginous coating; flowers white to pinkish; stamens 3-6.



Figure 1. A photograph and diagram of fanwort. The photo was taken from <http://www.adkinvasives.com> and the diagram was taken from www.fish.washington.edu.

Species Origin and Geography

Fanwort is native to the subtropic-temperate regions of eastern North and South America. Today, it is naturalized in the southeastern United States, and has been introduced throughout the world via the aquarium trade (Orgaard 1991). Within the U.S. it ranges from Florida to Texas in the south, up the east coast to New Hampshire and west to Oklahoma. In the western U.S. it is present in Washington and Oregon (Figure 2). Fanwort is highly capable of transport to new water bodies due to vegetative growth and reproduction. Plant fragments transported to new waterbodies can become rooted and form new shoots. Plant fragments are easily transported to new waterbodies by boats, trailers, fishing gear, wind, animals and currents. In one study, Minnesota authorities found aquatic plants on 23% of all boats inspected (Bratager et al. 1996). In Massachusetts, it is largely a plant of the eastern coastal plain and the granite belt bordering New Hampshire, both areas with acidic waters, and is absent from the more alkaline Berkshire lakes. It often co-occurs and competes with variable watermilfoil (*Myriophyllum heterophyllum*) another invasive plant.

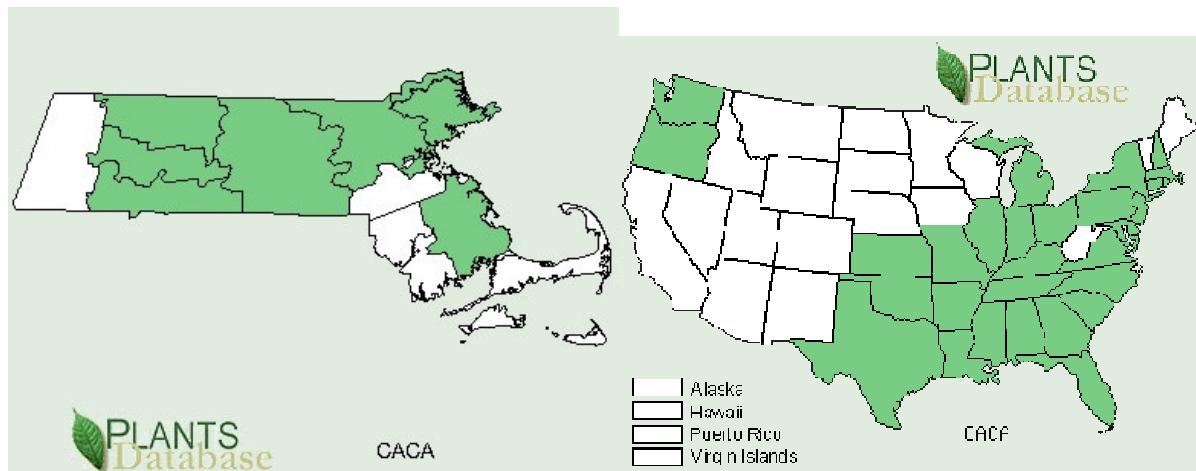


Figure 2. Map indicating the present range of *Cabomba caroliniana* in the United States, and Massachusetts. This map was taken from The USDA Plant Data Base.

http://plants.usda.gov/cgi_bin/topics.cgi

Species Ecology

Fanwort grows rooted in the mud of stagnant to slow flowing water, and is found in streams, small rivers, lakes, ponds, reservoirs, sloughs, ditches and canals. Fanwort can grow on a range of substrates, but prefers organic silts, and experiences reduced growth on harder substrates. Fanwort grows well in waters with low pH; the stems begin to defoliate above pH 8. Growth is also hindered in waters with high calcium levels, coincident with high pH in Massachusetts. While fanwort may survive temperatures as low as the freezing point for water, it prefers warm temperatures ranging from 13-27°C. Fanwort is sensitive to drying, and requires permanent water. Typically it grows in less than 10 feet of water, but can grow at depths of up to 30 ft. Fanwort reproduces primarily through plant fragmentation and rhizomes, but it produces flowers and seeds that may have a limited role in dispersal.

Variable Milfoil: An Invasive Aquatic Plant

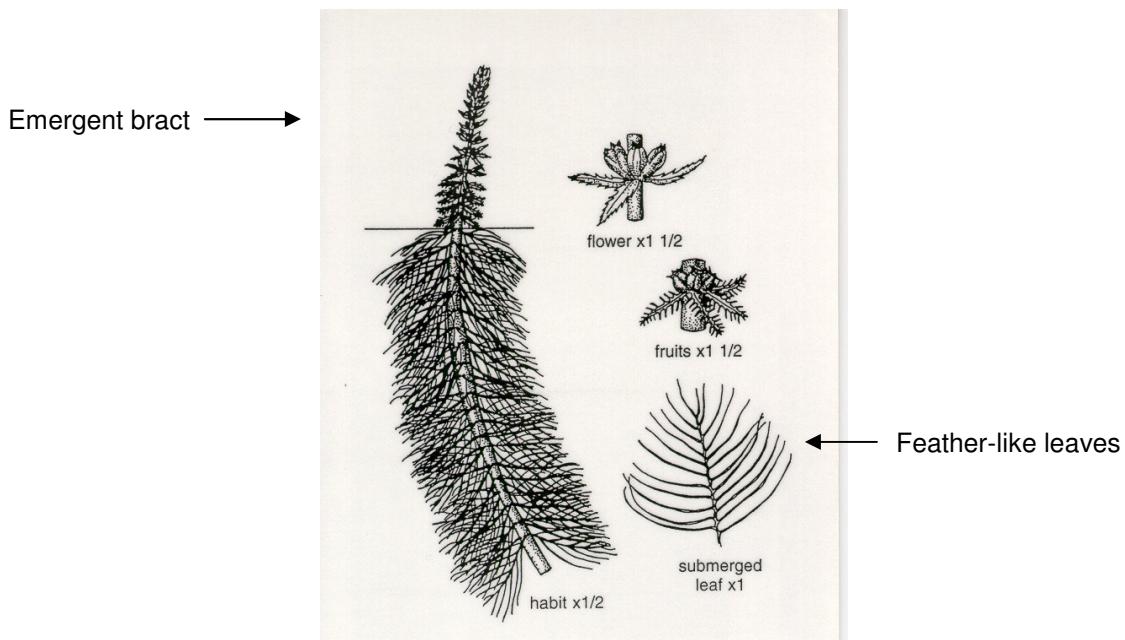
Myriophyllum heterophyllum



Description

- Variable Milfoil is an aquatic rooted, submerged non-native plant with a “raccoon-tail” or pipe cleaner appearance.
- Variable Milfoil can form dense mats at the water surface and can grow in the photic zone, in up to 10 feet of water.
- The delicate green underwater leaves are feather-like and average $\frac{1}{2}$ to 2 inches across. Leaves are arranged around the stem in whorls of 4-6. The leaves have 6-12 segments.
- During late summer a 4-6 inch emergent bract develops, protruding above the water surface. The small bright green leaves on the bract are oval and are both serrated and non-serrated. (The lower female section of the bract has serrated leaves, and the upper male portion has smooth margins).
- The stems are thick, robust and usually red.

Variable Milfoil



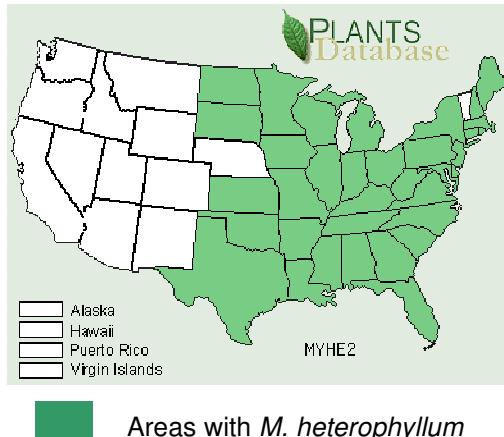
Habitat

Variable Milfoil is a hardy species that has established itself in a wide range of aquatic habitats.

- Over-winters in the frozen lakes of northern climates and can thrive in warm southern water bodies.
- Grows under a wide range of water chemistry conditions, can be found in acidic and calcium-rich lakes and can tolerate a wide range of temperatures.
- Prefers slow moving waters, including lakes and ponds, but occasionally can be found in rivers.
- Found state wide, but tends to prefer the acidic waters of eastern Massachusetts

Distribution Map

Myriophyllum heterophyllum



Reproduction

Variable Milfoil reproduces by both vegetative and sexual methods.

- Vegetatively, *M. heterophyllum* reproduces by fragmentation, rhizome division and asexually by budding.
- Although it is not as common, *M. heterophyllum* can re-grow from seeds remaining in lake or pond sediment.

Impacts and Threats Posed by Variable Milfoil

Variable Milfoil is a highly competitive plant that is capable of rapid growth and spread.

Variable Milfoil can displace native species, reduce biodiversity, hamper recreational uses, reduce real estate, diminish aesthetic values and decrease water quality.

- Once established, Variable Milfoil can out-compete native vegetation. Species that depend on that native vegetation to survive are forced to relocate or perish, resulting in a loss of biodiversity.
- Variable Milfoil produces dense large mats of vegetation on the water surface, thus intercepting sunlight leading to the exclusion of other submerged plants.
- As Variable Milfoil plants die and sink to the lake bottom, sediment levels increase.
- Variable Milfoil greatly impedes boaters, fisherman, water skiers and swimmers, and these limitations on water use can negatively impact real estate values.
- When dense mats of Variable Milfoil decay, the available oxygen in the water is depleted. The resulting low oxygen conditions (anoxia) can lead to fish kills and harm other aquatic organisms.



Management Methods

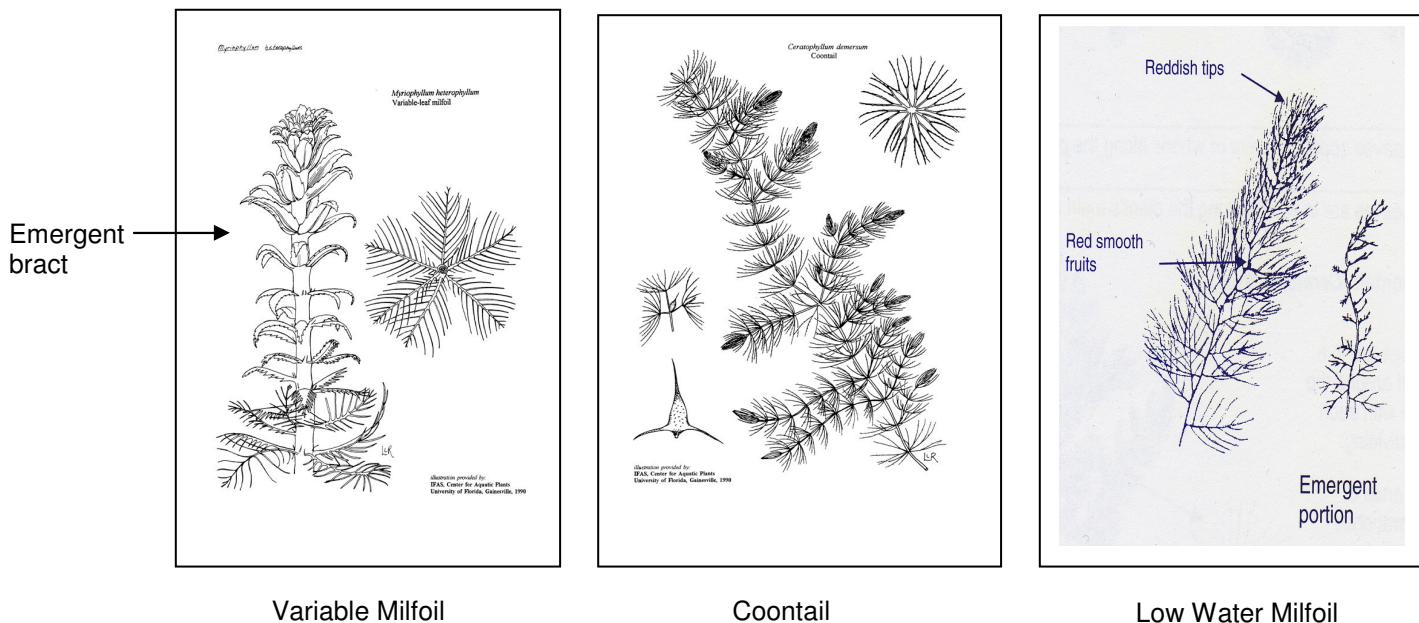
Management methods currently include mechanical removal, drawdowns, and herbicides. No known biological controls exist.

- Although harvesting can greatly reduce the Variable Milfoil biomass in a water body, harvesting also causes fragmentation, and fragments are capable of producing new plants. Some fragments may drift down stream or attach to boats and wildlife and create new infestations elsewhere.
- Drawdowns can be an effective mode of Variable Milfoil control if the drawdown is extensive enough to prevent re-growth from seeds. Drawdowns may impact fish, aquatic organisms, reptiles, amphibians and downstream conditions.
- Several herbicides have been used to control Variable Milfoil, including Diquat and 2,4-D.
- Benthic barriers may be used in small areas including swimming beaches, boating lanes and around docks. The barriers restrict light and upward growth but can have a negative impact on benthic organisms, and need to be properly anchored and maintained.

Other Information

- Variable Milfoil is on the Massachusetts Prohibited Plant List (as of January 1, 2006)
- Variable Milfoil is occasionally sold in pet stores as Red Foxtail.
- Informational web sites:
 - <http://aquat1.ifas.ufl.edu/welcome.html> (Center for Aquatic Invasive Species, Florida)
 - www.ProtectYourWaters.net (Aquatic Nuisance Species national web site)
 - <http://www.state.me.us/dep/blwq/topic/invasive.htm> (Maine DEP web site)
- Variable Milfoil is often confused with the native Coontail (*Ceratophyllum*), Low Water Milfoil (*Myriophyllum humile*), and endangered Farwell's Milfoil (*Myriophyllum farwellii*).
 - The leaves of Coontail are branched (the stem continues to fork and split) where as Variable Milfoil has leaves that are feathered (like a bird feather).
 - Although both the native Low Water Milfoil and exotic Variable Milfoil have feathered leaves, the native Low Water Milfoil has very limp leaves that are alternate, not whorled. Low Water Milfoil does *not* form a stiff emergent bract with variable-type leaves, instead it develops a delicate emergent portion and smooth fruits at the leaf axils.
 - Farwell's Milfoil looks similar to Low Water Milfoil, but under close inspection, the fruits have ridges and bumps (not smooth).

Variable Milfoil compared to native Coontail and Low Water Milfoil



References:

- 1) Literature sources:
 - <http://www.mass.gov/dcr/waterSupply/lakepond/geir.htm> (Generic Environmental Impact Report)
 - <http://www.rook.org/earl/bwca/nature/aquatics/myriophyllumhet.html>
 - <http://www.wapms.org/plants/milfoil.html> (Western Aquatic Plant Managers Society)
- 2) Photographs were obtained from:
 - Unknown (cover photo)
<http://www.state.me.us/dep/blwq/topic/invasive.htm> (guy in canoe, Maine DEP)
 - <http://www.state.me.us/dep/blwq/doclake/vardr2.jpg> (first line drawing of Variable Milfoil)
 - A Guide to Aquatic Plants in Massachusetts
 - <http://www.state.me.us/dep/blwq/doclake/vardr2.jpg> (line drawings of Coontail and Low Water Milfoil)
- 3) The distribution map was taken from:
http://plants.usda.gov/cgi_bin/topics.cgi (USDA Plant Data Base)

For more information please contact:

D.C.R. Office of Water Resources, Lakes and Ponds Program

Michelle Robinson at: michelle.robinson@state.ma.us

Or visit the Lakes and Ponds web site at: www.mass.gov/lakesandponds

Prepared by Michelle Robinson: November 2002

Littleton's monitoring equipment and online dashboard are being switched this year from OptiRTC, Inc to a competitor, In-Situ Inc.

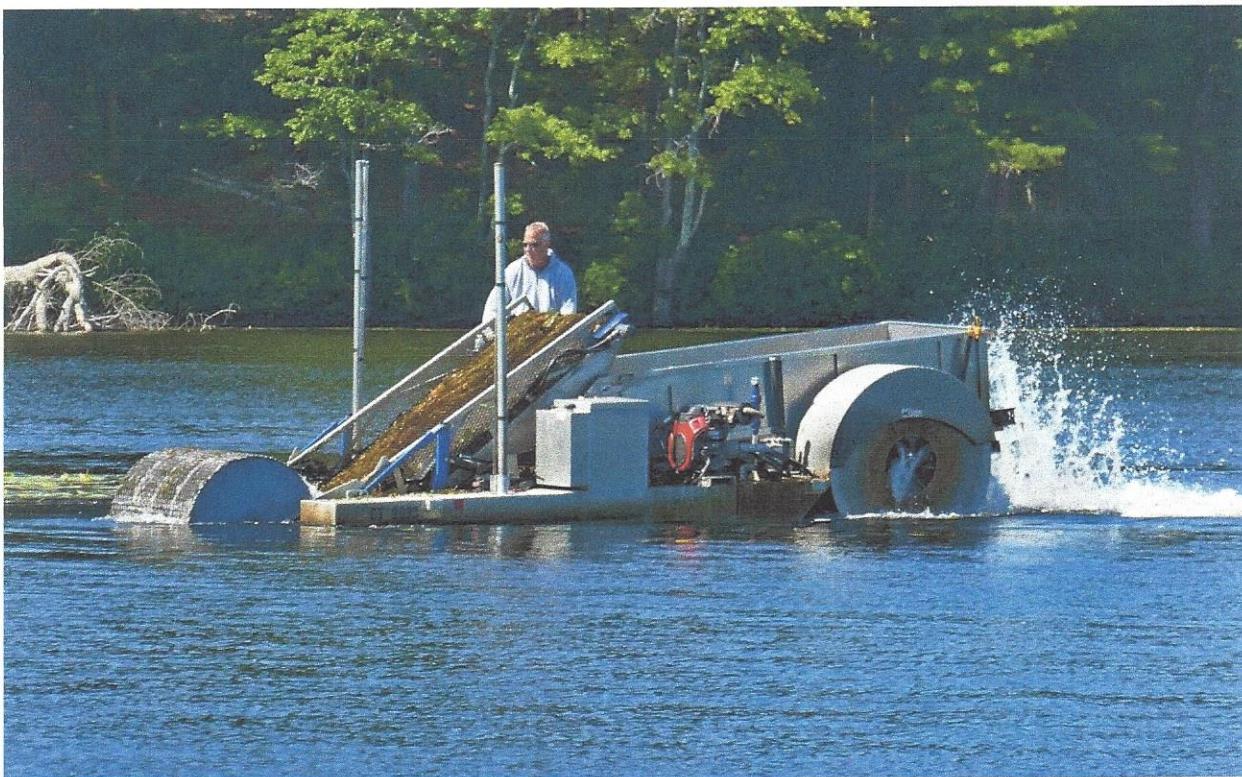
SOLitude Treats Invasives in Long Lake and an Eco Harvesting Pilot Program Starts in Spectacle Pond

While Long Lake received its annual herbicide treatment with little fanfare (or enthusiasm), at Spectacle Pond this year the CLC initiated an eco-harvesting program. Increasingly concerned about the cumulative effects of chemical treatments in Littleton's water bodies, we favor mechanically removing invasive plants altogether.

The technology is sound: unlike traditional aquatic weed harvesters that chop up plants, an eco-harvesting machine pulls whole plants out of the shallows, roots and all, and skims the water surface collecting debris and even some floating bogs. The accumulated plant mass is removed from the lake by a conveyer belt and composted rather than sinking to the bottom to decompose.

The hitch is that eco-harvesting works best with mature plants that bloom in mid- to late summer. The dilemma then is that to achieve the best results, everyone has to put up with clumps of thriving invasive plants into, say, July. Or later. This messes up a lot of plans.

Once pulled, are invasives gone? Not entirely. But with repeated sessions we are told they'll be more manageable. And decomposing plant material in the lake is reduced every year. Two worthy goals. We will likely continue the pilot program in 2023.



C&D Underwater Maintenance's Eco Harvester on Spectacle Pond

Photo by Ann Bousquet