

# Report of the New Hampshire Exotic Aquatic Species Program

2006-2008



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New Hampshire Exotic Aquatic Species Program  
2006-2008**

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## Executive Summary

This report summarizes the spread and distribution of exotic aquatic species in New Hampshire and the activities of New Hampshire's Exotic Aquatic Plant Program to control these species. Program history is summarized, and activities that occurred from 2006 through 2008 are described in detail.

"Exotic aquatic species" are plants or animals that are not part of New Hampshire's native aquatic flora and fauna. Since the first exotic aquatic plant infestation in New Hampshire was discovered in 1965 in Lake Winnepesaukee, exotic aquatic plant infestations have increased to a total of 83 infestations in 72 waterbodies in 2008. Species present include variable milfoil (63 waterbodies), Eurasian milfoil (3 waterbodies), fanwort (9 waterbodies), water chestnut (1 waterbody) and Brazilian elodea (1 waterbody), Curly-Leaf Pondweed (3 waterbodies), and European Naiad (3 waterbodies), and Didymo (1 waterbody). Most of these exotic plants can propagate by fragmentation as well as by seed.

Exotic aquatic plant fragments can easily become attached to aquatic recreational equipment, such as boats, motors, and trailers, and can spread from waterbody to waterbody through transient boating activities. Infestations can have detrimental effects on the ecological, recreational, aesthetic, and economic values of the state's precious surface waters, limiting use of the waterbodies and decreasing shorefront property values by as much as 10-20 percent according to a UNH study (Halstead, et al., 2001).

Since its inception in 1981 with the passage of RSA 487:15, the Exotic Aquatic Plant Program has grown to become a cooperative effort among state agencies, lake organizations, and concerned citizens. At the state level, this involves a partnership among the New Hampshire Department of Environmental Services, the Fish and Game Department, the Department of Safety, the Department of Resources and Economic Development, and the Department of Agriculture, Markets, and Foods to prevent the spread of exotic plants to new waterbodies and to monitor and treat infestations. Many lake associations and other non-profit organizations, such as the New Hampshire Lakes Association and the New Hampshire Rivers Council, and individual lake and river associations, participate in monitoring, education, and control efforts.

### Recent Program Activities

Program activities include five focus areas: 1) Prevention of new infestations through education and outreach; 2) monitoring for early detection of new infestations; 3) control of new and established infestations; 4) research towards new control methods; and 5) regional/national cooperation with other exotic species programs.

Education, Outreach, and Prevention: Between 2006 and 2008, over 140 presentations and seminars were given to lake associations and professional organizations, and several live radio broadcasts and local news media events were also conducted. The program coordinator also participated in a local television broadcast for shows focusing on aquatic ecology. The Exotic Species Program was also highlighted twice on "The Exchange," which is a segment on New Hampshire Public Radio. Working with Representative Bob L'Heureux in 2006, the DES Aquatic Plant Program created a video that has since been featured several times on local area networks. The program is also continuously working to update plant lists and to install warning signs at boat launches around the state.

Monitoring for Early Detection: Between 2006 and 2008, monitoring activities included macrophyte surveys by DES staff of 85 lakes. The Weed Watcher Program, coordinated by DES, recruits volunteers to monitor their waterbodies and to report suspicious plants to DES for immediate identification. By 2008, there were over 500 Weed Watchers monitoring over 130 waterbodies for early detection of exotics.

Control Activities for New and Existing Infestations: Control activities increased from 28 individual projects in 2006, to 49 in 2008. Control measures for new, small infestations include hand pulling or benthic barriers, and may include designation of a Restricted Use Area in the vicinity of the infestation. Larger, established infestations are usually controlled with herbicides. Project activities for 2006 included 14 herbicide applications, 3 benthic barrier installations, 7 hand-pulling activities, 3 Restricted Use Area designations, and 1 harvesting experiment. Project activities for 2007 included 12 herbicide applications, 4 benthic barrier installations, 13 hand-pulling activities, the establishment of 3 Restricted Use Areas, 1 harvesting experiment, and 1 Diver-assisted Suction Harvesting experiment. In 2008, project activities included 17 herbicide applications, 5 benthic barrier installations, 17 hand-pulling operations, 1 harvesting experiment, 1 Restricted Use Area designation, and 8 Diver-assisted Suction Harvesting experiments.

Research: Initiating and participating in research activities is a key element in the Exotic Aquatic Plant Program. As variable milfoil is not a common nuisance species throughout the United States, little research has been conducted on the plant's biology, ecological relationships, and potential control strategies. By working with local academic institutions, such as the University of New Hampshire, as well as consultants and federal researchers, DES is coordinating the field-testing of various hypotheses on New Hampshire waterbodies. DES is working towards finding solutions to exotic aquatic plant infestations. DES also stays informed about what other states are doing to manage exotic aquatic species, as well as about emerging technologies in the field of management.

Regional Cooperation: DES has worked on a regional level to standardize the key legislation and education initiatives between the New England states. To date, New Hampshire, Vermont, Connecticut, and Maine have state exotic species legislation in place. Prohibition of exotic species sale and transport is much more effective on a regional basis than state-by-state. If a standardized list of exotic plants can be prohibited in New England and neighboring states, the likelihood of success in preventing the spread of these species to new waterbodies is increased.

The DES Exotic Aquatic Plant Program was funded from a fee of \$1.50 per boat registration until January 1, 2003. Passage of new legislation increased the revenue to \$4.50 per boat registration. The additional \$3 is used to fund the Milfoil and Other Exotic Aquatic Plant Prevention and Research Grant Fund. Monies from the \$1.50 fee are used to fund herbicide applications, educational materials, and administrative costs.

## Long Term Goals

The goals of the Exotic Aquatic Plant Program are to limit the further spread of exotic aquatic species, control new and existing infestations, and to research new ways to contain or limit the spread of these species. Objectives in the five focus areas are:

Education and Outreach: Foster increased partnerships among public and private lake associations, state agencies, regional groups, and other aquatic interests to provide and disseminate innovative and proactive educational materials that inform the public about exotic aquatic species, how they are spread, and how they are controlled.

Monitoring for Early Detection: Expand the Weed Watcher Program and coordinate training activities with volunteer monitors. Map infestations using global positioning systems to more accurately document and track the occurrence and distribution of infestations over time. Develop DNA gene sequencing methods for positive identification of variable milfoil during all life stages.

Control Activities for New and Existing Infestations: Develop a streamlined process, including appropriate monitoring and environmental assessment, for conducting herbicide applications.

Research: Conduct research on long-term control methods and potential means for eradication of exotic aquatic plants. DES will work to develop DNA gene sequencing methods for positive identification of variable milfoil during all life stages. DES plans to continue working with the University of New Hampshire and other research entities to further our knowledge and control options. Other projects include: water chemistry studies surrounding the use of aquatic herbicides, chemistry dynamics of herbicides in a flowing system (Suncook River), and the importance of seeds in the reproduction of variable-leaf milfoil.

Regional Cooperation: Continue to develop regional approaches for the northeastern states for education, outreach and monitoring.

Looking to 2009 and beyond, DES would like to promote programs that meet the challenge of preventing new exotics infestations, controlling existing ones, and researching new techniques for control and even eradication of exotic aquatic species. DES looks to work with legislative committees to refine and expand the Exotic Species Program, as well as achieve expanded funding for continuing control activities to fulfill obligations in providing funding for long-term control projects to reduce existing infestations.

# 1. PROGRAM OVERVIEW

## 1.1 Purpose and Overview

This report describes activities of New Hampshire's Exotic Aquatic Plant Program from 2006 through 2008. It also summarizes the spread and distribution of exotic aquatic plants in New Hampshire and the program history.

The primary purpose of New Hampshire's Exotic Aquatic Plant Program is to "prevent the introduction and further dispersal of exotic aquatic weeds and to manage or eradicate exotic aquatic weed infestations in the surface waters of the state" (RSA 487:17, II). The program focuses on submerged exotic aquatic plants, including variable milfoil (*Myriophyllum heterophyllum*), Eurasian milfoil (*Myriophyllum spicatum*), fanwort (*Cabomba caroliniana*), Brazilian elodea (*Egeria densa*), Hydrilla (*Hydrilla verticillata*) and water chestnut (*Trapa natans*), among other species (reference Env-Wq 1303.02 in Appendix 1 for full list).

The program, initiated in 1981, has five focus areas: 1) Prevention of new infestations, 2) Monitoring for early detection of new infestations to facilitate rapid control activities, 3) Control of new and established infestations, 4) Research towards new control methods with the goal of reducing or eliminating infested areas, and 5) Regional cooperation. The program is funded through a \$5 fee derived from New Hampshire boat registrations. Of that \$5 fee, a total of \$4.50 is dedicated to tasks and projects associated with exotic aquatic plants. Details on revenues and expenditures can be found in Section 3.

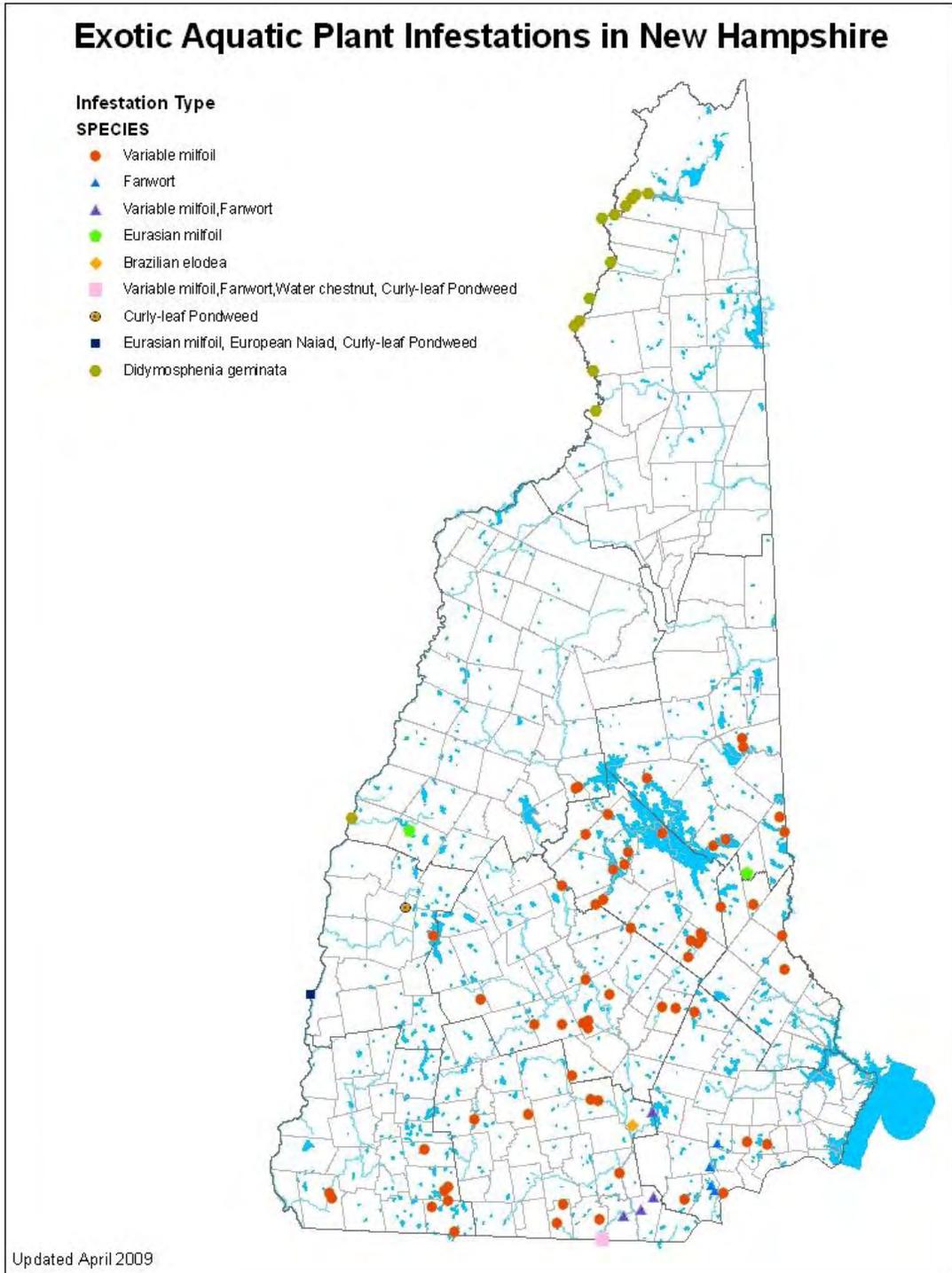
## 1.2 Problem Scope

"Exotic aquatic plants" are plants living in lakes, rivers, and other waterbodies that are not part of New Hampshire's native aquatic flora. These plants, sometimes called "nuisance" or "invasive" species, or "weeds" (and in the enacting legislation "exotic aquatic weeds") can grow and reproduce rapidly, taking over large portions of waterbodies and impairing boating, recreation, and aesthetics, threatening native plant species and causing habitat loss. A study by the University of New Hampshire has documented the potential for 10-20 percent declines in lakefront property values attributed to the presence of exotic aquatic plants (Halstead et al., 2001).

Exotic aquatic plants propagate primarily by fragmentation but can also reproduce by seed or tuber production. Fragmentation is a process by which a stem broken from a mature plant can grow roots, settle in a new location, and begin growth of a new plant. Plant fragments, most often generated by human activity, can easily become entangled on boats, trailers, fishing equipment, or diving gear, thus spreading from waterbody to waterbody. Recreational boat registrations in New Hampshire have grown over 20 percent since 1997, to include more than 103,000 boats registered in 2006, though with a slowing economy that number has dropped to roughly 101,000 boats in 2008. Increased boating activities raise the potential for the spread of exotic aquatic plants to new locations and waterbodies by boats and other water-related recreational equipment.

The first exotic aquatic plant infestation in New Hampshire was discovered in 1965 in Lake Winnepesaukee. Since then, infestations have increased to a total of 83 infestations on 72 waterbodies in 2008 (Figure 1-1).

**Figure 1-1**  
**Exotic Plant Infestations through 2008 Growing Season**



Four fanwort infestations were documented in the 1960s, but a dredge of Milville Lake during the early 1980s led to its eradication, leaving only three infestations. Other fanwort populations were documented in the Nashua River and Mine Falls Pond, Nashua, and in Robinson Pond, Hudson, in the late 1990s, and in Lake Massabesic in 2003. Fanwort infestations were also documented in 2004 in Otternic Pond, Hudson, and in Wilson Lake, Salem in 2005, bringing the total by 2008 to nine infestations. Water chestnut, first documented in New Hampshire in 1998, is currently growing only in the Nashua River. During the summer of 2001, the first New Hampshire infestation of Brazilian elodea was identified in Nutts Pond, Manchester.

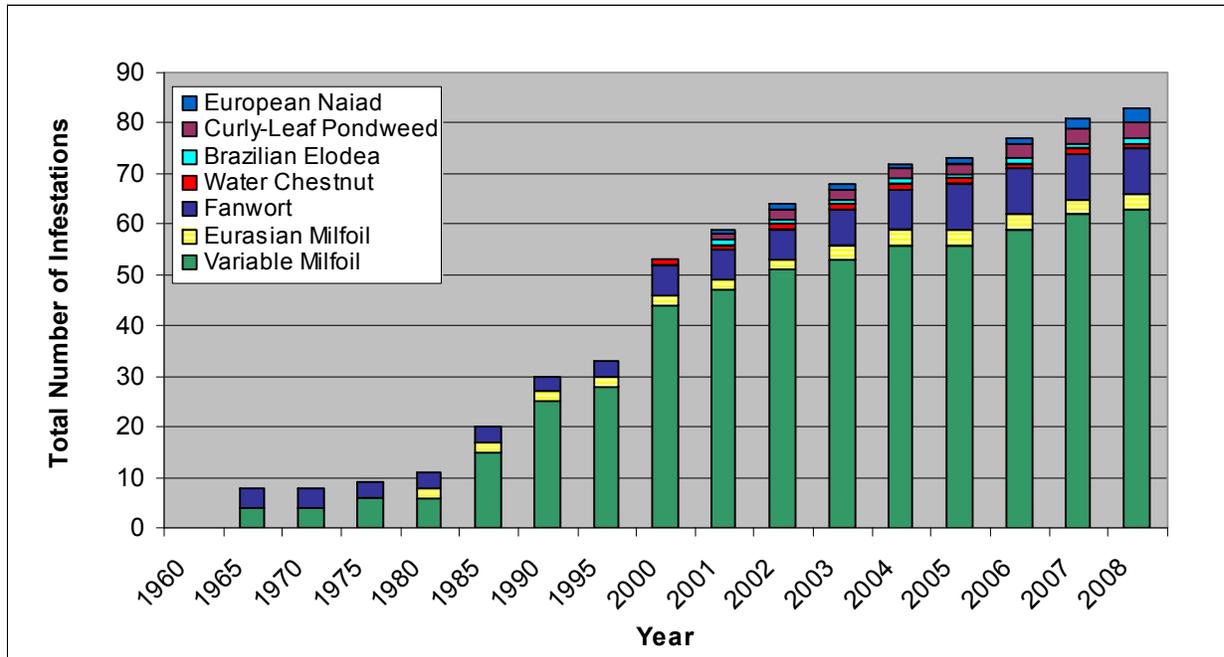
During the summer of 2007 a new species of invasive aquatic plant life was documented in New Hampshire. *Didymosphenia geminata*, commonly known as Didymo or rock spot was identified in the Connecticut River in Pittsburg. Didymo is a microscopic alga in the diatom family and is free floating in the water column, usually in flowing systems. Didymo is specially adapted to settle onto rocks, tip onto one end, and send out a stalk that attaches the alga to the bottom. This stalk can reach lengths of several inches, and when many of the diatoms group together in an area this stalk material forms a thick mat on the river bottom. Contrary to its name and the usual image one gets when they think of algae, rock spot is not green and slimy; in fact, rock spot mats have the feel and texture of wet wool or a wet cotton ball, and are brownish, tannish, or whitish in color. Unlike other algae that tend to bloom in slow flowing and nutrient rich conditions, Didymo is most often found in low nutrient, cold, fast moving streams. The alga is not toxic to aquatic life or humans, but it causes a decline in the ecological, aesthetic, and recreational values of waterbodies due to the thick mats it forms. A fact sheet on this alga is included in Appendix 3.

Eight waterbodies now have more than one species of exotic aquatic plants: Mine Falls Pond, Nashua (milfoil and fanwort), Robinson Pond and Otternic Pond, Hudson and Big Island Pond in Derry (milfoil and fanwort), Lake Massabesic, Auburn (milfoil and fanwort), the Nashua River, Nashua (milfoil, fanwort, curly-leaf pondweed and water chestnut), the Connecticut River south of Hanover (Eurasian water milfoil, two exotic water naiads, curly-leaf pondweed and Didymo), and Glen Lake in Goffstown (variable milfoil and exotic naiad). Figure 1-2 depicts the trend of exotic aquatic plant infestations by species from 1960-2008. Variable milfoil continues to be the most common exotic aquatic plant in New Hampshire.

### **1.3 History**

Activities associated with the control of exotic aquatic plants formally began in 1981 with the passage of an exotic plant control law, RSA 487:15. In 1998, RSA 487:16-a was adopted, establishing the current legislative basis for the Exotic Aquatic Plant Program. In September of 1999, Chapter Env-Ws 1300 was adopted, further defining the provisions of the exotic aquatic plant program, and listing certain aquatic plants as prohibited in New Hampshire. Copies of the program legislation and regulations are included in Appendix 1. Table 1-1 provides a summary of key events and activities that have occurred since the beginning of the program. A more complete chronology of program events and activities is provided in Appendix 2.

**Figure 1-2  
Annual Trends in Total Documented Exotic Aquatic Plant Infestations**



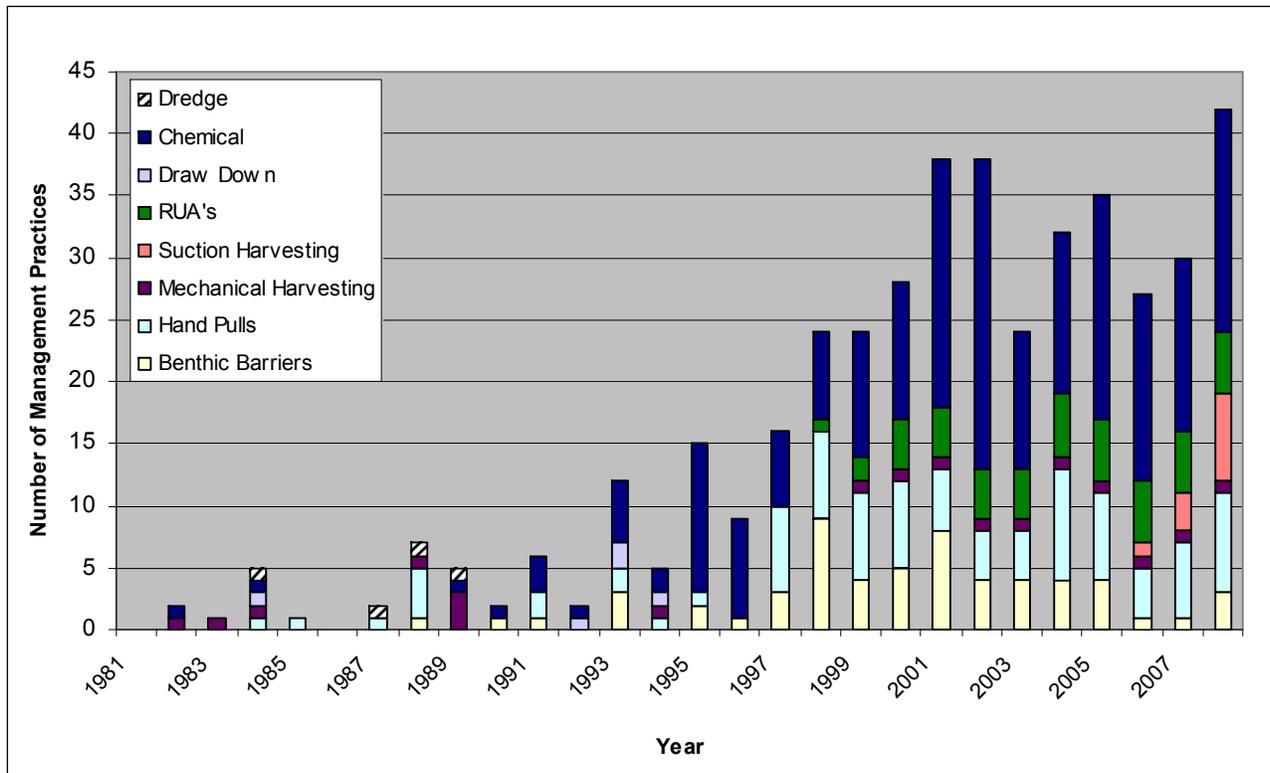
**Table 1-1**  
**Key Events in the Exotic Aquatic Plant Program: 1981-2008**

Year	Activity/Event
1981	➤ Exotic Weed Legislation (RSA 149-F:3) enacted
1982	➤ Citizen Aquatic Weed Control Advisory Committee formed by a group of volunteers
1984	➤ Milville Lake dredged to control a fanwort infestation
1985	➤ Exotic plant control funding suspended due to changes in legislation. No control techniques employed this year
1986	➤ Exotic plant control funding became available once again due to legislative action
1987	➤ \$45,000 grant awarded to the Aquatic Biology Department at the University of New Hampshire, Durham to conduct a literature search to determine adequate control techniques for exotic aquatic plants
1988	➤ Weed Watcher Program initiated
1991	<ul style="list-style-type: none"> <li>➤ Discovery of larval form of <i>Paraponyx allionealis</i> (an aquatic moth) on <i>Myriophyllum heterophyllum</i> (variable milfoil) in Lees Pond, Moultonborough, which led to research on the possible use of this organism as a biological control for milfoil. The insect was not specific to milfoil, so it is not a good biological control option.</li> <li>➤ Exotic aquatic plants sign developed for posting at public access sites</li> </ul>
1992	➤ First infestation of <i>Myriophyllum spicatum</i> (Eurasian milfoil) discovered in Mountain Pond, Brookfield, New Hampshire
1993	<ul style="list-style-type: none"> <li>➤ First aquatic plant workshop held at DES for lake association members and volunteers</li> <li>➤ Presentation on exotic plants given to BASS Master Associations</li> </ul>
1995	➤ Weed Watcher Wheel developed for use in identification of exotic plants
1996	➤ Exotic plant identification workshop held for Fish and Game Department
1998	<ul style="list-style-type: none"> <li>➤ RSA 487:16-a became effective on January 1, 1998, increasing funding for the Exotic Species Program.</li> <li>➤ Env-Ws 1300 Exotic Weed Control Rules adopted on September 5, 1998. Fourteen species of exotic aquatic plants listed as prohibited plants in rules</li> <li>➤ A mailing to 700 aquatic plant retailers in New Hampshire conducted to inform them of prohibitions associated with 14 listed exotic aquatic plants</li> <li>➤ First Restricted Use Area (RUA) established on Lake Massasecum, Bradford</li> <li>➤ <i>Trapa natans</i> (water chestnut) found in Nashua River, Nashua</li> </ul>
1999	➤ <i>Myriophyllum spicatum</i> (Eurasian milfoil) first identified in Lake Mascoma, Enfield
2000	➤ RSA 487:16-b relative to exotic aquatic plant penalties adopted
2001	<ul style="list-style-type: none"> <li>➤ Amendment to Env-Ws 1304.01(a) passed to modify provisions for the use of Restricted Use Areas on waterbodies with limited infestations of exotic aquatic plants</li> <li>➤ First infestation of <i>Egeria densa</i> (Brazilian elodea) found in New Hampshire in Nutts Pond, Manchester</li> <li>➤ Restricted Use Areas installed in Lake Sunapee and Squam Lake</li> </ul>

Year	Activity/Event
2002	<ul style="list-style-type: none"> <li>➤ Significant expansion of Weed Watcher Program</li> <li>➤ Pilot Lake Host Program Launched by New Hampshire Lakes Association</li> </ul>
2003	<ul style="list-style-type: none"> <li>➤ RSA 487:23 became effective, establishing the Milfoil Prevention and Research Grant Program</li> <li>➤ First round of Milfoil Prevention Grants awarded to three applicants. Lake Host Program received state funding to staff 37 public access sites. Sixteen boats with milfoil detected and cleaned, preventing new infestations</li> </ul>
2004	<ul style="list-style-type: none"> <li>➤ New infestations of variable milfoil were documented in the Merrimack River in Penacook, Kimball Pond in Hopkinton, and the Pemigewasset River in Sanbornton. Fanwort was newly documented in Otternic Pond in Hudson.</li> <li>➤ The Department of Environmental Services was the recipient of a \$1 million federal appropriation to conduct research on variable milfoil. DES funded 6 projects with this funding.</li> <li>➤ The Exotic Aquatic Weeds and Species Committee was enacted by RSA-487:30 to evaluate the Exotic Aquatic Plant Program, and work on legislation to expand the scope and funding of the program.</li> </ul>
2005	<ul style="list-style-type: none"> <li>➤ No new milfoil infestations this year. One new fanwort infestation was documented in Wilson Lake in North Salem. Lake Host Program continues to grow to cover 61 public access sites, and 54 boats with milfoil detected and cleaned, preventing new infestations.</li> </ul>
2006	<ul style="list-style-type: none"> <li>➤ MOA with Fish and Game signed regarding development of Long-Term Management Plans for exotic aquatic plants, for all infested waterbodies seeking to perform control activities</li> <li>➤ Three new infestations of exotic plants: 2 variable milfoil infestations and 1 curly-leaf pondweed infestation</li> </ul>
2007	<ul style="list-style-type: none"> <li>➤ Initiated rulemaking process to add new species to prohibited aquatic plant list, essentially doubling the list of species</li> <li>➤ Increased outreach activities with aquarium and water garden dealers in New Hampshire pursuant to newly amended exotic aquatic plant rules, including extended list of prohibited aquatic plants</li> <li>➤ Two new infestations of variable milfoil: Lake Pemigewasset (New Hampton) and Glen Lake (Goffstown)</li> <li>➤ Commissioned the construction of a prototype diver-assisted suction harvester (DASH) for use by DES</li> <li>➤ Initiated the Weed Control Diver Program and Certification Course</li> </ul>
2008	<ul style="list-style-type: none"> <li>➤ Field trials and retrofitting the DASH unit</li> <li>➤ Two new infestations of variable milfoil documented: Long Pond (Danville) and Spaulding Pond (Milton)</li> <li>➤ Contracted work on developing an Underwater Surveillance Vessel (USV) to enhance mapping techniques of DES biologists.</li> </ul>

A variety of DES funded (at full or partial levels) control projects have been conducted on lakes and ponds each year, with an increasing number of control projects conducted annually over the years, due to rising numbers of infestations. Figure 1-3 summarizes the historical trends in control practices since 1981.

**Figure 1-3  
Summary of Control Practices**



### 1.4 Partnerships

The scope of the Exotic Aquatic Plant Program has grown over time as public awareness of exotic aquatic plants has grown with the number of infestations. The program employs a multi-faceted approach to control the spread of exotic aquatic plants. This has developed and evolved with increased partnerships among state agencies, local government, and volunteer groups. The shared expertise, capacity, and knowledge base of the program activities built through these partnerships are key elements to program success. Many agencies and groups participate in program activities, including the Fish and Game Department, the Department of Safety, the Department of Agriculture Markets and Foods, the New Hampshire Lakes Association and the New Hampshire River Council. The roles of the partner organizations are described in Table 1-2.

**Table 1-2  
Partner Organizations and Their Responsibilities**

<b>I. STATE AGENCIES</b>
<p><b>Department of Environmental Services (DES)</b></p> <ul style="list-style-type: none"> <li>• Coordinates all aspects of the Exotic Aquatic Plant Program</li> </ul>
<p><b>Fish and Game Department (NHF&amp;G)</b></p> <ul style="list-style-type: none"> <li>• Conducts reviews of special aquatic permits for herbicide application to determine potential impacts to aquatic animal habitat</li> <li>• Provides assistance in the designation and enforcement of restricted use areas on waterbodies</li> <li>• Coordinates and performs education/outreach activities that include information on exotic species</li> <li>• Displays aquatic plant signs at NHF&amp;G owned boat launch facilities</li> <li>• Collaborates with DES on the development and production of educational materials</li> </ul>
<p><b>Department of Safety (NHDOS)</b></p> <ul style="list-style-type: none"> <li>• Provides assistance in the designation and enforcement of restricted use areas on waterbodies</li> <li>• Collaborates with DES on the implementation of the Milfoil Prevention Grant Program</li> <li>• Includes exotic plant awareness in boater safety instruction courses</li> <li>• Ensures that all Marine Patrol officers are aware of exotic aquatic plant problems and know the protocols associated with inspecting their boats and trailers for attached plant fragments</li> </ul>
<p><b>Department of Agriculture, Markets and Food (NHDA)</b></p> <ul style="list-style-type: none"> <li>• Permits and oversees the application of herbicide for control of nuisance exotic plants</li> <li>• Provides technical information on aquatic herbicides</li> </ul>
<p><b>Department of Resources and Economic Development (NHDRED)</b></p> <ul style="list-style-type: none"> <li>• Provides information on rare and endangered species in the event that an exotic aquatic plant may impact a threatened habitat</li> </ul>
<b>II. OTHER ORGANIZATIONS</b>
<p><b>Legislative Working Groups</b></p> <ul style="list-style-type: none"> <li>• The Exotic Aquatic Weeds and Species Committee was enacted by RSA-487:30 to evaluate the Exotic Aquatic Plant Program, and work on legislation to expand the scope and funding of the program. The Exotic Aquatic Plant Program meets with the members of this committee quarterly to review the program and funding needs</li> </ul>
<p><b>Municipalities</b></p> <ul style="list-style-type: none"> <li>• Manchester Water Works performs a number of milfoil control activities on Lake Massabesic including installation of benthic barriers and designation of restricted use areas</li> </ul>
<p><b>University of New Hampshire, Durham</b></p> <ul style="list-style-type: none"> <li>• Makes specimens in Hodgdon Herbarium available for verification of species</li> <li>• Offers trained botanists' time to verify a species identification</li> <li>• Provides outreach and education materials through the NH Lakes Lay Monitoring Program (NHLLMP) and Cooperative Extension</li> </ul>
<p><b>New Hampshire Rivers Council (NHRC)</b></p> <ul style="list-style-type: none"> <li>• Works closely with individual river groups</li> <li>• Coordinates with DES for the implementation and funding for the various prevention activities</li> <li>• Assists with monitoring for Didymo and other invasive aquatic plants in river systems in New Hampshire</li> </ul>
<p><b>New Hampshire Lakes Association (NHLA)</b></p> <ul style="list-style-type: none"> <li>• Works closely with individual Lake Associations</li> <li>• Coordinates with DES for the implementation and funding for the Lake Host Program</li> <li>• Works with DES to draft appropriate legislation that pertains to exotic aquatic plants</li> </ul>
<p><b>Marinas</b></p> <ul style="list-style-type: none"> <li>• Provide information to boaters about exotic aquatic plants</li> </ul>
<p><b>Private Citizens</b></p> <ul style="list-style-type: none"> <li>• Participate in NH Weed Watchers Program by frequently monitoring the littoral zone of waterbodies during the growing season</li> <li>• Mail or deliver suspected exotic plants to DES for identification of species</li> </ul>

## **2. PROGRAM ACTIVITIES**

The program has five focus areas: 1) Prevention of new infestations, 2) Monitoring for early detection of new infestations, 3) Control of new and established infestations, 4) Research towards new control methods with the goal of reducing or eliminating infested areas, and 5) Cooperation between regional and national groups. Activities in each focus area are discussed below. Funding for each of these activities is discussed in Section 3.

### **2.1 Prevention of New Infestations - Education and Outreach**

Education and outreach activities are the key to prevention activities. Both regionally and nationally, and on the local, state, and federal levels, efforts are under way to boost the level of information that is available to the general public about exotic aquatic plant species. The more individuals are aware of the problems associated with exotic aquatic plants, the lesser the likelihood the plants will continue to be spread throughout the state. Education and outreach initiatives are targeted towards the users of our surface waters (boaters, personal water craft users, fishermen, and others), special interest groups (fishermen, boater groups, seaplane groups), and aquarium and water garden hobbyists.

Outreach efforts are aimed at educating the public about the characteristics and control of exotic plants, including:

1. The negative environmental and economic impacts of exotic aquatic plants
2. Exotic aquatic plant identification
3. How exotic aquatic plants spread
4. How to minimize the spread
5. Control techniques
6. New Hampshire's Exotic Aquatic Plant laws and regulations
7. Prohibited exotic aquatic plants in New Hampshire

#### **2.1.1 Presentations**

From 2006 through 2008, the Exotic Aquatic Plant Program Coordinator and the Limnology Center Director provided more than 140 presentations on exotic aquatic plants. These presentations took place during annual lake association meetings, legislative committee meetings, municipal conservation commission meetings, lake management meetings, high school and college classes, and professional meetings.

The Exotic Aquatic Plant Program Coordinator attended annual lake festivals, conferences, and environmental awareness festivals throughout the state, including the Farm and Forest Expo, Naturally Newfound Day, and Wild New Hampshire Day events. At these events written materials were provided for distribution while the coordinator interacted on an individual basis with interested members of the public. Live specimens of exotic plants and look-alike native plants were also on display for close examination and comparison. Examples of fact sheets, pamphlets, and other materials provided at these presentations are included in Appendix 3. Table 2-1 lists the groups and events that received presentations from 2006 through 2008.

**Table 2-1  
Presentations and Seminars Given in 2006-2008**

<b>Organization/ Event</b>	<b>Location</b>	<b>Year</b>
Nashua River Watershed	Nashua	2006
Marine Patrol Trainees (2)	Gilford	2006
Lake Winnepesaukee Watershed Association	Gilford	2006
Robinson Pond Association	Hudson	2006
Lake Host Trainings (8)	Concord	2006
Volunteer Lake Assessment Program Refresher Course	Concord	2006
New Hampshire Lakes Congress	Eastman	2006
Millen Pond Association	Washington	2006
Pine River Pond Association	Washington	2006
Lake Monomonac Property Owners Association	Rindge	2006
Bow Lake Association	Strafford	2006
Thorndike Pond Association	Jaffrey	2006
Otter Pond Association	Sunapee	2006
Goose Pond Association	Canaan	2006
Lake Massasecum Improvement Association	Bradford	2006
New Hampshire Technical College- Environmental Science	Belmont	2006
Farm and Forest Expo	Manchester	2006
Sandown Budget Meeting	Sandown	2006
Lake Winnisquam Meeting	Belmont	2006
Webster Lake Watershed Meeting	Franklin	2006
Lake Winnisquam Meeting	Belmont	2006
Smith Cove Planning Meeting	Glendale	2006
Wild NH Day	Concord	2006
Naturally Newfound	Bristol	2006
Partridge Lake Meeting	Littleton	2006
Lees Pong Milfoil Control Meeting	Moultonborough	2006
Lake Sunapee Protective Association	Sunapee	2006
Lake Monomonac Meeting	Rindge	2006
French Pond	Haverhill	2006
Phillips Pond	Sandown	2006
Great Pond	Kingston	2006
Laconia Rotary	Laconia	2006
Pleasant Lake	Deerfield	2006
Mountain Lakes	Haverhill	2006
Volunteer Lake Association Refresher Training	Concord	2007
Lake Host Training (8)	Concord	2007
Loon Lake	Plymouth	2007
Big Island Pond	Derry/Atkinson	2007
Lake Ossipee Watershed Weekend	Ossipee/Freedom	2007
Highland Lake	Stoddard	2007
Northwood Lake Association	Northwood	2007

<b>Organization/ Event</b>	<b>Location</b>	<b>Year</b>
Messer Pond Association	New London	2007
Mascoma Lake Association	Enfield	2007
Great Pond Association	Kingston	2007
Sunrise Lake Association	Middleton	2007
Ayers Lake Association	Barrington	2007
Scobie Pond Association	Francestown	2007
Town of Hollis Selectmen	Hollis	2007
Rivers Management Advisory Committee	Concord	2007
Pittsburg Area Residents	Pittsburg	2007
Pennsylvania Lake Management Society Annual Meeting	State College, PA	2007
Maine Department of Environmental Protection Staff	Auburn, ME	2007
New Durham Milfoil Committee	New Durham	2007
Farm and Forest Expo	Manchester	2007
Pow Wow Pond	Kingston	2007
Wild NH Day	Concord	2007
Sandown Town Hall Treatment briefing	Sandown	2007
VLAP Symposium	Concord	2007
Naturally Newfound	Bristol	2007
Weed Control Diving	Concord	2007
Weed Control Diving	Concord	2007
Laurel Lake	Fitzwilliam	2007
New Pond	Canterbury	2007
Cobbetts Pond	Windham	2007
Northwood Lake	Northwood	2007
Lake Ossipee	Ossipee	2007
French Pond	Haverhill	2007
Eastman Pond	Grantham	2007
Province Lake	Effingham	2007
Silver Lake	Tilton	2007
Didymo Workshop	Montreal, CAN	2007
Town of Pittsburg	Pittsburg	2007
Hollis Conservation Commission	Hollis	2008
Master Gardeners Group (2)	Concord	2008
Lakes Management Advisory Committee (2)	Concord	2008
Maine Milfoil Summit	Lewiston, ME	2008
Marine Patrol Trainees	Gilford	2008
Montshire Museum Volunteer Staff	Vermont	2008
Trout Unlimited, Concord Area Chapter	Concord	2008
Namaske Lake Association	Goffstown	2008
Barnstead Milfoil Committee	Barnstead	2008
Volunteer Lake Assessment Program Refresher Course (2)	Concord	2008
New Durham Milfoil Committee	New Durham	2008
Pemigewasset River Local Advisory Committee	Bristol	2008

<b>Organization/ Event</b>	<b>Location</b>	<b>Year</b>
New Hampshire Rivers Council Interns	Concord	2008
Pawtuckaway Lake Association	Nottingham	2008
Eastman Pond Association	Eastman	2008
Weare Reservoir Recreation Staff	Weare	2008
Androscoggin Source to Sea Participants	Berlin	2008
Captains Pond Association	Salem	2008
Upper Merrimack River Local Advisory Committee	Franklin	2008
Pleasant Lake Association	New London	2008
Gregg Lake Association	Antrim	2008
Warren Lake Association	Alstead	2008
Powwow Pond Lake Association	Kingston	2008
Conway Lake Association	Conway	2008
Waukeena Lake Residents	Danbury	2008
Lake Sunapee Protective Association	Sunapee	2008
Weed Control Diver Course Attendees (2)	Concord	2008
Pearly Pond	Rindge	2008
Danforth Pond Association	Freedom	2008
Danville Conservation Commission/Long Pond Residents	Danville	2008
Wolfeboro Milfoil Committee	Wolfeboro	2008
Milfoil Legislative Committee	Concord	2008
St. Anselm College Ecology Students	Francestown	2008
Lake Massasecum Improvement Association	Bradford	2008
Hudson Conservation Commission	Hudson	2008
Arlington Pond Association	Salem	2008
Farm and Forest Expo	Manchester	2008
Sanbornton Milfoil	Sanbornton	2008
Wild NH Day	Concord	2008
Weed Control Diving	Concord	2008
VLAP Refresher Workshop	Concord	2008
VLAP Refresher Workshop	North County	2008
NH Lakes Congress	Meredith	2008
Lees Pond	Moultonborough	2008
Winnisquam Lake Assn	Belmont	2008
Swanzey Lake	Swanzey	2008
Beaver Lake	Deerfield	2008
Otter Pond	Sunapee	2008
Weed Control Diving	Concord	2008
Opechee Lake	Laconia	2008

### **2.1.2 Dissemination of Exotic Aquatic Plant Information through the Media**

The Exotic Aquatic Plant Program was the focus of two live radio broadcasts during this reporting period. Both were with NH Public Radio.

Another mechanism of media publicity was through several interviews and local coverage by Channel 9 News. At several times throughout each summer from 2006 through 2008, DES worked with Channel 9 to broadcast information about control practices, preventative measures, and proactive approaches to exotic aquatic plant control.

In 2006, the DES Exotic Aquatic Plant Program worked with Representative Bob L'Heureux to put together a video on variable milfoil and other exotic plants in the Merrimack area. The footage was shot on Horseshoe Pond in Merrimack, which is infested with variable milfoil, and in the DES Limnology Center. The video has been broadcast several times on local area cable networks in and around Merrimack.

In 2007, the DES Exotic Aquatic Plant Program gave a presentation to Namaske Lake (an impounded portion of the Piscataquog River) in Goffstown. The presentation was filmed by the lake association and the video was put on [www.YouTube.com](http://www.YouTube.com) for viewing by their members and others.

The Exotic Aquatic Plant Program maintains a regularly updated website at <http://des.nh.gov/organization/divisions/water/wmb/exoticspecies/index.htm>. The website provides links to exotic plant identification information, weed watching information, exotic aquatic plant distribution maps, and copies of fact sheets and exotic aquatic plants legislation and regulations. The site is frequently updated with new information on lake and river infestations, and facts and figures on exotic aquatic plants.

To inform boaters and other users of our surface waters, DES, the New Hampshire Fish and Game Department, and the New Hampshire Department of Resources and Economic Development have collaborated to post signs at each of the state-owned public access sites. These signs warn boaters about exotic plant infestations, and where to look on their recreational equipment for tag-along plant fragments. Examples of each type of sign are included in Appendix 4.

DES did work with the NH Department of Transportation to evaluate the possibility of installing large signs at all state borders to warn transient boaters about invasive aquatic plants. The state of Maine has similar signs that are informative and very visible at their borders. Unfortunately the project did not move forward due to some concerns that were raised about a preponderance of signage already present at state border crossings.

### **2.1.3 Milfoil Prevention Grants**

To further promote milfoil prevention activities and stimulate cooperative ventures with various interest groups, DES has implemented a milfoil and other exotic aquatic plant prevention grant program. Funding for this program was established through legislation (RSA 487:25-29), and as of January 1, 2003, \$3 from each boat registration fee is allocated towards this innovative grant program.

The intent of the milfoil prevention grants is to garner public support and participation in milfoil prevention activities, including such activities as education and outreach initiatives, staffing public access sites to conduct inspections of aquatic recreational gear for attached aquatic plant fragments, and other similar projects.

Under the provisions of RSA 487:25, funding for the Prevention Grant Program were set to sunset on January 1, 2008. The intent of the sunset provision was to allow for program evaluation to determine effectiveness and worthiness for continued funding after 2008. Working with the legislatively enacted Milfoil Study Committee, the Prevention and Research Grant Program was reviewed and found valuable and worthy of continued funding, therefore a bill was introduced into the 2005 legislative session to remove the sunset provision. The bill passed, and the sunset provision was removed from these important grant funds. Without the prevention grant program in place for the last six years, New Hampshire could have realized more than a two-fold increase in the number of infested waterbodies in New Hampshire, as evidenced by the number of “saves” from the Lake Host Program, which is in part funded from Prevention Grant money.

### **2.1.4 – Listing of Exotic Aquatic Plants as Prohibited in New Hampshire**

In 2007 and 2008 the Exotic Species Program worked to expand the list of prohibited exotic aquatic plants in New Hampshire. The reason for this expansion was to take into consideration species that were not previously included as prohibited in 1998, when the list was first developed, but that have recently shown a rapid expansion in their geographic range and an increased infestation rate in nearby states.

A draft list of plant species was developed through communications with northeast region state biologists, and through evaluation of plants in the southern tier of the country that were expanding their range. Once this working list was compiled, research was conducted on each plant to narrow the list to those species that have the greatest survival potential to New Hampshire’s winters (essentially ruling out the more tropical species and less hardy species). Regional botanist’s evaluated the final list and provided final recommendations for prohibited species inclusion.

The list of species was finalized and the rulemaking process was initiated to include the new list of species to the existing list. Amendments to a number of species on the existing list were made, particularly to species of *Cabomba*, *Myriophyllum*, and *Trapa*. For these, all species under each genus were prohibited due to the fact that the species level identification is very difficult when the plant is not in fruit or flower, leaving doubt to the proper species identification during pet store or other retailer inspections.

## **2.2 Early Detection - Monitoring and Identification**

DES takes an active role in monitoring both the natural environment, as well as retailers of aquatic plants, to prevent new introductions of nuisance species into New Hampshire’s surface waters. Following is a summary of the monitoring activities conducted from 2006 through 2008.

### **2.2.1 Field Monitoring**

Between 2006 and 2008, DES biologists conducted aquatic macrophyte mapping as an element of the scheduled lake assessments at 85 lakes. Any new or existing infestations of exotic aquatic plants were documented and mapped, and control actions were recommended based on the status of the infestation. No new infestations of exotic aquatic plants were documented during lake assessment surveys in these years.

### **2.2.2 Pet and Plant Nursery Store Monitoring**

In 1998, legislation went into effect banning certain activities associated with exotic aquatic plants in New Hampshire. Specifically, RSA 487:16-a states, “*No exotic aquatic weeds shall be offered for sale, distributed, sold, imported, purchased, propagated, transported, or introduced in the state of New Hampshire.*” To implement this program, the Department of Environmental Services adopted rules to prohibit a number of aquatic plant species in New Hampshire. Retail store inspections were conducted to ensure that the listed prohibited plants are not offered for sale.

During the 2006-2008 summer seasons, DES staff conducted more than 130 pet and plant store inspections. A thorough plant inspection at each store was followed by the distribution of educational materials and references to state laws on exotic aquatic plants to store owners. Owners were asked to sign the survey sheet to indicate they are aware of the prohibited species and a list of prohibited plants was distributed at each store to facilitate ordering and prohibited species purchase avoidance. Stores were also provided pamphlets for customers that purchased aquatic plants to educate the consumer about the significant problems posed by exotic aquatic plants when they enter the natural environment.

During the summer of 2006, 45 pet stores were inspected for the sale of exotic aquatic plants. Stores that had not sold aquatic plants during past inspections were contacted by phone to update their aquatic plant sale status. This decreased the time and effort for pet store inspections. Three stores had exotic aquatic plant sale violations (Table 2-2) and were asked to remove the plants (variable milfoil) from the selling floor. Further enforcement actions were not taken as these were each first time offenses and the problems were addressed on site.

During the summer of 2007, 44 pet stores were inspected for the sale of exotic aquatic plants. Five stores were found to be in violation for the sale of prohibited plants (Table 2-2). All stores were asked to remove the exotic plants from the selling floor and each was issued a Letter of Deficiency (LOD).

In 2008, 44 pet stores were inspected for the sale of exotic aquatic plants. Four stores were issued LODs in 2008 (Table 2-2). Stores were documented selling various milfoil species (*Myriophyllum*) and Brazilian elodea (*Egeria densa*). All stores were asked to remove the exotic plants.

**Table 2-2  
Retail Store Exotic Plant Violations**

<b>Date</b>	<b>Facility</b>	<b>Location</b>	<b>Exotic Plant</b>	<b>Action</b>
2006	Petco	Plaistow	Variable milfoil	Removed
2006	Animal Supplies	Salem	Variable milfoil	Removed
2006	Sea World	Salem	Variable milfoil	Removed
6/29/07	Laconia Pet Center	Laconia	Hydrilla	Removed and LOD
7/17/07	Little Critters Pet Center	Exeter	Fanwort and Hydrilla	Removed and LOD
8/3/07	Fish Bowl	Milford	Parrot-feather	Removed and LOD
8/14/07	Pet Paradise	Rochester	Brazilian elodea	Removed and LOD
7/13/07	Pet City	Seabrook	Fanwort	Removed and LOD
7/22/08	Lebanon Pet and Aquarium	Lebanon	Milfoil species and parrot-feather	Removed and LOD
7/25/08	Lowes	Gilford	Milfoil species	Removed and LOD
7/31/08	Lowes	Concord	Milfoil species	Removed and LOD
8/11/08	Little Critters Pet Center	Exeter	Brazilian elodea	Removed and LOD

### **2.2.3 Volunteer Weed Watcher Program**

The goal of the Weed Watcher program is to promote a volunteer, grass-roots effort to monitor lakes, ponds, and rivers for the early detection of exotic aquatic plant infestations. Because eradication of established exotic plant infestations is rarely possible, early detection is of utmost importance. Trained Weed Watchers monitor waterbodies for new infestations, frequently during the summer season, and report suspected new infestations to DES. This allows DES biologists to rapidly respond during the same season of discovery.

Weed Watcher volunteers are trained by DES biologists to identify both exotic aquatic plants and native plants that commonly grow in their waterbody. Typically, volunteers are provided with photographic keys to native and exotic plants. A biologist will accompany volunteers in the field to instruct them how to identify plants within their chosen waterbody. If no exotics are present, the Coordinator will provide specimens of exotic aquatic plants for the volunteers to use as learning tools. Volunteers are also supplied with site-specific vegetation maps prepared by the DES Lake Assessment Program, a Weed Watcher Kit containing fact sheets on the exotic plants, instruction on how to Weed Watch, state lake infestations, and laminated plant identification guides. Instructions on how to immediately report any suspected new infestations are also included in the kit, as well as how to collect and send samples of suspect plants to DES for positive identification.

In 2006, volunteers from 28 waterbodies received program training; in 2007, participants from 33 lakes were trained in Weed Watching, and in 2008 there were 24 groups that were added

to the Weed Watcher Program. Figure 2-1 shows the distribution of active Weed Watching groups in New Hampshire.

In 2007 the DES Exotic Species Program developed a special re-sealable sampling bag to assist volunteers in correctly collecting and turning in voucher specimens. The bags are imprinted with information on collection methods on one side, and the other side is a form to complete with detailed information about where the specimen was collected, and contact information for the collector. The new bag has streamlined the sample processing and increased the accuracy of information recorded in the laboratory.

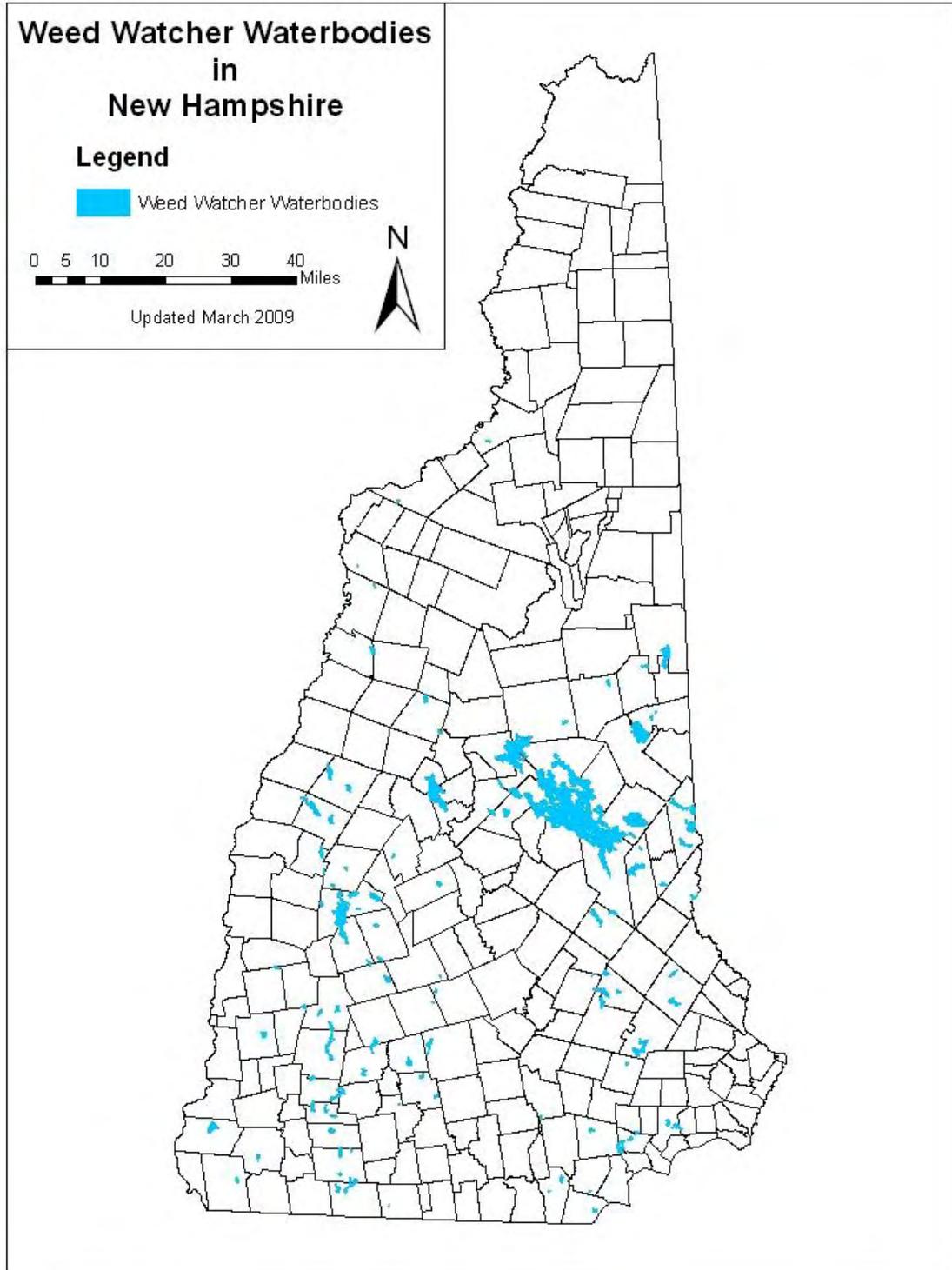
Weed Watcher volunteer's survey their waterbody once each month from May through September. Volunteers closely monitor the shallow lake bottom zones for new plant growth and map any vegetation they observe. The volunteers provide plant survey information to DES for entry into a database, collect specimens of unfamiliar plants and deliver them to DES for positive identification. There are now over 500 trained Weed Watchers monitoring over 130 waterbodies for early detection of exotics. This does not include a number of volunteers from the Volunteer Lake Assessment Program that participate on an "unofficial" basis (some have not been trained by the Coordinator so they are not considered official Weed Watchers).

Between 2006 and 2008 at least 920 plants were sent to the DES Limnology Center for identification and verification. Most of these were derived from activities of the Lake Host Program (751), but the balance (169) was sent in from active Weed Watchers across the state. Of these 169 specimens, only three were identified as exotic aquatic plants:

- Halfmoon Pond, Barnstead – variable milfoil
- Rockybound Pond, Croydon – curly-leaf pondweed
- Lake Pemigewasset, New Hampton – variable milfoil

Thanks to the vigilance of the volunteers on these waterbodies, two of the three infestations have been eradicated with only hand-removal activities because they were identified early before the infestation spread. The infestation at Lake Pemigewasset was larger, and was controlled using an aquatic herbicide. Follow-up monitoring and further control activities will be necessary.

**Figure 2-1**  
**Weed Watcher Waterbodies in New Hampshire**



## **2.3 Control**

The Exotic Aquatic Plant Program relies on a number of methods to control exotic plant infestations, including physical control, chemical control, biological control, and habitat manipulation. DES typically integrates one or more of these control strategies for each lake, in a method termed “Integrated Pest Management” (IPM). IPM strategies generally result in longer term control than any one control method. Following is a summary of the various control strategies that are used in New Hampshire. Table 2-3 outlines possible control methods, including information on target plant specificity, advantages, disadvantages, and approximate cost (cost analysis provided by Aquatic Control Technologies Inc.). A brief description of each available control technique is included in Appendix 7. Below is a summary of the projects under each category that took place between 2006 and 2008.

### **2.3.1 Restricted Use Areas**

Restricted Use Areas (RUAs) have been used successfully to control both small new infestations and as a follow-up to controlling infestations that remain as a result of other control options. No new RUAs were designated during this reporting period, but a number of existing RUAs were maintained during this timeframe.

Following are examples of projects that have involved the use of these RUAs:

#### Example #1 - Lake Massasecum, Bradford

An RUA has been in place on Lake Massasecum, Bradford since the summer of 1999. An infestation of variable milfoil covering approximately 10 acres of the northern cove has been successfully contained since the RUA has been in place. The netting continuously traps floating plant fragments. Volunteers regularly clean milfoil fragments from the net.

#### Example #2 - Lake Massabesic, Manchester

Lake Massabesic is Manchester’s water supply, and also receives high levels of transient boat traffic. Manchester Water Works has maintained four RUAs on the lake since 1996; two near Deer Neck Bridge (Route 28), and two near Claire’s Landing in Auburn. As Lake Massabesic is a public water supply, herbicides are not a feasible option for controlling exotic aquatic plants. The RUAs have been effective in keeping boaters out of isolated milfoil patches in the lake, and the patches have not spread.

Table 2-4 lists the locations of active Restricted Use Areas and the years they were initiated. A posting of the locations of RUAs is also maintained on the DES website on the exotic species webpage.

**Table 2-3  
DES Exotic Aquatic Plants Program: Plant Control Techniques**

<b>Action</b>	<b>Effectiveness</b>	<b>Specificity to Target</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Cost*</b>
Hand Pulling (Physical)	Removes a few individual plants at a time	High	Good for localized areas/ few plants  Plants physically removed from waterbody	Labor intensive  Good for small infestations only. Not practical when plant growth is dense	Labor Costs vary depending upon contractor costs or staff time but can range from \$25-\$150 per hour.
Diver assisted Suction Harvesting	Can target growths of exotic aquatic plants	Medium to High	Excellent for small patches or sparse widespread infestations	Labor Intensive, expensive.	Costs vary from \$5,000 to \$35,000 per acre.
Mechanical Harvesting (Physical)	Removes large amounts of vegetation at a time	Not specific	Rapidly removes vegetation from area  Removes plants physically from waterbody	Residual plant fragments could cause regrowth  Removes beneficial native vegetation along with the exotics.  Could increase turbidity, ultimately affecting other aquatic life  Does not remove roots	Ranges widely depending on plant density, location, disposal, etc. \$350-\$1500 per acre
Hydro-raking (Physical)	Removes large amounts of vegetation at a time	Not specific	Rapidly removes vegetation  Removes roots to prevent rapid regrowth.  Removes plants physically from waterbody	Residual plant fragments could cause regrowth  Could increase turbidity, ultimately affecting other aquatic life  Removes beneficial native vegetation along with the exotics.	Ranges widely depending on plant density, location, and disposal. \$350-\$2500 per acre

Action	Effectiveness	Specificity to Target	Advantages	Disadvantages	Cost*
Permeable Benthic Barrier  (Physical)	Used for very small infestations	Specific to area where barrier is located  Impacts all plants under barrier	Compresses plants to sediments and prevents likelihood of fragmentation by wind, wave, or anthropogenic means	Labor intensive Requires frequent barrier cleaning or re-staking Does not physically remove plants from waterbody May cause sediment/water oxygen depletion May impact non-target species such as fish	\$0.60-\$1.22 per square foot or(\$25,000-\$50,000 per acre)
Herbicides (Chemical)	Herbicides which are taken up by root systems (systemic herbicides) more effective than contact herbicides	Most chemicals have target plants for which they are most effective  Varying application rates can increase target specificity	Chemical can eliminate exotic plant infestation if done at correct time, and if correct concentration is used  Relatively rapid effect  Can be target specific	Chemicals added to waterbody  May impact non-target species  Could be environmentally damaging by impacting non-target species, if not applied per label restrictions	Varies with chemical and size of treatment area  ~\$350-450/acre for 2,4-D  ~\$250-350/acre for Diquat  Plan for approximately \$2000 or more of additional fees for permitting and sample/analysis
Drawdown (Habitat Manipulation)	Somewhat effective if repeated frequently	Not specific	Could control density of vegetation due to plant die off from desiccation or freezing	Impacts non-target plants  Impacts fish, amphibians, insects, and other aquatic organisms	Low cost if dam or other means of drawing down water is available

Action	Effectiveness	Specificity to Target	Advantages	Disadvantages	Cost*
Drawdown (cont.)	More effective if drawdown maintained for long time period		Can be cost effective	Drastically changes entire waterbody ecology	
Dredging (Habitat Manipulation)	Effective in removing plants from localized area where dredge takes place	Not specific	Completely removes all plant material Removes nutrient laden sediments Removes seed bank	Drastically changes entire waterbody ecology Impacts non-target plants and animals Could cause excessive turbidity Must wait for waterbody to fill after dredging	\$16,000-32,000 per acre
Insects, bacteria, or viruses that infect and kill or weaken target plants (Biological)	List specific organisms and targets. Effective against target plants	Specific	Insects, bacteria, or viruses used in this method are typically specific to target plant. Their life cycles revolve around particular plant species  Does not affect other non-target plants	May cause decline in oxygen as plant material decays Many biological controls are themselves exotic Still experimental	Cost of insects Monitoring cost high

\*Costs are averages determined from data obtained from "Draft Generic Environmental Impact Report" for Massachusetts, and from Aquatic Control Technology, Inc. Fact Sheet.

**Table 2-4  
List of Restricted Use Areas in place in 2006-2008**

<b>Waterbody</b>	<b>Town</b>	<b>Date Installed</b>	<b>Date Removed</b>
Lake Massabesic	Auburn	1996	Still in place
Lake Massasecum	Bradford	1998	Still in place
Little Squam Lake*	Ashland	2001	Removed for 2003 season, reinstalled in 2004, removed in 2007
Lake Sunapee	Georges Mill	2001	2002
Balch Lake*	Wakefield	2002	Still in place
Big Squam Lake	Holderness	2005	Still in place

\*This RUA is more of a containment device for fragments. Access is not restricted.

### **2.3.2 Hand-pulling**

Hand-pulling exotic aquatic plants is a technique used on both new and existing infestations, as circumstances allow. For a new infestation, hand-pulling activities are typically conducted several times during the first season, with follow-up inspections for the next 1-2 years or until no re-growth is observed. For existing infestations, hand-pulling may be done to slow the expansion of plant establishment in a new area or where new stems are removed in a section that may have previously been uninfested.

In 2007 a new program was created through a cooperative between a volunteer monitor that is a certified dive instructor, and the DES Exotic Species Program. A Weed Control Diver Course (WCD) was developed and approved through the Professional Association of Dive Instructors (PADI) to expand the number of certified divers available to assist with hand-pulling activities. DES has only four certified divers in the Limnology Center to handle problems with aquatic plants, and more help was needed. There is a unique skill involved with hand-removing plants from the lake bottom. If the process is not conducted correctly, fragments could spread to other waterbody locations. For this reason, training and certification are needed to help ensure success.

Further, the Exotic Species Program worked with the DES Wetlands Bureau to amend their rules pertaining to the requirement of Wetlands Permits for hand removal projects. Typically a permit would be necessary to remove any plant from the lake bottom, through hand-removal or otherwise. Now, a WCD may perform hand-removal activities for exotic aquatic plants without a permit, as long as they follow guidelines in Wetlands rules, including notification requirements to the Exotic Species Program. Those divers that are not WCD certified must still obtain a Wetlands Permit to do any hand-removal.

The WCD course involves a day of classroom training and a series of open water dives to train the diver in the field the proper exotic aquatic plant removal techniques and proper disposal practices. Roughly 60 divers were certified through this program through the 2008 season. DES maintains a list of WCD divers and shares them with waterbody groups and municipalities that seek diver assistance for controlling exotic aquatic plants. Classes are offered two to three times per summer.

### Example #1- Halfmoon Pond, Alton/Barnstead

During the summer of 2007, a volunteer water quality monitor brought a specimen of a plant in to the DES Limnology Center for identification. The plant was variable milfoil. Upon field inspection it was determined that the plants were distributed in only one small cove of the pond, and that simple hand removal activities could be used to eliminate the plants. Local residents used colorful buoys to mark spots where they had identified the plants, and DES divers swam the entire cove to identify any additional sites. Variable milfoil plants were hand-removed by a team of DES divers in June 2007, and follow-up inspections in July and August of 2008 showed persistent yet diminishing plant growth. DES divers continued to site inspect and pull scattered variable milfoil stems during the 2008 season. By the end of the 2008 growing season the milfoil was absent from the cove. Plans are in place to continue to monitor the cove for any regrowth and to mobilize DES divers should any plants be detected.

### Example #2- Rockybound Pond, Croydon

During the summer of 2007, another volunteer water quality monitor brought a specimen of an unusual plant to the DES Limnology Center for identification. The plant proved to be curly-leaf pondweed, a species that is not common in New Hampshire. The plant is an invasive species, so DES divers conducted an initial site inspection in July 2007. Two separate dives were conducted during the 2007 summer and another in the summer of 2008. By the end of the 2008 growing season, no curly-leaf stems were observed. A false alarm occurred in the fall of 2008 when a similar pondweed species was found by the volunteer. DES divers identified this species as a benign native pondweed.

In each case, early detection of the infestation and reporting to DES biologists resulted in success stories. The infestations were contained and controlled with simple hand-removal activities. Continued monitoring will be required for several years, but if these infestations went undetected, each waterbody may have been at risk for a widespread infestation and eradication may not have been feasible.

### **2.3.3 Diver Assisted Suction Harvesting**

Diver Assisted Suction Harvesting (DASH) is an emerging and evolving control technique in New Hampshire. The first pilot project for this technique was through one of the federally funded research projects detailed earlier in this report, and took place on Lake Massasecum in Bradford. Since then, suction harvesting projects have taken place in Smith Cove on Lake Winnepesaukee (Gilford), at Gilford Town Docks on Lake Winnepesaukee (Gilford), at Alton Town Beach on Lake Winnepesaukee (Alton), Lake Winnisquam, Meredith and in Contoocook Lake (Rindge).

DES continues to modify, retrofit and improve the state owned DASH unit on an annual basis. Each year the DASH program is expanded to new waterbodies. The DASH unit has been demonstrated to other lake groups in New Hampshire that now plan to construct their own unit for local and/or regional sharing to control the growth of exotic aquatic plants.

DES will be directly involved in each project to ensure that the devices are being used appropriately and effectively.

#### **2.3.4 Benthic Barriers**

Benthic barriers are a reliable alternative to controlling exotic aquatic plants that manifest as small to medium sized isolated patches on a lakebed. Benthic barriers were used on a handful of waterbodies during the reporting period here, including Lake Massasecum (Bradford), Lake Winnisquam (Sanbornton), Sunrise Lake (Middleton), Nutts Pond (Manchester), and others.

#### **2.3.5 Dredging**

There were no dredging projects to control exotic aquatic plants in New Hampshire during this reporting period.

#### **2.3.6 Targeted Application of Herbicides**

Application of aquatic herbicides is another tool employed for controlling exotic aquatic plants. Generally, herbicides are used when infestations are too large to be controlled using other alternative non-chemical controls, or if other techniques have been tried and have proven unsuccessful.

Generally, 2,4-D is the herbicide that is recommended for control of variable milfoil. As referenced earlier in this report, a study performed by US ACE-ERDC showed that variable milfoil was best controlled by formulations of this herbicide, and provided the longest term control as compared to other herbicides.

A field trial was performed during the 2008 summer using the herbicide Renovate to control variable milfoil. Renovate is a systemic aquatic herbicide that targets both the shoots and the roots of the target plant for complete control. In this application it was dispersed as a granular formulation that sank quickly to the bottom to areas of active uptake of the milfoil plants. A small (<5 acre) area of Captains Pond in Salem was treated with this systemic herbicide. The herbicide was applied in pellet form to the infested area in May 2008, and showed good control by the end of the growing season. Renovate works a little slower to control aquatic plants than 2,4-D and it is a little more expensive, but presents DES with another alternative that could be used in future treatments.

Another herbicide, Fluridone, was also used during this reporting period. Fluridone is a systemic aquatic herbicide that inhibits the formation of carotenoids in plants which ultimately results in the breakdown of chlorophyll of target plants and subsequent loss of photosynthetic function of the plants. It was applied as both a liquid and a pellet formulation in this application. Phillips Pond in Sandown had extensive growths of fanwort across the lake, with patches of variable milfoil interspersed with the fanwort. A Fluridone treatment was performed during the 2006 summer and proved very successful at removing both fanwort and variable milfoil from the system. By the end of the growing season in 2008, two years post treatment, no fanwort was visible in the lake. A 2008 plant survey around Phillips Pond revealed only one small patch of variable milfoil. DES divers returned the next day to hand-remove the milfoil patch documented in the survey. It is hoped that with regular monitoring any new re-growth can be removed immediately so that a full-lake infestation does not occur.

### 2.3.7 Extended Drawdown

Extended drawdowns are not often recommended for invasive aquatic plant control, generally due to the fact that drawdowns cause disturbance within natural systems, and invasives thrive on that disturbance.

Some waterbodies that are heavily infested with exotic plants do conduct drawdowns to reduce some of the invasive aquatic plant density. During this reporting period both Northwood Lake (Northwood) and Jones Pond (New Durham) coordinated deep winter drawdowns to reduce growths of variable milfoil (the drawdown on Northwood Lake is primarily for flood control purposes, but they do see some ancillary benefits from the technique for variable milfoil control).

Table 2-5 provides a summary of the control activities that occurred during this reporting period.

**Table 2-5  
Summary of 2006 through 2008 Control Projects**

<b>Waterbody/Town</b>	<b>Benthic Barriers</b>	<b>Hand Pulls</b>	<b>Harvesting</b>	<b>RUAs*</b>	<b>Diver-Assisted Suction Harvesting</b>	<b>Chemical</b>
<b>2006</b>						
Balch Lake, Wakefield		X		X		X
Captains Pond, Salem						X
Cobbetts Pond, Windham						X
Contoocook Lake, Jaffrey		X				X
Haunted Lake, Frankestown		X				X
Lees Pond, Moultonborough		X				X
Lake Winnepesaukee, Christmas Island, Paugus Bay						X
Phillips Pond, Sandown						X
Rocky Pond, Gilmanton						X
Sunrise Lake, Middleton	X	X				X
Lake Winnepesaukee, Balmoral, Moultonborough						X
Lake Winnepesaukee, Fish and Round Coves, Meredith						X
Lake Winnisquam, Sunray Shores, Belmont						X
Lake Winnisquam, Winnisquam Marine, Belmont						X
Lake Massasecum, Bradford	X	X	X	X		
Squam Lakes,				X		

<b>Waterbody/Town</b>	<b>Benthic Barriers</b>	<b>Hand Pulls</b>	<b>Harvesting</b>	<b>RUAs*</b>	<b>Diver-Assisted Suction Harvesting</b>	<b>Chemical</b>
Holderness/Ashland						
Nutts Pond, Manchester	X	X				
<b>2006 Totals:</b>	<b>3</b>	<b>7</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>14</b>
Balch Lake, Wakefield		X		X		X
Forest Lake, Winchester		X				X
Haunted Lake, Frankestown		X				X
Locke Lake, Barnstead		X				X
Lake Monomonac, Rindge		X				X
Rocky Pond, Gilmanton						X
Silver Lake, Tilton		X				X
Lake Winnepesaukee, Alton Town Beach, Alton		X				X
Lake Winnepesaukee, Krainwood Shores, Moultonborough						X
Lake Winnepesaukee, Mountainview Yacht Club, Gilford						X
Lake Winnepesaukee, Rand Cove, Alton						X
Lake Winnepesaukee, Smith Cove, Glendale		X			X	X
Lake Massasecum, Bradford	X	X	X	X		
Halfmoon Pond, Barnstead	X	X				
Squam Lakes, Holderness/Ashland				X		
Lake Pemigewasset, New Hampton	X	X				
Halfmoon Pond, Barnstead	X	X				
Rockybound Pond, Croydon		X				
<b>2007 Totals:</b>	<b>4</b>	<b>13</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>12</b>
<b>2008 Waterbody/Town</b>	<b>Benthic Barriers</b>	<b>Hand Pulls</b>	<b>Harvesting</b>	<b>RUAs*</b>	<b>Diver-Assisted Suction Harvesting</b>	<b>Chemical</b>
Captains Pond, Salem						X
Cobbetts Pond, Windham		X				X
Contoocook Lake, Jaffrey		X			X	X

<b>Waterbody/Town</b>	<b>Benthic Barriers</b>	<b>Hand Pulls</b>	<b>Harvesting</b>	<b>RUAs*</b>	<b>Diver-Assisted Suction Harvesting</b>	<b>Chemical</b>
Forest Lake, Winchester						X
Glen Lake, Goffstown		X				X
Haunted Lake, Frankestown		X				X
Horseshoe Pond, Merrimack						X
Lees Pond, Moultonborough		X			X	X
Melendy Pond, Brookline						X
Northwood Lake, Northwood		X				X
Lake Winnepesaukee, Lakeport Landing, Paugus Bay, Laconia						X
Lake Pemigewasset, New Hampton		X				X
Lake Potanipo, Brookline						X
Powwow Pond, Kingston						X
Sunrise Lake, Middleton	X	X				X
Back Bay, Wolfeboro		X			X	X
Lake Winnisquam (north end), Meredith		X			X	X
Lake Massasecum, Bradford	X	X	X	X		
Halfmoon Pond, Barnstead	X	X				
Squam Lakes, Holderness/Ashland				X		
Balch Lake, Wakefield				X		
Black Brook, Sanbornton	X	X				
Pawtuckaway Lake, Nottingham	X					
Lake Winnepesaukee, Gilford Town Docks, Gilford		X			X	
Rocky Pond, Gilmanton		X				
Lake Massabesic, Auburn					X	
Lake Winnepesaukee, Alton Town Beach, Alton		X			X	
Rockybound Pond, Croydon		X				
Big Island Pond, Derry					X	
<b>2008 Totals:</b>	<b>5</b>	<b>17</b>	<b>1</b>	<b>3</b>	<b>8</b>	<b>17</b>

## 2.4 Research

Research activities are a key element in the Exotic Aquatic Plant Program. Because variable milfoil is the most common exotic aquatic plant in New Hampshire but not a common nuisance species in most of the United States, little research nationwide has been conducted on the plant's biology, ecological relationships, and potential control strategies. By working with local colleges and universities, as well as field-testing various hypotheses on New Hampshire waterbodies, the Program can address the needs for finding viable control solutions that apply to existing infestations and the development of more effective prevention mechanisms.

### 2.4.1 State-Funded Milfoil Research Grants

Several exciting research endeavors were initiated between 2006 and 2008 with the Milfoil Research Grants, which were established under RSA-487:23. Table 2-6 provides a summary of each project.

**Table 2-6  
List of State Funded Milfoil Research Projects**

<b>Year</b>	<b>Grantee</b>	<b>Project Summary</b>	<b>Grant Amount</b>
2006	Plymouth State University	<p>The project objectives for this study were 1) to monitor the response in lake chemistry nutrients to a 2,4-D herbicide treatment intended to induce a major milfoil dieback at Kimbell's marina; and 2) to determine the response of the macroinvertebrate community to the perturbation induced by the treatment.</p> <p>Water chemistry will be monitored before and after treatment to determine changes in nutrients and related variables during milfoil dieback. Monitoring of the biologic response will determine the changes in epiphytic and benthic macroinvertebrates related to milfoil die off. Literature shows that there is little risk of lethal exposure to aquatic invertebrates. However, there is little information available on macroinvertebrate impacts as a result of habitat loss and changes to the foraging structure. An anticipated increase in sedimentation after treatment may impact benthic macroinvertebrates as an indirect effect of the treatment.</p>	\$34,062.00
2007	Town of Barnstead, in cooperation with the University System of New Hampshire	This was an innovative project that the Town of Barnstead's Milfoil Committee worked on cooperatively with the University System of New Hampshire. UNH assisted the BMC in conducting flow studies and chemical analyses of water samples from the Suncook River in Barnstead before, during, and following an aquatic herbicide treatment to	\$45,800.00

Year	Grantee	Project Summary	Grant Amount
		control growths of variable water-milfoil. This was cutting edge research in New Hampshire in that the project sought to explore the effectiveness of controlling an exotic aquatic plant in a flowing system. Because of dilution effects and other factors that are present in rivers, historic herbicide applications have been unsuccessful at controlling the target plant. Here, an innovative approach that involves scaled drawdown, two formulations of aquatic herbicide, and intensive planning and field coordination efforts were employed to ensure this technique was successful.	
2008	Town of Barnstead, in cooperation with the University System of New Hampshire	This was an innovative project that the Town of Barnstead's Milfoil Committee worked on cooperatively with the University System of New Hampshire. UNH assisted the BMC in conducting flow studies and chemical analyses of water samples from the Suncook River in Barnstead before, during, and following an aquatic herbicide treatment to control growths of variable water-milfoil. This was year-two cutting edge research that explores the effectiveness of controlling an exotic aquatic plant in a flowing system using variations in herbicide concentration and treatment timing.	\$50,000.00
	U.S. Army Corps of Engineers (USACOE)	The USACOE partnered with DES to research the potential role of variable milfoil seeds as a source of re-infestation in a waterbody following management. The research sought to determine seed viability and characterize germination and survival of variable milfoil seedlings from managed and non-managed sites. Knowledge about how milfoil re-grows from seeds will be valuable in planning follow-up monitoring activities and control activities.	\$20,000.00

#### **2.4.2 Federally-Funded Milfoil Research Grants**

During the winter of 2004, DES was the recipient of approximately \$1 million dollars of federal appropriations. Half of this one-time appropriation came from the Environmental Protection Agency, with the other half being allocated by the National Oceanic Atmospheric Administration. The money was earmarked for research on variable milfoil control, to be conducted by academia or qualified consulting firms. During the winter of 2003, DES sent out a request for conceptual proposals to research entities in New Hampshire and surrounding states to solicit proposals for variable milfoil related research.

A total of 13 conceptual proposals were submitted to DES in spring 2004. Two rounds of reviews by a committee of five were conducted for the submitted proposals. Personal presentations and interviews with the top eight candidates and lead researchers provided the necessary information for the selection of six finalists for the grant funds. Table 2-7 lists the project titles and lead researchers, the cost for each project, and a summary of the project purpose.

Research focused on two key areas: risk assessment for new infestation and management/control of existing infestations. Three of the six projects focused on examining various aspects of water quality data and sediments to determine commonalities between environmental and spatial data as they pertain to the existence of variable milfoil populations in New Hampshire and beyond. Some genetics work was also involved in identifying milfoil species. As a result of these research efforts DES hopes to better understand the physical, chemical and biological characteristics of lakes, ponds, and rivers that can support variable milfoil growth. Waterbodies with known risk characteristics will signal DES to increase its efforts at prevention and early detection of variable milfoil.

The remaining three projects focused on various aspects of control, including herbicide bioassays, biological control, and plant replacement techniques. The goal was to discover herbicides and biological controls that are most effective in stemming variable milfoil growth in waterbodies, while avoiding impacts to non-target species. It is hoped that if variable milfoil populations can be kept in check through integrated pest management practices, that native plants will have a better opportunity to prosper and limit the growth of variable milfoil.

These projects were completed in 2007, at which time final reports were submitted. DES has worked to integrate the information gained from these studies into daily program activities and control practices. The final reports from each of these projects can be found online at [http://des.nh.gov/organization/divisions/water/wmb/exoticspecies/federally\\_funded.htm](http://des.nh.gov/organization/divisions/water/wmb/exoticspecies/federally_funded.htm), with the exception of the suction harvesting/plant replacement project, which has been submitted as three separate manuscripts for publication in a peer-reviewed journal article in the near future.

**Table 2-7**

**List of Federally Funded Milfoil Research Projects**

<b>Project Title</b>	<b>Lead Researchers</b>	<b>Cost</b>	<b>Purpose</b>
Evaluation of Seven Aquatic Herbicides for the Selective Control of Variable Milfoil	Dr. Kurt Getsinger and Dr. Mike Netherland, US ACOE	\$200,000	The purpose of the Army Corps of Engineers, Waterways Experimental Station research was to develop specific strategies for aquatic herbicide use that incorporate plant phenology, water quality, and treatment timing, for optimal, cost-effective and selective control of variable milfoil in New Hampshire water bodies.
An Exploration of the Use of Parasitic Nematodes for the Biological Control of Variable Milfoil	Mr. Jeff Schloss, Dr. Garrett Crow, University of New Hampshire	\$225,000	The purpose of the University of New Hampshire research was to compare and characterize the plant and nematode communities along with water chemistry and sediment conditions, associated with variable milfoil in its native range and in New Hampshire lakes using traditional, molecular and genetic tools, and discover possible plant-nematode association that can be of use in biological control of variable milfoil.
Integration of Hydro acoustic and Water-Quality Related Assessments for Identifying Susceptible Areas for Variable Milfoil Growth	Jeff Deacon, Richard Kiah, and Jane Denny, U.S. Geological Survey	\$112,000*	The purpose of the US Geological Survey research was to evaluate the effects of chemical and physical properties on variable milfoil, to develop an effective monitoring tool to support resource managers responsible for mitigating the impacts of variable milfoil, and to determine optimal aquatic habitat characteristics (chemical and physical) for milfoil establishment and growth in New Hampshire lake environments. Geophysical surveys, vegetation surveys, water quality sampling, and integrating the geophysical, vegetation, and water-quality sampling was conducted.
Using Dispersal and Environmental Variables to Predict Milfoil Occurrence and Susceptibility to Invasion by Non-Native Milfoil in New Hampshire Lakes	Dr. Ryan Thum, Cornell University Dr. Jay Lennon, Brown University	\$50,000	The purpose of the research conducted by Dr. Ryan Thum and Dr. Jay Lennon was to identify lake attributes that influence the distribution of native and non-native ( <i>M. heterophyllum</i> ) milfoils in New Hampshire. The researchers use a combination of multivariate statistics and logistic regressions to determine whether invasive milfoil species are correlated with chemical, morphological, biological, and/or spatial characteristics of NH lakes. This research extends their previous research concerning the causes of aggressive growth in invasive milfoils and makes efficient use of a large amount of existing data with powerful discriminatory statistical techniques.

Project Title	Lead Researchers	Cost	Purpose
			Results from this study identified classes of lakes that may be susceptible for colonization by invasive <i>M. heterophyllum</i> .
Variable Milfoil Plant Replacement Project	Dr. Ken Wagner and Ms. Wendy Corbin, ENSR Corporation	\$124,792*	The purpose of the first research project conducted by ENSR Corporation was to perform an experimental rooted plant replacement project. The Plant Replacement Program was an attempt to establish a native, non-nuisance assemblage of plants dominated by low-growing species such as <i>Nitella</i> , <i>Najas</i> or <i>Potamogeton</i> . This effort involved both removal of the current dominant milfoil population over a target area early in the growing season and planting or seeding with the desired species. A multi-treatment, multi-plot experimental design was planned.
The Effects of Water and Sediment Chemistry, Sediment Physical Properties, Number and Size of Contiguous Wetlands, and Watershed Geology in Variable Milfoil Abundance or Presence/Absence	Dr. Ken Wagner and Ms. Wendy Corbin, ENSR Corporation	\$89,566	The purpose of the second research project conducted by ENSR Corporation was to investigate the effects of water and sediment chemistry, sediment physical properties, number and size of contiguous wetlands, and watershed geology on variable milfoil ( <i>Myriophyllum heterophyllum</i> ) abundance or presence/absence. The objective of this investigation was to determine if a correlation exists between these variables and variable milfoil growth.

\*Total project cost is inclusion of fees/charges from sub contractual work used in these projects.

## 2.5 Regional Cooperation

A primary goal of regional cooperation is to standardize the activities associated with exotic aquatic plants among New England states, including the establishment of common legislation, regulations, prohibited species lists, educational materials, and rapid response protocols with neighboring states.

Until 2003, the only states in the northeastern region to pass legislation prohibiting the sale or transport of certain listed exotic plants were New Hampshire, Vermont, and Maine. Other states are becoming interested in creating programs and legislation, and in fact, Connecticut passed new legislation in 2003 that prohibited certain activities associated with exotic aquatic plants. Massachusetts and Rhode Island have yet to pass state legislation about invasive species, though they do have active programs in place to monitor for and control invasive aquatic plants. If a standardized list of prohibited exotic plants within each state can be developed in the New England region and neighboring states, it would decrease the likelihood of the spreading these plants to new waterbodies.

During 2006-2008, New Hampshire's Exotic Aquatic Plant Program Coordinator attended various planning meetings in other states, at their request, to assist in developing exotic plant legislation and promoting successful programs like Weed Watchers.

Additionally, in an effort to promote further cooperation among the New England states and the northeast area in general, New Hampshire is active in various professional organizations associated with exotic species control and outreach activities. Goals of these organizations include fostering partnerships between states to reduce the transport of exotic plants, sharing success and failure information with regards to control practices, and strategizing to enhance existing programs and laws to reduce the impacts of invasive plants. Following is a list of the regional, national, and international organizations with which NHDES is involved:

- **Northeast Aquatic Plant Management Society (NEAPMS)** – State and regional government officials, academia, and plant management specialists are represented with the goal of sharing resources and information concerning management practices and innovative technologies, as well as providing a forum for interaction between government, academia, and managers.
  - In 2006-2008, three regional conferences took place that allowed for the exchange of information on various management strategies employed within the various states, as well as the development of new legislation and regulations, and the certification of new aquatic herbicides for use on exotic aquatic plants. Information gained from the meeting is used to streamline New Hampshire's activities associated with preventing and controlling exotic aquatic plants.
- **North American Lake Management Society (NALMS)** – This organization focuses on a variety of holistic lake management issues, including exotic plant management and impacts to lake ecology as a result of exotic aquatic plant infestations. This organization is representative of state, federal, and regional, and international government officials, academia, professional research organizations, and miscellaneous non-government

officials and organizations. NALMS meets twice annually and also has regional chapters throughout North America that meet at least on an annual basis.

- In 2006-2008, NALMS offered special extended sessions on invasive species management, and a number of presentations on outreach and education initiatives associated with exotic aquatic species.
  - In 2006, the DES Exotic Species Program Coordinator gave a presentation on an innovative control project that DES funded in Lake Massasecum in Bradford, New Hampshire.
- **NH Invasive Species Committee (ISC)** – This committee was established by RSA 430:54 in 2000. This committee is comprised of one representative from each state agency (including the Departments of Agriculture, Fish and Game, Environmental Services, and Resources and Economic Development), one representative from academia (UNH), one from the nursery industry, and three members at large from the public. The group is charged with developing a list of prohibited species to include terrestrial plants and animals (aquatic plants are already coordinated through DES, and aquatic animals through Fish and Game) in New Hampshire, finding ways to enforce compliance with listed species, and developing education and outreach materials for target audiences that are affected by the plants and animals. This group meets on a monthly basis in Concord, NH.
  - **Northeast Aquatic Nuisance Species Panel (NEANS)** This group is a regional panel of the National Aquatic Nuisance Species Task Force. The goals of this group are to assist the northeastern states and Eastern Canadian provinces in developing state, provincial, and regional Aquatic Nuisance Species Management Plans and standardize educational messages and materials in the region. The group is represented by state agencies across the northeast, and meets two times each year (May and November).
    - During 2006-2008 this group worked on a number of initiatives, including a hydrilla action plan, developing new educational materials for the region, developing a model rapid response plan for invasive species, and held numerous "Spotlight on Species" presentations to educate participants about species on the move and new threats to the region.

### 3. PROGRAM COSTS

Beginning in 1981, exotic plant control activities were funded by a \$0.50 fee added to boat registrations. In 1998, the legislature established the Lake Restoration and Preservation Fund and a fee of \$1.50 per boat registration was deposited in the fund for the Exotic Aquatic Plants Program. In 2003, program funds were again increased with the enactment of RSA 487:26, which established a Milfoil and Other Exotic Aquatic Plant Prevention and Research Fund. This new legislation added an additional \$3 fee per boat registration in the state. DES anticipates an annual income of \$300,000, which will fund Milfoil and Other Exotic Aquatic Plant Prevention and Research Grants. Table 3-1 summarizes the breakdown of the \$5 boat registration fee.

**Table 3-1  
Program Funding (per boat registration)**

<b>Program</b>	<b>Funding</b>	<b>Activities</b>
Clean Lakes Program	\$0.50	<ul style="list-style-type: none"> <li>• Lake and watershed studies</li> <li>• Sampling</li> <li>• Administrative costs</li> </ul>
Invasive Aquatic Plant Control Program	\$1.50	<ul style="list-style-type: none"> <li>• Monitoring for exotic plants</li> <li>• Control grants</li> <li>• Benthic barrier supplies</li> <li>• Educational materials</li> <li>• Administrative costs</li> </ul>
Milfoil and other Exotic Plant Prevention and Research Grant Program	\$3.00	<ul style="list-style-type: none"> <li>• Funding for prevention grants</li> <li>• Funding for research grants</li> </ul>

Table 3-2 summarizes the income and expenditures of this dedicated fund for exotic plant related monies. A full summary of the 2006-2008 budgets for the Exotic Aquatic Plants Program can be found in Appendix 8.

The control fund pays 100 percent of the control costs for newly documented infestations, up to 50 percent of the cost for subsequent control practices, and up to 80 percent of the costs for innovative control measures, with the remaining costs paid by local organizations, businesses municipalities, or individuals. Unfortunately, during this reporting period funding shortfalls for control projects resulted in grants that were much less than 50 percent of the total project cost, and in fact ranged from 25 percent-40 percent cost matches. The result of the shortfalls prompted local groups and municipalities to contribute the balance of the control funds. For example:

- In 2007
  - 14 requests for funds totaling more than \$140,000
  - \$70,000 available for control
  - 40-50 percent match grants were awarded
- In 2008
  - 33 requests for funds totaling more than \$370,000
  - \$110,000 available for control
  - 25-50 percent match grants were awarded

- In 2009
  - 34 requests for funds totaling more than \$575,000
  - \$60,000 available for control
  - 30 percent match grants were awarded

Figure 3-1 illustrates the DES expenditures for exotic plant control grants, and matching grants from municipalities, businesses and lake associations for each year of the program.

Because the requests for control grants are expected to continue to exceed the current budgeted amount for control activities, DES has developed a priority-rating model for funding control projects that was initiated during the 2004 season. In 2008 this objective rating model was adopted into administrative rules. A copy of the rating model is included in Appendix 9. DES plans to work with the legislature on the possibility of increasing funding for control practices during the 2009 legislative session.

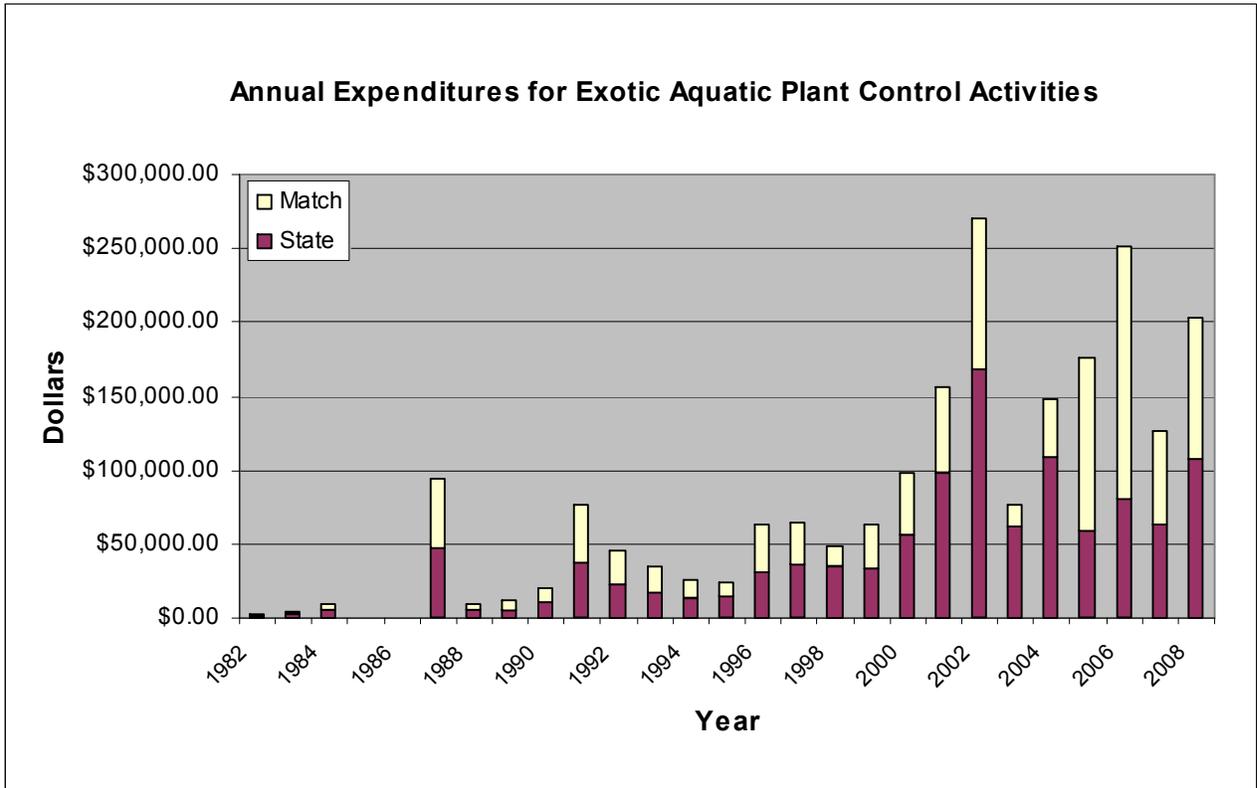
**Table 3-2  
Program Income and Expenditures for 1982-2008\***

<b>FISCAL YEAR</b>	<b>INCOME</b>	<b>EXPENSES</b>	<b>ENCUMBRANCES</b>	<b>BALANCE</b>
1982	\$12,258.50	\$144.45		\$12,114.05
1983	\$27,309.00	\$1,214.31		\$38,208.74
1984	\$24,387.50	\$2,949.57		\$59,646.67
1985	\$23,969.50	\$7,201.50		\$76,414.67
1986	\$36,026.50	\$2.40		\$112,438.77
1987	\$35,674.00	\$47,138.04	\$33.90	\$100,940.83
1988	\$38,701.50	\$32,552.85	\$9,270.90	\$97,852.48
1989	\$39,584.50	\$60,569.02	\$10,635.50	\$75,503.36
1990	\$42,784.00	\$50,092.53	\$15,351.61	\$63,478.72
1991	\$41,702.64	\$35,384.19	\$42,944.89	\$42,203.89
1992	\$39,267.50	\$46,711.82	\$6,763.72	\$70,940.74
1993	\$38,436.00	\$48,870.21	\$3,455.48	\$63,814.77
1994	\$38,299.88	\$37,969.16	\$16,941.11	\$50,659.86
1995	\$47,414.00	\$57,011.20	\$18,666.67	\$39,337.10
1996	\$43,790.00	\$57,441.36	\$12,573.92	\$31,778.49
1997	\$46,293.50	\$34,247.75	\$34,663.19	\$21,734.97
1998	\$145,809.00	\$94,880.92	\$25,333.22	\$81,993.02
1999	\$174,211.50	\$129,486.71	\$41,367.32	\$110,683.71
2000	\$226,455.00	\$175,293.23	\$80,510.62	\$122,702.18
2001	\$195,628.00	\$259,223.99	\$60,530.33	\$79,086.48
2002	\$205,487.00	\$262,358.82	\$80,512.00	\$2,232.99
2003	\$440,460.00	\$234,736.82	\$39,900.00	\$248,568.17
2004	\$537,702.00	\$358,012.82	\$148,751.86	\$319,405.49
2005	\$506,269.50	\$476,118.20	\$104,992.20	\$393,316.45
2006	\$532,232.63	\$469,051.57	\$159,872.75	\$401,616.96
2007	\$518,977.06	\$531,872.87	\$231,270.69	\$317,323.21
2008	\$493,342.91	\$615,079.24	\$367,294.00	\$59,563.57
<b>TOTALS</b>	<b>\$4,552,473.12</b>	<b>\$4,125,615.55</b>	<b>\$1,511,635.88</b>	<b>\$59,563.57</b>

\*Values represent monies from both control and prevention/research funds and Clean Lakes Program

\*\*Due to a near shortfall of funds in 2002 due to an increase in the numbers of plant management practices, conservative budgetary measures were followed in 2003, resulting in an increased FY End Balance shown for 2003 and beyond.

Figure 3-1



## 4. THE FUTURE

The goals of the Exotic Aquatic Plant Program are to limit the further spread of exotic aquatic plants, control new and existing infestations, and to research new ways to contain or even decrease the spread of these plants. Objectives in the five focus areas are:

Education and Outreach: Foster increased partnerships among lake associations, state agencies, regional groups, and other aquatic interests to provide and disseminate innovative and proactive educational materials that inform the public about exotic aquatic plants, how they are spread, and how they can be controlled.

Monitoring for Early Detection and Rapid Response: Expand the Weed Watcher Program and coordinate training activities with volunteer monitors from other lakes management programs. Map infestations using global positioning systems to more accurately document and track the occurrence and distribution of infestations over time.

Control: Develop a more streamlined process, including appropriate monitoring and environmental assessment, for conducting herbicide applications.

Research: Send out Requests for Proposals for specialists to conduct research on long-term control methods and potential means for eradication of exotic aquatic plants. Develop DNA gene sequencing methods for positive identification of variable milfoil during all life stages. Provide this technology to the DES Limnology Center so samples will not have to be sent out to other universities for analyses. Encourage state universities and colleges to submit proposals for research on exotic aquatic plants.

Regional Cooperation: Foster partnerships with other states across the northeast region to better promote an understanding of exotic aquatic plants and their impacts on our water resources. Assist other states in developing and/or enhancing exotic species legislation.

Looking to 2009 and beyond, DES desires this program to grow to meet new future challenges. The program will have to adapt to the movement of new exotic species from other states or other countries into New Hampshire waters. The program must increase its focus on preventing exotic infestations to the state's uninfested waterbodies, control existing waterbody infestations, and continue research on new techniques for control and even eradication of exotic aquatic plants. DES expects the recent dramatic increase in requests for control grants to continue, spurred by increased public awareness and interest. There is still much to accomplish.

The sections below summarize a vision for program activities in state fiscal year (SFY) 2009 and 2010.

### 4.1 Education and Outreach

- ❖ Update and revise the "Attention Boater" pamphlet to include a revised list and map of infestations in New Hampshire.
- ❖ In partnership with NH Lakes Association, work to continue annual implementation and expansion of the Lake Host Program.

- ❖ Continue to publish a “Weed Watchers” newsletter each summer.
- ❖ Produce Weed Watcher t-shirts for trained Weed Watchers (funding permitting).
- ❖ Update fact sheets and educational materials for distribution to the public, as needed.
- ❖ Conduct plant identification and Weed Watcher workshops in conjunction with the annual Volunteer Lake Assessment Program Refresher Workshop and Lake Host trainings.
- ❖ Give educational presentations to lake associations and other stakeholder groups.
- ❖ In 2010 prepare a 2009-2010 Program Report.

#### **4.2 Monitoring, Identification, and Prevention**

- ❖ Expand the Weed Watcher Program to include more lakes and train additional volunteer Weed Watchers to locate new exotic plant infestations earlier in the growing season.
- ❖ Train VLAP volunteers in both native and exotic aquatic plant identification.
- ❖ Locate and map individual infested areas of exotic aquatic plants using GPS.
- ❖ Update mapping technology and techniques based on successful methods developed by other researchers, and field experience of DES biologists.
- ❖ Prepare and/or update long-term management plans for each lake with an exotic aquatic plant(s), outline the status of the infestation, special species of concern, and management goals and timetables.
- ❖ Assist the Pesticide Control Board of the Department of Agriculture with aquatic herbicide permits and evaluations.
- ❖ Continue to conduct annual inspections of aquarium stores and nurseries to investigate illegal sales of exotic aquatic plants.
- ❖ Conduct 20-30 lake macrophyte surveys each summer as part of the Lake Assessment Program.
- ❖ Continue to track the spread of infestations in the New England region and beyond and update the list of prohibited species in New Hampshire as appropriate.
- ❖ Continue to provide updates to the University of Connecticut “Invasive Plant Atlas of New England” (IPANE).
- ❖ Continue to support the efforts of Lake Hosts and other groups that monitor public access sites to prevent the further introduction of exotic aquatic plants.

#### **4.3 Control**

- ❖ Continue to explore avenues to increase funding for control practices through legislation, grants, and federal appropriations.
- ❖ Continue to improve the application process for control grants, including an RFP and timelines that encourage permit application submittal by early fall of each year.
- ❖ Continue to explore alternative methods of control through participation in regional and national conferences associated with exotic aquatic plant and lake management and through scientific literature reviews.
- ❖ Award Research Grants to institutions of higher learning to explore new avenues for aquatic plant management.
- ❖ Update, as necessary, Milfoil Control Grant Review Matrices for all future control activity requests for funding.

#### **4.4 Research**

- ❖ Provide grants for innovative research projects related to exotic aquatic plants from funds derived from the Milfoil Research Grant Program.
- ❖ Partner with state colleges and universities to conduct biological and ecological research on variable milfoil.
- ❖ Work to establish a DNA fingerprinting program for milfoil species within the DES Limnology Center.

#### **4.5 Regional Cooperation**

- ❖ Attend invasive species conferences to keep up with current research methods, educational activities, control measures, and exotic aquatic plants programs, and share the New Hampshire experience.
- ❖ Give presentations on New Hampshire's programs to impart information on both the successes and needs for improvement in the various categories within the Exotic Aquatic Plant Program.
- ❖ Assist neighboring and nearby New England states in promoting and drafting exotics legislation by giving presentations to appropriate legislative committees, if asked, and provide copies of New Hampshire's legislation and annual reports.
- ❖ Continue to actively participate in regional groups and organizations to expand resources and the knowledge base for New Hampshire's program.

#### **4.6 Legislation and Regulations**

- ❖ Continue to work with the Exotic Aquatic Weeds and Species Committee to refine and expand the DES Exotic Species Program through legislation.
- ❖ Work with the Exotic Aquatic Weeds and Species Committee to craft legislation that seeks to increase program funding to strengthen the entire program.
- ❖ Make further amendments to Chapter Env-Wq 1300 of the Administrative Rules to streamline the rating criteria and rank lakes and rivers equally for funding consideration.

## References

Halstead, J.M., J. Michaud, S. Hallas-Burt, and J.P. Gibbs. 2001. An Hedonic Analysis of the Effects of an Exotic Invader (*Myriophyllum heterophyllum*) on New Hampshire Lakefront Properties. University of New Hampshire, Durham.

## **Appendix One**

Clean Lakes Statutes RSA 487:15 through RSA 487:25

and

Chapter Env-Wq 1300 of New Hampshire Administrative Rules

**TITLE L  
WATER MANAGEMENT AND PROTECTION**

**CHAPTER 487  
CONTROL OF MARINE POLLUTION AND AQUATIC GROWTH**

**New Hampshire Clean Lakes Program**

**487:15 Purpose.** – The general court recognizes that rapidly escalating pressures of shorefront development and recreational uses of public waters have placed increasing strains upon the state's lake resources, thereby accelerating the eutrophication process in many of our public lakes through nuisance growths of aquatic macrophyton and phytoplankton (algae) and thus posing a threat to water quality. The general court further recognizes the need to restore, preserve and maintain the state's lakes and ponds in order that these significant environmental, aesthetic and recreational assets will continue to benefit the social and economic well-being of the state's citizens.

**Source.** 1990, 143:2, eff. June 18, 1990.

**487:16 Definitions.** – In this subdivision:

- I. "Department" means the department of environmental services.
- II. The term "exotic aquatic weeds" includes only those species of vascular aquatic plants which were not part of New Hampshire's native aquatic flora before 1950. *Cabomba caroliniana* and *Myriophyllum heterophyllum* are examples of exotic aquatic weeds.
- III. "Federal program" means the federal Water Pollution Control Act, 33 U.S.C.A. 1324, the federal clean lakes program (P.L. 92-500, section 314), as amended, now known as the Water Quality Act of 1987 (P.L. 100-4), as amended.
- IV. "Commissioner" means the commissioner of the department of environmental services.

**Source.** 1990, 143:2. 1996, 228:98, 99. 1997, 185:2, eff. Jan. 1, 1998.

**487:16-a Exotic Aquatic Weed Prohibition.** – No exotic aquatic weeds shall be offered for sale, distributed, sold, imported, purchased, propagated, transported, or introduced in the state. The commissioner may exempt any exotic aquatic weed from any of the prohibitions of this section consistent with the purpose of this subdivision.

**Source.** 1997, 185:3, eff. Jan. 1, 1998.

**487:16-b Exotic Aquatic Weed Penalties.** – It shall be unlawful to knowingly, recklessly, or purposely offer for sale, distribute, sell, import, purchase, propagate, or introduce exotic aquatic weeds into New Hampshire waterbodies. Notwithstanding RSA 487:7, any person engaging in such an activity shall be guilty of a violation.

**Source.** 1999, 204:3, eff. Jan. 1, 2000.

**487:17 Program Established.** –

I. A program for the preservation and restoration of New Hampshire lakes and ponds eligible under RSA 487:20 shall be established and administered within the department of environmental services. Said program shall function to limit the eutrophication process in New Hampshire lakes by reducing nuisance growths of macrophyton and phytoplankton. It shall reinforce and complement the program authorized by the federal program and shall serve 3 basic purposes:

- (a) To diagnose degraded lakes and ponds and implement long-term solutions for the purpose of restoring water quality where such solutions are feasible and cost effective.
- (b) To diagnose lakes and ponds and implement methods for long-term preservation of the water quality when such measures can be shown to be feasible and cost effective.
- (c) To provide short-term remedial actions which can effectively maintain water quality conditions adequate for

public recreation and enjoyment, including, but not limited to, the control of exotic aquatic weeds pursuant to paragraphs II and III.

II. The department is directed to prevent the introduction and further dispersal of exotic aquatic weeds and to manage or control exotic aquatic weed infestations in the surface waters of the state. The department is authorized to:

(a) Display and distribute promotional material and engage in educational efforts informing boaters of the problems with exotic aquatic weed control.

(b) Control small new infestations of exotic aquatic weeds, according to the following criteria:

(1) The waterbody had been free, within the previous 5 years, of the exotic aquatic weed to be treated.

(2) The infestation is not widespread in the waterbody, and the department shall have determined that the exotic aquatic weed can in fact be controlled in the waterbody.

(3) The most environmentally sound treatment technique relative to the specific infestation will be used, which also meets the requirements of state rules, including rules adopted under RSA 430.

(c) Develop an emergency response protocol to control small new infestations. The protocol may include contractual agreements with one or more licensed pesticide applicators that would enable the prompt treatment of exotic aquatic weeds with herbicides consistent with the criteria provided in subparagraph (b).

(d) Designate, in consultation with the department of fish and game and the division of safety services, department of safety, restricted use of exotic aquatic weed control areas.

III. After notice and opportunity for hearing and comment, the department may make financial grants to lakefront associations, private businesses, citizens, and local governmental agencies for the management of exotic aquatic weeds where eradication is deemed impossible. All applications for grants by such groups shall be approved by both the department and the fish and game department, and shall meet state rule requirements.

**Source.** 1990, 143:2. 1996, 228:100, 106. 1997, 185:4, eff. Jan. 1, 1998. 2002, 201:4, eff. Jan. 1, 2003.

**487:18 Project Prioritization.** – Project approval shall be based upon prioritization factors to be established by rules adopted under RSA 541-A. Such rules shall give first priority for expenditure of available funds to the control of new infestations of exotic aquatic weeds pursuant to RSA 487:17, II(b). Otherwise, preference shall be given to lakes that have public access or that serve as a public drinking water supply. Implementation measures shall be based upon an assessment of potential success, technical feasibility, practicability, and cost effectiveness. Restoration and preservation projects shall include watershed management plans to control and reduce incoming nutrients wherever possible through best management practices. Repeated short-term solutions shall be discouraged where long-term solutions are feasible and cost effective. Treatments shall be designed to minimize any adverse effect upon fish and wildlife, their habitats, and the environment.

**Source.** 1990, 143:2, eff. June 18, 1990. 2002, 201:5, eff. Jan. 1, 2003.

**487:19 Public Hearings.** – No project for the implementation of a lakes restoration or preservation program shall be approved or initiated until at least 2 public hearings have been held on the project. Said hearings shall be held in one or more of the affected municipalities.

**Source.** 1990, 143:3, eff. June 18, 1990.

**487:20 Eligibility.** – To be eligible for funding under this subdivision, a body of water shall be any freshwater lake or pond which meets priorities established under RSA 487:18. Lakefront associations, private businesses, citizens and local government agencies shall be eligible to apply for funding under this subdivision.

**Source.** 1990, 143:3, eff. June 18, 1990

**487:21 Cost Sharing.** –

I. For diagnostic and feasibility studies where the federal government has made financial assistance available in the amount of 70 percent of the cost, the department may provide an amount not exceeding 30 percent of the total eligible costs as determined by the department. Where no federal funding is available, the department may provide an amount not exceeding 80 percent of the total eligible costs.

II. For implementation of restoration or preservation projects where the federal government has made financial assistance available in the amount of 50 percent of the costs, the department may provide an amount not exceeding 35 percent of the total eligible costs, as determined by the department. Where no federal funding is available, the department may provide an amount not exceeding 80 percent of the total eligible costs.

III. For water quality maintenance programs, the department may provide an amount of funding not to exceed 80 percent of the total eligible costs, as determined by the department, except that for the control of new infestations of exotic aquatic weeds the state may assume 100 percent of the cost.

IV. The local cost share shall be the cost of a project remaining after taking into account any state and federal funding.

V. An amount up to 10 percent of the total available funding may be expended on research that addresses the problems of lake eutrophication and exotic aquatic weeds.

**Source.** 1990, 143:3. 1996, 228:106, eff. July 1, 1996. 2002, 201:6, eff. Jan. 1, 2003.

**487:22 Municipal Agreements.** – Whenever a project requires a commitment of cooperative action or local cost sharing involving 2 or more municipalities, all participating municipalities shall execute an intermunicipal agreement relative to their respective obligations. No project which requires a local match shall be initiated with state funding until such an agreement, if applicable, has been approved by the legislative bodies of all the involved municipalities.

**Source.** 1990, 143:3, eff. June 18, 1990.

**487:23 Agency Cooperation.** – The department shall make a concerted effort to integrate and coordinate the clean lakes program with other environmental management programs involving lakes and their watersheds, whether such programs fall within the jurisdiction of the department of environmental services or within that of another state department. The university system and the department shall maintain regular communication for the purpose of sharing data bases and other relevant information.

**Source.** 1990, 143:3. 1996, 228:101, eff. July 1, 1996.

**487:24 Rulemaking.** – The commissioner shall adopt rules, under RSA 541-A, relative to:

I. The criteria to be used in the prioritization of grants for diagnostic or feasibility studies.

II. The criteria used to determine the priority of implementation projects and maintenance projects.

III. Contracting procedures with local governments or private businesses.

IV. Application procedures to participate in the program.

V. Criteria for the determination of project eligibility.

VI. Criteria governing the conduct of and reporting requirements on diagnostic and feasibility studies, implementation projects and maintenance projects.

VII. Designation of plants as exotic aquatic weeds as defined in RSA 487:16, II.

VII-a. Administration and enforcement of, and exemptions to, the exotic aquatic weed prohibition under RSA 487:16-a.

VII-b. Criteria governing the emergency response protocol under RSA 487:17, II(c).

VII-c. Designation of restricted use exotic aquatic weed control areas under RSA 487:17, II(d).

VIII. Any other matters that are necessary to implement the provisions of this subdivision.

**Source.** 1990, 143:3. 1997, 185:5. 1999, 204:4, eff. Jan. 1, 2000.

**487:25 Lake Restoration and Preservation Fund; Addition to Boat Fee.** –

[Paragraph I effective until January 1, 2008; see also paragraph I set forth below.]

I. The fee of \$5 collected under the provisions of RSA 270-E:5, II(a) shall be paid to the director of the division of motor vehicles. The director of the division of motor vehicles shall pay over said fee to the state treasurer who shall

keep the fee in a special fund to be expended by the department of environmental services. The department shall use \$.50 of the fee for lake restoration and preservation measures, exclusive of exotic aquatic weed control, \$1.50 of the fee for the control of exotic aquatic weeds, and \$3 of the fee for the milfoil and other exotic aquatic plants prevention program. The department shall deposit the \$3 into a special account within the lake restoration and preservation fund which shall be used to administer the milfoil and other exotic aquatic plants prevention program. The special fund shall be nonlapsing. All funds received under this section are continually appropriated to the department for the purposes of this subdivision.

[Paragraph I effective January 1, 2008; see also paragraph I set forth above.]

I. The fee of \$2 collected under the provisions of RSA 270-E:5, II(a) shall be paid to the director of the division of motor vehicles. The director of the division of motor vehicles shall pay over said fee to the state treasurer who shall keep the fee in a special fund to be expended by the department of environmental services. The department shall use \$.50 of the fee for lake restoration and preservation measures, exclusive of exotic aquatic weed control, and \$1.50 of the fee for the control of exotic aquatic weeds. The special fund shall be nonlapsing. All funds received under this section are continually appropriated to the department for the purposes of this subdivision.

II. The department is authorized to utilize such methods of control and to employ such personnel, consultant services, and equipment as, in its judgment, will control aquatic nuisances in the surface waters of the state as defined in RSA 485-A:2.

III. The department shall be the agency to receive and utilize federal funds, gifts, or grants from any person or association, which may be made available for the purposes of this subdivision.

**Source.** 1990, 143:3. 1996, 228:102, 106. 1997, 185:6, eff. Jan. 1, 1998. 2002, 201:2, eff. Jan. 1, 2003, 201:9, eff. Jan. 1, 2008.

#### **487:26 Grant Program Established. –**

There is hereby established a grant program to be administered by the department of environmental services for the allocation of money to state agencies, non-profit organizations, and municipalities or political subdivisions of the state which seek to administer a milfoil and other exotic aquatic plants prevention program, and to institutions of higher learning which seek to conduct research on milfoil and other exotic aquatic plants remediation techniques. The grant program shall be funded by the portion of the lake restoration and preservation fund, established in RSA 487:25, and allocated to the milfoil and other exotic aquatic plants prevention program. Up to 2/3 of the moneys distributed from the fund to the milfoil and other exotic aquatic plants prevention program shall be allocated for the purposes of milfoil and other exotic aquatic plants prevention and the remainder shall be allocated to milfoil and other exotic aquatic plants remediation research. Of the moneys in the milfoil and other exotic aquatic plants prevention program, the moneys allocated specifically for the purposes of the milfoil and other exotic aquatic plants prevention shall be distributed upon approval of the commissioner of the department of environmental services and the commissioner of safety. Of the moneys in the milfoil and other exotic aquatic plants prevention program, the moneys allocated specifically for the purposes of milfoil and other exotic aquatic plants remediation research shall be distributed upon approval of the commissioner of the department of environmental services.

**Source.** 2002, 201:3, eff. Jan. 1, 2003.

#### **487:27 Management Plan. –**

The commissioner of the department of environmental services, or designee, in consultation with the commissioner of safety, or designee, shall establish a management plan to implement the grant program. The management plan shall include, but not be limited to:

- I. Eligibility determination criteria and procedures.
- II. Application requirements and procedures.
- III. Project selection and prioritization requirements and procedures.
- IV. Stewardship requirements and procedures, including annual reporting to the department by the grantee.

**Source.** 2002, 201:3, eff. Jan. 1, 2003.

[RSA 487:28 repealed by 2002, 201:7, eff. Jan. 1, 2008.]

**487:28 Eligible Applicants; Matching Funds. –**

I. The department of environmental services shall distribute funds for projects to further the purposes of this program only to eligible applicants. Eligible applicants shall include:

(a) Publicly-supported nonprofit corporations exempt from federal income taxation under Section 501(c) of the Internal Revenue Code.

(b) Municipalities or other political subdivisions of the state.

(c) Institutions of higher learning.

(d) State agencies.

II. All eligible applicants shall provide a minimum level of matching resources equal to 50 percent of the proposed program budget. The department may exempt institutions of higher learning from the required match. The cost-sharing match may be met through the use of in-kind services. Qualifying matching funds from the applicant may include, but are not limited to, municipal appropriations, private donations, federal funds, and the value of goods and services provided by the applicant.

**Source.** 2002, 201:3, eff. Jan. 1, 2003.

[RSA 487:29 repealed by 2002, 201:7, eff. Jan. 1, 2008.]

**487:29 Milfoil and Other Exotic Aquatic Plants Prevention; Grant Fund Report and Budget. –**

The department of environmental services shall submit an annual report, beginning on January 1, 2004, to the speaker of the house, president of the senate, and the governor and council which shall include, but not be limited to, a description of prevention and research projects funded by the milfoil and other exotic aquatic plants prevention program and the extent of aid to municipalities or subdivisions of the state, non-profit corporations, and research institutions.

**Source.** 2002, 201:3, eff. Jan. 1, 2003.

**487:30 Exotic Aquatic Weeds and Species Committee. –**

I. There is established a committee to study exotic aquatic weeds and species in the state of New Hampshire.

II. (a) The members of the committee shall be as follows:

(1) Five members of the house of representatives, appointed by the speaker of the house.

(2) One member of the senate and one public member, appointed by the president of the senate.

(b) Members of the committee shall serve terms which are coterminous to their terms on the general court and shall receive mileage at the legislative rate when attending to the duties of the committee.

III. The committee shall study the spread of exotic aquatic weeds and exotic aquatic species in the waters of New Hampshire. The study shall include education, management, and potential means to eliminate the spread of these weeds and species.

IV. The members of the committee shall elect a chairperson from among the members. The first meeting of the committee shall be called by the first-named house member. The first meeting of the committee shall be held within 45 days of the effective date of this section. Four members of the committee shall constitute a quorum.

V. The committee shall report its findings and any recommendations for proposed legislation to the speaker of the house of representatives, the senate president, the house clerk, the senate clerk, the governor, and the state library on or before November 1 of each year.

**Source.** 2004, 115:1, eff. May 17, 2004. 2005, 240:2, eff. July 14, 2005.

## CHAPTER Env-Wq 1300 NEW HAMPSHIRE CLEAN LAKES PROGRAM

Statutory Authority: RSA 487:18 and 24

### PART Env-Wq 1301 PURPOSE AND APPLICABILITY

Env-Wq 1301.01 Purpose. The purpose of these rules is to implement the following statutory provisions:

- (a) RSA 487:16-a, which prohibits the sale, distribution, importation, purchase, propagation, transportation, or introduction of exotic aquatic weeds into the state;
- (b) RSA 487:17 relative to limiting the eutrophication of lakes and ponds, controlling exotic aquatic weeds, designating restricted use areas, and making financial grants for management of exotic aquatic weeds;
- (c) RSA 487:18 relative to project prioritizations;
- (d) RSA 487:20 relative to eligibility requirements;
- (e) RSA 487:21 relative to cost sharing; and
- (f) RSA 487:22 relative to municipal agreements.

Env-Wq 1301.02 Applicability. These rules shall apply to people who live, work, and recreate on the surface waters of New Hampshire, as well as people who own or manage places of business that offer the sale or other distribution of exotic aquatic weeds.

### PART Env-Wq 1302 DEFINITIONS

Env-Wq 1302.01 “Bottom barrier” means a semi-permeable, fine mesh screening, laid over an area of sediments in a surface water to shade and physically inhibit plant growth.

Env-Wq 1302.02 “Commissioner” means the commissioner of the department of environmental services.

Env-Wq 1302.03 “Cultivar” means a cultivated species of plant for which there is no wild form.

Env-Wq 1302.04 “Department” means the department of environmental services.

Env-Wq 1302.05 “Diagnostic and feasibility study” means a study as contemplated by RSA 487:21, I, to identify sources of pollution to a surface water and recommend the most cost effective practices to restore or preserve water quality.

Env-Wq 1302.06 “Exotic aquatic weeds” means “exotic aquatic weeds” as defined by RSA 487:16, II, namely “only those species of vascular aquatic plants which were not part of New Hampshire’s native aquatic flora before 1950. Cabomba caroliniana and Myriophyllum heterophyllum are examples of exotic aquatic weeds.”

Env-Wq 1302.07 “Herbaria” means collections of dried, pressed plants for the purposes of education and scientific study.

Env-Wq 1302.08 “Infested waters” means water and water bodies having populations of prohibited exotic aquatic weeds such as milfoil or fanwort.

Env-Wq 1302.09 “Integrated pest management (IPM)” means an aquatic plant management approach that includes:

- (a) Defining the problem or need;
- (b) Identifying the desired exotic aquatic plant management goals;
- (c) Making decisions based on site-specific information;
- (d) Using ecosystem, watershed, and cost perspectives to determine long-term strategies;
- (e) Developing a system of integrated exotic plant control methods, including mechanical-physical, biological, chemical, and cultural BMPs; and
- (f) Quantitatively assessing the results of the control methods.

Env-Wq 1302.10 “Limited infestations” means an infestation of 5 acres or less.

Env-Wq 1302.11 “Maintenance project” means a project designed to remediate a water impairment through the short-term control of an exotic aquatic weed infestation or a water quality problem by treating the problem but not the underlying cause.

Env-Wq 1302.12 “New infestation” means an infestation that was not previously reported to or otherwise identified by the department.

Env-Wq 1302.13 “Public access” means “public access” as defined by RSA 271:20-a, I, namely “legal passage to any of the public waters of the state by way of designated contiguous land owned or controlled by a state agency, assuring that all members of the public shall have access to and use of the public waters for recreational purposes.”

Env-Wq 1302.14 “Public boat access area” means an area adjacent to a public body of water that is owned or controlled by the state, is accessible by the public, and has been designated by the fish and game department as a boat launching area under the statewide public boat access program.

Env-Wq 1302.15 “Public bodies of water” means:

- (a) Public waters as defined in RSA 271:20;
- (b) Any impoundment of a stream, lake, pond, or tidal or marine waters of 10 acres or more; and
- (c) Any other body of water owned by the state or by a state agency or department.

Env-Wq 1302.16 “Restricted use area” means a marked area or marked areas of a water body where infestations of exotic aquatic weeds have been delineated in accordance with Env-Wq 1304, which is closed to entry by boaters, anglers, or other water users and their equipment except in emergency situations where property or human life is endangered.

Env-Wq 1302.17 “Surface waters of the state” means “surface waters of the state” as defined by RSA 485-A:2, XIV, namely, “perennial and seasonal streams, lakes, ponds, and tidal waters within the jurisdiction of the state, including all streams, lakes, or ponds bordering on the state, marshes, water courses and other bodies of water, natural or artificial.”

#### PART Env-Wq 1303 LISTING OF PROHIBITED EXOTIC AQUATIC WEEDS; EXEMPTIONS

Env-Wq 1303.01 Criteria for Listing Exotic Aquatic Weeds as Prohibited. The department shall list an aquatic plant species as prohibited if it meets any of the following criteria:

(a) The species does not naturally occur in New Hampshire and will cause or is likely to cause economic or environmental harm or harm to human health or safety if introduced to the area, because it grows or is likely to grow more rapidly than native plants so as to impair an ecosystem’s ability to function by altering its productivity, decomposition, water fluxes, nutrient cycling and loss, soil fertility, erosion, dissolved oxygen concentrations, or its ability to maintain its existing species diversity;

(b) The species is known to invade and disrupt aquatic and wetland ecosystems in other geographic areas where the climate is similar to that of New Hampshire;

(c) The species is able to create dense, monospecific stands or monotypic stands that displace or destroy native plant habitat, destroy fish and wildlife habitats, inhibit water circulation, hinder navigation or irrigation, or severely restrict the recreational use of waterways; and

(d) The species resists effective control by present technology or available management practices.

Env-Wq 1303.02 Prohibited Exotic Aquatic Weeds. Subject to Env-Wq 1303.03, the following exotic aquatic weeds, identified in “A Manual of Aquatic Plants” by Norman C. Fassett and “Aquatic and Wetland Plants of Northeastern North America” by Garrett Crow and C. Barre Hellquist, both copyrighted by The University of Wisconsin Press, shall be prohibited from being offered for sale, distributed, sold, imported, purchased, propagated, transported, or introduced in the state, pursuant to RSA 487:16-a, because they pose a substantial threat to native species in the state:

(a) All Myriophyllum species, including but not limited to Myriophyllum heterophyllum, Myriophyllum spicatum, and Myriophyllum aquaticum, and commonly referred to as milfoils or feather-foils;

(b) All Cabomba species, including but not limited to Cabomba caroliniana and commonly referred to as fanworts;

(c) Hydrilla verticillata; commonly referred to as Hydrilla or Anacharis;

(d) All Trapa species, commonly referred to as water chestnuts;

(e) Potamogeton crispus, commonly referred to as curly leaf pondweed;

(f) Lythrum salicaria, L. virgatum, L. alatum and their cultivars, commonly referred to as purple loosestrife;

(g) Phragmites australis or P. communis, commonly referred to as common reed;

- (h) Egeria densa, commonly referred to as Brazilian elodea;
- (i) Hydrocharis morsus-ranae, commonly referred to as frogbit;
- (j) Butomus umbellatus, commonly referred to as flowering rush;
- (k) Najas minor, commonly referred to as European naiad;
- (l) Nymphoides peltata, commonly referred to as yellow floating heart;
- (m) Crassula helmsii, commonly referred to as swamp stonecrop;
- (n) Epilobium hirsutum, commonly referred to as great willow herb or hairy willow herb;
- (o) Glyceria maxima, commonly referred to as reed sweet grass or manna grass;
- (p) Hygrophila polysperma, commonly referred to as East Indian hygrophila;
- (q) Ipomoea aquatica, commonly referred to as water spinach;
- (r) Iris pseudocarus, commonly referred to as yellow iris or yellow flag iris;
- (s) Lagarosiphon major, commonly referred to as African oxygen weed;
- (t) Limnophila sessiliflora, commonly referred to as ambulia;
- (u) Marsilea quadrifolia, commonly referred to as water fern;
- (v) Myosotis scorpioides, commonly referred to as water forget-me-not;
- (w) Sagittaria japonica, commonly referred to as double flowering arrowhead, Japanese arrowhead, or old world arrowhead;
- (x) Sagittaria sagittifolia, commonly referred to as giant sagittaria;
- (y) Typha gracilis, commonly referred to as slender cattail;
- (z) Typha laxmanii, commonly referred to as dwarf cattail or Laxman's cattail; and
- (aa) Typha minima, commonly referred to as miniature cattail or micro-mini cattail.

Env-Wq 1303.03 Synonymy. The prohibited status of exotic aquatic weeds shall apply not only to the most recent and accepted scientific and common names of the species as listed in Env-Wq 1303.02 but also to undesignated synonyms for the listed species. Plant status shall be determined using the Latin name of the species.

#### Env-Wq 1303.04 Inspections.

(a) For purposes of this section, "business" means a commercial establishment that is open to the public and maintains stocks of aquatic plants for sale or other distribution, including pet stores and nurseries.

(b) The department shall inspect, during a business's normal business hours, the aquatic plants on display to the public.

(c) If the department's inspector observes plants that are on the list of prohibited species, the inspector shall inform the on-site manager of the business of the prohibitions of RSA 487:16-a and request the manager to discontinue the sale or other distribution of the plants.

(d) If the department's inspector observes plants that could be on the list of prohibited species, the inspector shall inform the on-site manager of the business of the prohibitions of RSA 487:16-a and request the manager to provide a sample of the questionable aquatic plant material of sufficient size to allow identification of the plant material at no compensation.

Env-Wq 1303.05 Exemptions for Transportation. Transportation of any exotic aquatic weed(s) on any road or highway in the state shall be exempt from the transportation prohibition of RSA 487:16-a, if:

(a) The transportation is for the purpose of disposal as part of a harvest control activity under the supervision of the department; or

(b) The transportation is for the purpose of identifying a species or reporting the presence of a species, and the plant material is in a sealed container.

Env-Wq 1303.06 Acceptable Means of Disposal.

(a) Any exotic aquatic weed shall be immediately disposed of away from water or moist areas where it might survive.

(b) Acceptable means of disposal shall include:

(1) Burning or incinerating;

(2) Land filling;

(3) Disposing in a trash container whose contents are destined for incineration or land filling;

(4) Desiccating;

(5) Composting, if applied away from surface waters; and

(6) Any other method that ensures the plant material will not enter surface waters.

Env-Wq 1303.07 Exemptions for Preserved Specimens, Research or Education, and Field Experimentation.

(a) Subject to (b) and (c), below, and as authorized by RSA 487:16-a, the following uses of exotic aquatic weeds shall be exempt from the prohibitions of RSA 487:16-a:

(1) Exotic aquatic weeds in the form of herbaria or other preserved specimens;

(2) Exotic aquatic weeds being used in a controlled environment, such as in a laboratory for research or for educational display; and

(3) Exotic aquatic weeds that are subjected to experimental processes or equipment in the field for the purpose of finding control mechanisms for such exotic aquatic weeds.

(b) All specimens shall be destroyed as specified in Env-Wq 1303.06 when they are no longer used as specified in (a), above.

(c) For plants subjected to experimental processes or equipment in the field, the exemption shall apply only if such experimental processes or equipment are conducted in a way that prevents the spread of such weeds.

Env-Wq 1303.08 Notification Requirement.

(a) Any person, other than an employee of the department acting in his or her official capacity, who participates in any of the activities exempted pursuant to Env-Wq 1303.05 and Env-Wq 1303.07, shall notify the department prior to or within 24 hours after performing such activity, by calling 271-3503 and asking for the Exotic Species Program or Limnology Center.

(b) Notification shall not be required for disposal after removal from recreational watercraft and equipment such as trailers, motors, fishing equipment, or diving gear.

PART Env-Wq 1304 RESTRICTED USE AREAS

Env-Wq 1304.01 Designation and De-listing of Restricted Use Areas.

(a) Subject to (e), below, the commissioner shall designate as a restricted use area any area that contains a limited infestation of exotic aquatic weeds, such as:

(1) Areas with new infestations;

(2) Infestations in areas with a high risk of fragmentation; and

(3) Areas in waterbodies with previously documented infestations where treatments or management practices have removed all but a small area of exotics that can be contained with the establishment of a restricted use area until such time that other management practices can remove the remainder of the population.

(b) After designation, a restricted use area shall be in place until the area is no longer infested as determined using the criteria in (a), above, or until a period of 3 years has expired since the time of designation, whichever is sooner.

(c) Subject to (e), below, when an infestation has been eradicated or cannot be successfully treated or managed within the 3-year time limit, or the 3-year time limit has been reached, the commissioner shall evaluate the designated area to determine whether the area will be de-listed or the area's designation as restricted use will be extended.

(d) The commissioner shall issue press releases to the newspapers in the towns-surrounding the water body(ies) in which a restricted use area is designated or de-listed and post the list of waterbodies with restricted use areas or de-listed areas on the department's website by June 1 of each year.

(e) In considering whether to designate a restricted use area pursuant to (a), above, or whether to extend the designation pursuant to (c), above, the commissioner shall proceed as directed by RSA 487:17, II(d).

Env-Wq 1304.02 Notice of Restricted Use Areas.

(a) The department shall post signs and place buoys warning of a restricted use area in accordance with Env-Wq 1304.03 and Env-Wq 1304.04.

(b) The commissioner shall post on the department's website a list of restricted use areas that includes the following information:

- (1) The town(s) in which the water body containing the restricted use area is located;
- (2) The name of the water body containing the restricted use area;
- (3) The specific location of the infestation within the water body;
- (4) The type of infestation; and
- (5) The general dimensions of the restricted use area.

Env-Wq 1304.03 Delineation and Markers for Restricted Use Areas. The department or its designee shall mark restricted use areas using buoys and signs as specified below:

(a) At least one sign meeting the requirements of Env-Wq 1304.08 shall be posted at each public access site and public boat access area on the surface water in which the restricted use area is located;

(b) A minimum of 3 buoys shall be placed around the actual restricted use area;

(c) The buoys shall:

- (1) Be placed not more than 300 feet apart;
- (2) Be connected by rope with small floats every 8 feet; and
- (3) Meet the requirements of Env-Wq 1304.04; and

(d) Buoys and signs shall be removed at the end of each growing season, unless removed sooner pursuant to the de-listing process.

Env-Wq 1304.04 Type of Warning Buoy. The buoy used to warn of a restricted use area shall:

- (a) Be a standard state danger buoy;
- (b) Be white and international orange in color;
- (c) Have an orange diamond symbol with an X through it; and

(d) Read as follows: "Restricted Use Area, pursuant to RSA 487. NH Dept. of Environmental Services 603-271-3503."

Env-Wq 1304.05 Marking of Restricted Use Areas by Municipalities.

(a) Any municipality with a method of marking restricted use areas within municipal surface water supplies that is similar to the method described in Env-Wq 1304.03 and Env-Wq 1304.04 may request the department to approve the use of the method in lieu of Env-Wq 1304.03 and Env-Wq 1304.04, by submitting a request in writing to the department.

(b) The request shall describe the municipality's method of marking restricted use areas and identify the area(s) to which it is to be applied.

(c) The department shall authorize the municipality to mark municipal surface water supplies using the municipality's method if the municipality's method is equivalent to or more stringent than the method identified in Env-Wq 1304.03 and Env-Wq 1304.04.

Env-Wq 1304.06 Navigation Prohibition. Subject to Env-Wq 1304.07, no person or equipment, including boaters, anglers, or other water users and private or commercial watercraft of any type, shall enter a restricted use area except in emergency situations where property or human life is endangered.

Env-Wq 1304.07 Public Access and Public Boat Access. If an infestation occurs at an access point to a marina, private residence, or public or private boat access ramp, a bottom barrier shall be put over the infestation to keep it from spreading and the access point may remain open.

Env-Wq 1304.08 Signs. The signs posted pursuant to Env-Wq 1304.03(a) shall:

- (a) Be at least 8 ½ by 11 inches in size;
- (b) Include a picture of a warning buoy; and
- (c) Inform people that the purpose of the buoys is to mark a restricted use area and that the area must not be entered except in emergencies where property or human life is endangered.

Env-Wq 1304.09 Installation and Removal of Buoys.

- (a) The department shall install buoys during weekday office hours.
- (b) The department shall remove the buoys at the end of each growing season, unless removed sooner pursuant to the de-listing process.

PART Env-Wq 1305 RESPONSE PROTOCOLS FOR NEW INFESTATIONS OF EXOTIC AQUATIC WEEDS

Env-Wq 1305.01 Emergency Response Protocol for Small New Infestations.

- (a) Upon notification of a possible new infestation of exotic aquatic weeds, the department shall:
  - (1) Document the infestation in accordance with Env-Wq 1305.02; and
  - (2) Determine whether the infestation is small enough that eradication is reasonably possible based on the criteria specified in (b), below.

(b) The department shall determine that eradication is reasonably possible if:

(1) The infestation is present as:

- a. A small patch or scattered individual stems, such that the infestation can be controlled by hand-pulling the subject plant stems using snorkeling or SCUBA diving activities; or
- b. A single dense mat or a series of separate dense mats wherein each mat covers an area less than 400 square feet, such that the infestation can be controlled by installing bottom barriers; and

(2) The infestation is a new infestation in a previously-uninfested water body or in a previously-uninfested area of a water body having already-controlled or otherwise minimal infestations.

(c) If the infestation meets the criteria specified in (b), above, the department shall undertake hand-pulling or install bottom barriers, or both, as is most likely to control the infestation.

(d) If the infestation is not small enough to be controlled with hand-pulling or bottom barriers, the department shall develop a recommendation for an appropriate non-emergency response in accordance with Env-Wq 1305.03.

Env-Wq 1305.02 Documentation of Infestation. To document a new infestation, the department shall:

- (a) Conduct a site inspection of subject waterbody within 72 hours of a new report;
- (b) Collect a specimen of the suspect plant;
- (c) Determine if the plant is a native or exotic species per RSA 487:16, II, as follows:
  - (1) When fruit or flower is present, the department shall make an identification directly; and
  - (2) When no fruit or flower is present, the department shall send the specimen for DNA analysis to verify the species level identification;
- (d) Map and characterize the extent of the infestation;
- (e) Document any native plant abundances and community structure around and dispersed within the exotic plant population; and
- (f) Identify potential impacts to downstream habitats as a result of the infestation or possible control activities.

Env-Wq 1305.03 Recommendation for Non-Emergency Response.

(a) If the infestation does not qualify as a small new infestation per Env-Wq 1305.01, the department shall develop a management plan in consultation with interested stakeholders, including affected municipalities and lake associations, to address the infestation over the longer-term.

(b) If the management plan developed pursuant to (a), above, calls for action by the department, the department shall implement the portion(s) of the plan calling for department action.

#### PART Env-Wq 1306 MAINTENANCE PROJECT GRANTS

Env-Wq 1306.01 Eligibility for Maintenance Project Grant. The following criteria shall be met in order to be eligible for a grant under RSA 487:21, III for a maintenance project:

- (a) The subject water body shall:
  - (1) Be a surface water of the state;
  - (2) Have at least one public access or public boat access; and
  - (3) Be infested with an exotic aquatic weed listed in Env-Wq 1303.02; and

(b) The proposed maintenance project shall incorporate integrated pest management (IPM) strategies.

#### Env-Wq 1306.02 Application for Maintenance Project Grant.

(a) The applicant for a maintenance project grant shall submit a completed application for funding assistance on a form provided by the department to the department's Exotic Species Program by November 1 of the year preceding the year for which the grant is requested.

- (b) The application shall include the following information:
  - (1) The applicant's name and mailing address and the name, mailing address, and daytime telephone number of an individual who can be contacted on behalf of the applicant with questions regarding the application;
  - (2) The amount of the grant being requested and the amount of the local match;
  - (3) The name of the surface water for which the grant is sought and whether it is public or private;
  - (4) The type and availability of public access sites and public boat access sites on the surface water;
  - (5) The predominant use(s) of the surface water;
  - (6) The type(s) of exotic aquatic species with which the surface water is infested;
  - (7) The size and location of the infestation;
  - (8) The impact of the infestation to recreational, ecological, and economic values of the surface water; and
  - (9) Which IPM strategies will be used.

(c) The application shall be signed by a responsible official of the organization or political subdivision that is applying for the grant. Such signature shall constitute certification that the information contained in the application is true and complete to the signer's information and belief.

Env-Wq 1306.03 Funding Determinations.

(a) The department shall review the grant applications, rank them using the prioritization criteria specified in Env-Wq 1306.04, and assign funding amounts based on available funds.

(b) The department shall notify each applicant in writing regarding whether or not a grant was awarded. If a grant is not awarded, the written notice shall specify the reason(s) for the decision.

(c) Upon notification of grant award, the applicant shall provide the following to the department:

- (1) A new or updated W-9 form, as appropriate;
- (2) An original Certificate of Good Standing or a Certificate of Existence from the New Hampshire Secretary of State's Office;
- (3) A signed and notarized standard state contracting form; and
- (4) A signed and notarized certificate of authority.

Env-Wq 1306.04 Prioritizing Maintenance Projects. Pursuant to RSA 487:18, project priority shall be determined by totaling the points assigned under each of the following categories:

(a) Based on the type of infestation in the surface water, points shall be assigned as follows:

- (1) Rivers and streams shall receive 0 points;
- (2) Lakes and ponds with widespread and well-established infestations shall receive one point;
- (3) Lakes and ponds with established infestations that are showing signs of spreading to uninfested portions of the waterbody shall receive 2 points; and
- (4) Lakes and ponds with infestations that have remained small or localized shall receive 3 points; and
- (5) The score for this category shall be multiplied by a weighting factor of 4;

(b) Based on the type of proposed treatment, points shall be assigned as follows:

- (1) Projects where only herbicides will be used shall receive 0 points;
- (2) Projects where herbicide treatment will be followed by non-chemical management efforts, such as hand removal or bottom barriers, shall receive one point;
- (3) Projects where only non-herbicide controls will be used shall receive 2 points;

- (4) Projects where a new or innovative approach will be tried shall receive 3 points; and
  - (5) The score for this category shall be multiplied by a weighting factor of 3;
- (c) Based on the type and availability of public access sites and public boat access sites, points shall be assigned as follows:
- (1) Private ponds shall receive 0 points;
  - (2) Public bodies of water with no known access point shall receive one point;
  - (3) Public bodies of water where public access exists only as open land or beach and there is no public boat access area shall receive 2 points;
  - (4) Public bodies of water where a public boat access area exists shall receive 3 points; and
  - (5) The score for this category shall be multiplied by a weighting factor of 2;
- (d) Based on the predominant use(s) of the surface water, points shall be assigned as follows:
- (1) Surface waters where less than 30% of the shorefront is developed shall receive 0 points;
  - (2) Surface waters where the surrounding land use is mostly residential and boating is predominantly small boats and canoes shall receive one point;
  - (3) Surface waters where the surrounding land use is both residential and transient and boating is a mix of large and small boats, including unmotorized boats, shall receive 2 points;
  - (4) Surface waters designated as public water supplies shall receive 3 points; and
  - (5) The score for this category shall be multiplied by a weighting factor of 2;
- (e) Based on the impact of the infestation to recreational and economic values of the surface water, points shall be assigned as follows:
- (1) Infestations in mostly-undeveloped areas of a surface water where there is little cultural impact shall receive 0 points;
  - (2) Infestations with mostly residential impacts shall receive one point;
  - (3) Infestations with impacts to residential boat access or beaches as well as to residents shall receive 2 points; and
  - (4) Infestations with impacts to commercial operations, such as marinas, public beaches, motels, restaurants, and public docks, shall receive 3 points;
- (f) Based on the impact of the infestation to ecological values of the surface water, points shall be assigned as follows:
- (1) Infestations that are physically contained and do not threaten the life cycle of native aquatic plant or animal communities shall receive 0 points;

- (2) Infestations that are rapidly spreading and threaten the life cycle of native plant and animal communities shall receive 2 points; and
  - (3) Infestations that pose a risk to rare, threatened, or endangered plant or animal species within a surface water shall receive 4 points;
- (g) Based on the treatment history of the surface water, points shall be assigned as follows:
- (1) Projects funded within the last 2 years shall receive 0 points;
  - (2) Projects not funded within the last 2 years where there was no request for funding in those 2 years shall receive one point;
  - (3) Projects not funded within the last 2 years where funding was requested and denied shall receive 2 points; and
  - (4) Projects not previously funded shall receive 3 points; and
- (h) Based on the amount of local match, points shall be assigned as follows:
- (1) Projects where the applicant proposes to provide not more than 50% match for the project shall receive 0 points;
  - (2) Projects where the applicant proposes to provide at least 50% but less than 65% match for the project shall receive one point;
  - (3) Projects where the applicant proposes to provide at least 65% but less than 80% match for the project shall receive 2 points; and
  - (4) Projects where the applicant proposes to provide 80% or more match for the project shall receive 3 points.

Env-Wq 1306.05 Contracting Procedures. All contracts for control or eradication of exotic aquatic weeds shall be advertised, bid, and contracted in accordance with applicable state contractual procedures established by the New Hampshire department of administrative services.

Env-Wq 1306.06 Reporting Requirements.

(a) For maintenance projects using aquatic herbicides, the grant recipient shall submit a report at the end of the growing season on the type of herbicide, rate of chemical application, success of the treatment, total project cost, and impacts to any non-target aquatic or land-based plant or animal species, as well as a summary of IPM strategies used during the grant period.

(b) To satisfy the reporting requirement of (a), above, the grant recipient may submit a photocopy or electronic copy of the report submitted to the department of agriculture, markets and foods pursuant to Pes 603.03(c)(26) that has been supplemented with the information not already contained in the report that is otherwise required by (a), above.

Env-Wq 1306.07 Recordkeeping Requirements. All grant recipients shall keep detailed records of documented grant disbursements, match, and project tasks and deliverables for a period of 3 years from

the end of the contractual period for the grant.

#### PART Env-Wq 1307 DIAGNOSTIC AND FEASIBILITY STUDIES

Env-Wq 1307.01 Eligibility for Diagnostic and Feasibility Studies. To be eligible for participation in the diagnostic and feasibility study program established under RSA 487:21, I, the subject water body shall:

- (a) Be a surface water of the state;
- (b) Have at least one public access or public boat access area;
- (c) Be:
  - (1) Listed as impaired on the current or draft list prepared pursuant to section 303(d) of the federal Clean Water Act as specified in 40 CFR 130.7;
  - (2) Identified as being at risk of being impaired in documented Volunteer Lake Assessment Program (VLAP) data demonstrating a statistically-significant decline in water quality; or
  - (3) Experiencing change(s) within its boundaries or within its watershed that are deemed a significant risk to the water quality and designated water uses by the department pursuant to section 305(b) of the federal Clean Water Act as specified in 40 CFR 130.8;
- (d) Be sponsored by an organized association or a municipality providing matching funds and volunteer time; and
- (e) Be the subject of an organized and coordinated water quality monitoring program that has collected water quality data spanning 10 or more consecutive years, such that:
  - (1) The surface water is monitored at least 3 times from May 15 through October 1, with the samples taken at least 30 days apart; and
  - (2) All analyses were performed by the department's laboratory or a laboratory certified by EPA or another government agency using National Environmental Laboratory Accreditation Committee standards.

#### Env-Wq 1307.02 Application to Participate in Diagnostic and Feasibility Study.

- (a) The application to participate in a diagnostic and feasibility study shall be filed:
  - (1) By a municipality or an organization, such as a lake association, that is in good standing with the New Hampshire Secretary of State; and
  - (2) For a surface water that is eligible to participate as specified in Env-Wq 1307.01.
- (b) The application shall be in writing and addressed to the DES Limnology Center Director and Clean Lakes Program Coordinator.
- (c) The application shall include the following:

- (1) The applicant's name and mailing address and the name, mailing address, and daytime telephone number of an individual who can be contacted on behalf of the applicant with questions regarding the application;
- (2) The name of the surface water that would be the subject of the study and whether it is public or private;
- (3) Certification that the surface water meets the eligibility criteria specified in Env-Wq 1307.01;
- (4) The reason for request;
- (5) Observations related to declines in the recreational, ecological, and economic value of the surface water due to impairment;
- (6) Specific areas of concern in the surface water or watershed, or both;
- (7) Desired outcomes for surface water and watershed conditions; and
- (8) The level of financial support and volunteer participation donated by the applicant during the study and implementation phases.

(d) The application shall be signed by a responsible official of the organization or political subdivision that is applying to participate. Such signature shall constitute certification that the information contained in the application is true and complete to the signer's information and belief.

Env-Wq 1307.03 Participation Determinations.

(a) The department shall review the participation applications to:

- (1) Determine whether they meet the criteria of Env-Wq 1307.02; and
- (2) Rank them using the prioritization criteria specified in Env-Wq 1307.04.

(b) The department shall notify each applicant in writing regarding whether or not the proposed project was selected for participation. If the proposed project was not selected, the written notice shall specify the reason(s) for the decision.

(c) The department shall maintain a ranked list of accepted applications.

(d) As funds become available, the department shall conduct diagnostic and feasibility studies in the order on the ranked list.

Env-Wq 1307.04 Prioritizing Diagnostic and Feasibility Studies. Pursuant to RSA 487:18, project priority shall be determined by totaling the points assigned under each of the following categories:

(a) Based on the degree of impairment of the surface water, points shall be assigned as follows:

- (1) Lakes and ponds not listed as impaired on the current or draft list prepared pursuant to section 303(d) of the federal Clean Water Act as specified in 40 CFR 130.7 shall receive 0

points;

(2) Lakes and ponds not listed as impaired on the current or draft list prepared pursuant to section 303(d) of the federal Clean Water Act as specified in 40 CFR 130.7, but identified as being at risk of being impaired in documented Volunteer Lake Assessment Program (VLAP) data demonstrating a statistically-significant decline in water quality shall receive one point;

(3) Lakes and ponds listed as impaired on the current or draft list prepared pursuant to section 303(d) of the federal Clean Water Act as specified in 40 CFR 130.7 shall receive 3 points; and

(4) The score for this category shall be multiplied by a weighting factor of 4;

(b) Based on the type and availability of public access sites and public boat access sites, points shall be assigned as follows:

(1) Privates lakes and ponds shall receive 0 points;

(2) Public bodies of water with no known access point shall receive one point;

(3) Public bodies of water where public access exists only as open land or beach and there is no public boat access area shall receive 2 points;

(4) Public bodies of water where a public boat access area exists shall receive 3 points; and

(5) The score for this category shall be multiplied by a weighting factor of 2;

(c) Based on the predominant use(s) of the surface water, points shall be assigned as follows:

(1) Surface waters where less than 30% of the shorefront is developed shall receive 0 points;

(2) Surface waters where the surrounding land use is mostly residential and boating is predominantly small boats and canoes shall receive one point;

(3) Surface waters where the surrounding land use is both residential and transient and boating is a mix of large and small boats, including unmotorized boats, shall receive 2 points;

(4) Surface waters designated as public water supplies shall receive 3 points; and

(5) The score for this category shall be multiplied by a weighting factor of 2;

(d) Based on the impact of the impairment or potential impairment to recreational and economic values of the surface water, points shall be assigned as follows:

(1) The impairment is to mostly-undeveloped surface water where there is little cultural impact shall receive 0 points;

(2) The impairment is on lakes and ponds with mostly residential impacts shall receive one point;

(3) The impairment impacts residential or public beaches shall receive 2 points; and

- (4) The impairment impacts commercial operations, such as marinas, public beaches, motels, restaurants, and public docks, shall receive 3 points;
- (e) Based on the impact of the impairment or potential impairment to ecological values of the surface water, points shall be assigned as follows:
- (1) Impairments to mostly non-native plant or animal communities in the lake or pond shall receive 0 points; and
  - (2) Impairments to native plant or animal species, such that the identified impairment would reduce the habitat for those species to the point where their abundance may be altered, shall receive 2 points; and
- (f) Based on the amount of local match, points shall be assigned as follows:
- (1) Projects where the applicant proposes to provide not more than 50% match for the project shall receive 0 points;
  - (2) Projects where the applicant proposes to provide at least 50% but less than 65% match for the project shall receive one point;
  - (3) Projects where the applicant proposes to provide at least 65% but less than 80% match for the project shall receive 2 points; and
  - (4) Projects where the applicant proposes to provide 80% or more match for the project shall receive 3 points.

## Appendix

<b>Rule</b>	<b>State Statute(s) Implemented</b>
Env-Wq 1301	RSA 487:15-23
Env-Wq 1302	RSA 487:15-23
Env-Wq 1303	RSA 487:16-a; RSA 487:24, VII
Env-Wq 1304	RSA 487:17, II (d); RSA 487:24, VII-c
Env-Wq 1305	RSA 487:17, II (c); RSA 487:24, VII-b
Env-Wq 1306	RSA 487:17, I (c), II, & III; RSA 487:18, :20, :21; RSA 487:24, II-VI
Env-Wq 1307	RSA 487:17, I (a) & (b); RSA 487:18, :20, :21, :22; RSA 487:24, I-VI

## **Appendix Two**

### Chronology of Key Events: 1981-2008

## **NHDES Exotic Aquatic Species Program Chronology of Events: 1981-1998**

### **1981**

- The exotic aquatic weed control legislation (RSA 487-17 formally RSA 149-F:3) became law on August 22, 1981.
- Fifty thousand brochures describing the exotic aquatic weed control program were distributed to boat license agents, state rest areas, marinas and lake associations.
- Waterproof posters depicting how to stop the spread of exotic weeds to other waterbodies were designed and distributed by DES personnel. Posters were placed at high use boat launching facilities throughout the state.
- A television commercial describing the exotic weed control program aired on Channel 9, in Manchester.
- Articles on exotic weed control were placed in several of the states most read newspapers.
- Personnel from this department discussed the exotic weed control problem at many lake association meetings.
- Several exotic weed complaints were field investigated by DES personnel.

### **1982**

- The Citizen Aquatic Weed Control Advisory Committee was formed.
- Educational material was distributed throughout the state to keep the public up to date on milfoil control. Boat license agents, state rest areas, boat marinas and lake associations received this material.
- Matching funds were awarded to Smith Cove Lake Association for mechanical harvesting of milfoil in Lake Winnepesaukee.
- Fifty lakes were surveyed for the presence of exotic weeds.
- A new infestation of milfoil was discovered in the outlet of Lake Waukegan by DES personnel. It was successfully eradicated with an aquatic herbicide.

### **1983**

- The Smith Cove Lake Association in Gilford and the Wolfeboro Conservation Commission were awarded matching fund grants for the harvesting of milfoil in Lake Winnepesaukee.
- Educational material was distributed throughout the state.
- Fifty lakes were surveyed for exotic weed life by DES personnel.
- Several complaints or inquiries pertaining to exotic weeds were either field investigated or handled through correspondence.
- DES personnel presented several talks on weed control at lake association meetings during the summer.
- Correspondence to other states and countries experiencing exotic aquatic weed problems was initiated in order to obtain new or existing aquatic weed control techniques.

### **1984**

- The Towns of Alton, Gilford, Meredith and Wolfeboro were awarded matching grants to mechanically harvest exotic milfoil in Lake Winnepesaukee.
- The West Alton Marina was awarded a matching grant to apply aquatic herbicide to their

dock area to control milfoil.

- Educational material was distributed throughout the state.
- Fifty exotic weed surveys were performed throughout the state.
- A new infestation of milfoil was hand pulled at the boat launching facilities on Crescent Lake in Wolfeboro. SCUBA equipment was utilized during the operation.
- Several aquatic weed complaints were field investigated by DES personnel.
- Personnel from DES monitored a lake drawdown and dredging project that was undertaken to control exotic fanwort in Millville Lake in Salem.
- Several newspaper articles were published state wide pertaining to exotic aquatic weed control. The Boston Sunday Globe did an extensive feature story on exotic milfoil in Lake Winnepesaukee. "The Laker" in Wolfeboro printed an excellent article explaining the problem.
- DES personnel addressed the exotic plant control problems at lake association meetings during the summer.

### **1985**

- Funding for exotic weed control was suspended due to a previously unknown legislative footnote. No weed control projects were funded this year.
- Fifty exotic weed surveys were performed on lakes throughout the state.
- Millville Lake was inspected for Cabomba growth following a dredging operation.
- Educational material was distributed throughout the state.
- DES SCUBA team removed a small patch of milfoil from Crescent Lake boat landing area in Wolfeboro.
- DES personnel addressed aquatic weed problems at lake association meetings.

### **1986**

- Aquatic weed control program funds became available due to legislative action. However, no projects were funded that summer due to funds not being available in time.
- Fifty exotic weed surveys were undertaken during the summer months.
- Two papers entitled "A Review of Current and Experimental Methods for the Control and Management of Aquatic Milfoil" and "Answers to Questions Concerning Aquatic Milfoil in New Hampshire Surface Waters" were written for distribution to the public.
- Educational material was distributed to lake associations, boat marinas, and the general public.
- Millville and Crescent Lakes were intensely surveyed for exotic weeds.
- Personnel from DES addressed aquatic weed problems at lake association meetings during the summer months.

### **1987**

- Matching funds were awarded to the Town of Alton to undertake a milfoil dredging project in Lake Winnepesaukee.
- SCUBA divers removed small milfoil infestations at the Crescent Lake boat landing in Wolfeboro and in a section of the Winnepesaukee River in downtown Laconia.

- Two mechanical harvesting projects were planned for the summer. However, town officials could not obtain the necessary local funding to match the state's share.
- An attempt to dredge 10,000 square feet of milfoil and bottom substrate was canceled in Opechee Lake in Laconia. Heavy duty equipment became mired down in the deep muds near the milfoil infestation.
- Educational material was distributed throughout the state.
- Intensive exotic weed surveys were undertaken in seventeen lakes and ponds near Lake Winnepesaukee. These ponds were considered to be vulnerable to a milfoil infestation.
- Fifty exotic weed searches were performed on other state lakes.
- A grant of \$45,000 was awarded to the University of New Hampshire in Durham for Research on how to control exotic weed growth. Research was conducted in Back Bay in Wolfeboro on Lake Winnepesaukee.
- Private citizens participating in the New Hampshire State Assisted Lay Monitoring Program were instructed to report the sighting of any new weed growths in their respective lakes and ponds. The manual used by these lay monitors has a special section on exotic weed life.
- Millville Lake in Salem was checked for any regrowth of fanwort after a dredging operation. There has been no sign of fanwort in the lake to this date.
- A news release concerning exotic weeds and their potential spread to other lakes was distributed throughout the state media system.
- DES personnel participated in a workshop entitled "Nuisance Aquatic Weeds in New England". This workshop was sponsored by the New England Association of Environmental Biologists.
- A 4" x 6" educational handout card depicting how exotic weeds can be spread to other lakes through boating activity was distributed to boat owners during registration of their respective boats.

## 1988

- The state initiated a "Weed Watcher Program" for lake residents. Volunteer weed watchers were given instruction kits which taught them how to look for exotic weeds in their respective lakes. Any weeds that were suspected to be milfoil or fanwort were submitted to the DES Biology Bureau for verification. The program was well received by the public.
- Fifty exotic weed surveys were performed during the summer as well as many field investigations of exotic weed complaints.
- Matching funds were awarded to the Smith Cove Lake Association for the harvesting of exotic milfoil in Lake Winnepesaukee.
- Benthic barriers were installed in Lake Opechee to control a small area infested with milfoil.
- DES personnel assisted on a private dredging project to control milfoil in Lake Opechee.
- Hand pulling of small infestations of milfoil was undertaken in Flints Pond, Crescent Lake, Lake Opechee and the Winnepesaukee River.
- A boat inspection program to detect "stowaway" exotic plant fragments was initiated during the summer of 1988. Participating towns were given \$2.00 per boat inspection. A questionnaire was also filled out by each person going through the inspection. Educational material was handed out to all boaters using these inspection launch sites. Towns participating were Meredith, Alton, Center Harbor (Winnepesaukee) and Sunapee

(Lake Sunapee).

- Exotic milfoil was found in Turkey Pond, Concord and Flints Pond in Hollis during routine exotic weed surveys.
- Several boat docking facilities and launch sites were checked for the presence of exotic weeds during the summer.

### 1989

- A matching grant was awarded to the Locke Lake Association in Barnstead for the purpose of chemically treating 40 acres of exotic milfoil. The chemical called Diquat was used to control the milfoil.
- Lake shore residents along the northwestern section of Opechee Lake were awarded a matching grant to dredge milfoil and the bottom muds that sustain the exotic weeds. This was undertaken during a fall drawdown of the lake.
- St. Paul's School, located in Concord, was awarded a matching grant to mechanically harvest and hydrorake milfoil in Library Pond and Lower School Pond. The grant also provided for the application of lime to selected milfoil beds to determine if there was a reduction in biomass. The lime experiment was intended to supplement the work previously undertaken on Lake Winnepesaukee in 1987.
- Fifty lake surveys were performed which included intensive searches for exotic weeds.
- Several complaints were investigated relative to sightings of exotic plants.
- A matching grant was awarded to lake residents in Paugus Bay in Laconia, for the purpose of controlling milfoil with a mechanical weed harvester. Boat movement through the area was impeded by the large amounts of exotic milfoil.
- Milfoil was confirmed to be growing in Contoocook Lake in Rindge. DES biologists spent a whole day mapping the extent of the problem in Contoocook Lake. Several meetings were scheduled between lake association residents and DES biologists to determine a course of action to curtail the milfoil infestation. After discussing the problem thoroughly with all concerned, it was decided that the use of an aquatic herbicide would be the most efficient milfoil management tool available. During the winter months, plans were drawn up, permits obtained and a weed control firm was hired to complete the plan.

### 1990

- Exotic milfoil was found in Northwood Lake during a routine inspection. Initially it was thought to be a small localized infestation. A SCUBA team revealed later that the milfoil encompassed a larger area not seen during the boat inspection. Since this was a pioneer infestation of milfoil it was decided that the best course of action to control the problem would be through the use of the herbicide called Diquat. The entire lake was surveyed for the presence of milfoil towards the end of the summer. The survey revealed that the initial infestation had spread to about 75 acres of the lake shore. Invitation for bids to control this problem were sent out and the necessary permits were obtained with a target date set for the spring of 1991 for the application of the chemical Diquat. DES funded 100% of the project.
- Contoocook Lake in Rindge received a matching grant from DES to treat 70 acres of milfoil. Aquatic Control Technology Inc. was selected to treat the lake with liquid Diquat. Milfoil had entered the lake about three to four years earlier but was not brought to the state's attention until 1989.

- A small patch of milfoil (50'x10') was found at the Mast Landing boat launching site in Crescent Lake, Wolfeboro. To prevent boats from transporting the milfoil into nearby Wentworth Lake, DES personnel used Aqua Screen, a bottom barrier, to smother the plants. The screen effectively killed the milfoil and is still in place to prevent further plant growth.
- Fifty lake water quality surveys were completed during the summer. During the surveys aquatic weeds were noted.

### 1991

- During the month of June, approximately 75 acres of exotic milfoil in Northwood Lake was treated with the herbicide called Diquat. Since the milfoil was new to the lake system, the entire cost of the weed control operation was funded by the Department of Environmental Services (DES).
- The Fish Cove Lake Association and Mt. View Marina, both located on Lake Winnepesaukee, had severe infestations of exotic milfoil that precluded the recreational and commercial value of the waters. They each received matching grants to fund the application of the herbicide Diquat. Crescent Lake in Wolfeboro, also received a grant to treat 35 acres of milfoil with Diquat.
- A "weed watcher" on Lake Winnisquam notified DES that exotic milfoil was found in the northern section of the lake. DES personnel confirmed the milfoil sighting and sent two SCUBA divers to cover the small milfoil infestation with Aqua Screen. Any "straggler" plants were hand pulled by the SCUBA divers.
- A "weed watcher" from Lees Pond in Moultonborough noticed that some stands of milfoil in the pond were being eaten by some unknown animal. Closer inspection by DES personnel revealed that an aquatic moth was responsible for the apparent decline in the milfoil biomass. The aquatic moth was subsequently identified as Paraponyx allionealis. DES SCUBA divers observed and monitored the progress of the insect and mapped out the areas affected by the insect.
- A new sign warning lake residents that milfoil was growing in their respective lakes was designed and placed at the milfoil infested lakes, usually at the boat launching facility.
- Fifty lakes were surveyed for the presence of milfoil or other exotic weeds.
- DES personnel presented several talks on exotic weed control at lake association meetings during the summer months.
- Professional divers were hired to hand pull a new infestation of milfoil in Round Cove on Lake Winnepesaukee. This was a fifty-fifty match with the local residents. DES biologists monitored the project.

### 1992

- Round Cove located on Lake Winnepesaukee was given a matching grant to control a small encroachment of milfoil. A weed control firm was hired to apply liquid Diquat to the 5 acre cove. Mt. View Marina in Gilford was also given a grant to chemically control the obnoxious milfoil that interfered with boating activities.
- DES and the Town of Wolfeboro provided money for Brewster Academy to study the aquatic moth currently eating milfoil in Lees Pond in Moultonborough. The study examined the fundamental characteristics of the aquatic moth, such as food preferences, biomass consumption, and the life cycle. These studies were performed in Back Bay in Wolfeboro and Lees Pond. Initial tests performed in "live cages" showed that the insects

will decrease milfoil if in sufficient numbers. DES personnel assisted the researchers at Brewster Academy during the summer.

- A new exotic weed Myriophyllum spicatum was discovered growing in Mountain Pond in the Town of Brookfield. Otherwise known as Eurasian milfoil, this plant can spread very quickly to other ponds. A decision was made to drain the small shallow pond in an attempt to freeze and dry out the hardy plants. The beaver dam holding back the lake was breached during the fall. The plan is to let the pond stay down for at least two years. Several trips were made to the pond to insure that local beaver were not plugging the opening in the dam. As a last resort the pond may need a spot treatment of herbicides to insure that it does not spread to other nearby waterbodies.
- Exotic milfoil was found growing in Lake Winnisquam in the Towns of Tilton and Belmont. The combined total affected area was 7.81 acres. Since this was a new infestation of exotic weeds, the state was mandated to fund 100% of the weed control process. The decision was made to treat the two small areas with the herbicide 2,4-D. A request for bids to treat the two areas was sent out during the fall of 1992. A contractor was hired to obtain all the necessary permit from the Division of Pesticide Control and to apply the granular 2,4-D to the sites in Lake Winnisquam. Unfortunately, the project ran into difficulties over the issue of a nearby business using the lake as a drinking water source. The treatment area was too close to the drinking water source. The project was denied by the Division of Pesticide Control.
- The Wentworth Lake association applied for a matching grant from the state to chemically treat thirty five acres of milfoil in nearby Crescent Lake, Wolfeboro. This project also was denied due to a drinking water issue and the use of the aquatic herbicide 2,4-D.
- As in previous years, educational material was distributed to the public, exotic weed signs were placed at boat launching sites and talks relating to the exotic weed problem were given by DES personnel. Also, many weed specimens were submitted to DES for identification. Fifty weed surveys were performed on selected lakes in conjunction with a survey of the current water quality status of each waterbody.

### 1993

- The following were awarded matching grants from the state for the purpose of controlling exotic milfoil:
  - a. Mt. View Marina - Gilford; herbicide; 2, 4-D
  - b. Lake Shore Park - Gilford; herbicide; 2,4-D
  - c. West Alton Marina - Alton; herbicide; 2,4-D
  - d. Contocook Lake Association - Rindge/Jaffrey; herbicide; Diquat

Each site was severely infested with exotic milfoil to the point that recreational and commercial activities were impaired.

- "Weed Watchers" found three more lakes that harbored suspected stands of milfoil. Lower Suncook Lake, Lake Wentworth and Broad Bay were the latest victims of the milfoil encroachment. DES personnel covered the small stand of milfoil in Lake Wentworth with a benthic bottom barrier. The barrier physically constrains the weeds and ultimately smothers the plants within a month. Suncook Lake in Barnstead had scattered stands of milfoil near the outlet section of the lake. DES SCUBA divers placed bottom barriers on the milfoil. Each of the 5 stands of milfoil took about 300 square feet of bottom barrier. Any separately growing plants were hand pulled by the divers. During the fall

drawdown of Lower Suncook Lake DES personnel patrolled the affected area searching for new milfoil growths missed during the summer. Any patches larger than 25 square feet were covered with barrier while "straggler" plants were individually hand pulled. The milfoil in Broad Bay (Bay Marina) seems to be confined to an area not larger than two acres. Local residents concerned about the problem are hand raking and pulling the milfoil plants. This area will be looked at more extensively next spring in order to decide what type of management approach will be undertaken to control the problem.

- In 1991 Northwood Lake was chemically treated to control exotic milfoil. The plants came back during the summer of 1992 and 1993. After a meeting with the lake association and DES personnel, it was decided to draw down the water in Northwood below the normal winter drawdown level. It is hoped that a cold winter will kill the newly exposed plant life.
- Officials from the Lake Wentworth Lake Association found milfoil growing in a small cove near Albee Beach in Wolfeboro. They notified DES officials of its presence and location on the lake. The plants did not have all the necessary taxonomic features needed to correctly identify the milfoil to species. However, since the milfoil was suspected to be an exotic species, it was decided that something should be done to ensure that it does not spread to the rest of the lake. DES personnel decided to cover the small area with bottom barrier. Approximately 1500 square feet of bottom barrier (Aqua Screen) were installed over the milfoil plants.
- Each year a Volunteer Lake Monitoring Workshop is held at DES headquarters in Concord. This year an aquatic weed workshop was given as well as an overview of the exotic weed program. These two programs were well attended by lake volunteers.
- Lake association members from New York state concerned about the current milfoil spread in their state asked a representative of DES to give a talk on the New Hampshire exotic weed program. They are trying to get a similar program started in New York.
- A representative from DES gave a major exotic weed presentation at the annual "Bass Master" state chapter meeting held in Concord. Major emphasis was given to cleaning weeds from boats during the "Bass Master" competitions held at many lakes during the summer months.
- An exotic weed control talk was given at the annual "Lakes Congress" held at St. Paul's School in Concord. About one hundred representatives from the many lakes of New Hampshire attended the conference.
- A grant was given to Brewster Academy in Wolfeboro to do follow up studies on the insects that eat milfoil. DES personnel assisted on this project by supplying a dive team to perform some of the experiments. Local lake association people also got involved on this project.
- Approximately 300 weed watcher kits were given out to various lake associations throughout the state. Requests for the "kits" were received from other states.
- DES personnel periodically checked on the status of the Mountain Pond drawdown in Brookfield. Occasionally, beaver would attempt to plug up the breach in the dam. The mini drought experienced this summer took its toll on the exposed Eurasian milfoil plants. Once the plants dried up, land plants took their place.
- NH Fish & Game became the lead agency for the "Statewide Public Access Program." They have agreed to place DES exotic weed warning signs at all their new and existing public access points.
- Currently, a new exotic weed sign is being developed for distribution during the summer of 1994.

- Several routine exotic weed complaints were field investigated by DES personnel. Many suspect weeds were sent to the DES Limnology Center for identification.
- Fifty lake surveys to determine current water quality status were performed by DES biologists during the summer. A weed survey was undertaken during the survey. A search for exotic weed species was also performed on each lake or pond.
- Problems associated with milfoil and other exotic plants in NH generated several newspaper articles during the summer. This "free publicity" helped get the word out to the public informing them to be careful not to spread exotic weeds to other lakes and ponds through boating activities.
- A weed watcher from the northern section of Lake Winnisquam notified DES biologists that a small patch of milfoil had appeared in one of the coves. SCUBA divers successfully hand-pulled the plants before they spread to other sections of the lake.

### 1994

- Pioneer infestations of exotic milfoil were found in Lake Waukewan, Meredith; Cheshire Pond, Jaffrey; Broad Bay, Freedom; and Silver Lake in Tilton.

**Lake Waukewan, Meredith** -DES biologists found approximately 1.5 acres of the exotic milfoil in the outlet/canal section of Lake Waukewan during a routine water quality inspection. This same general area had milfoil in 1981 and was successfully treated and controlled with a chemical herbicide in 1982.

**Cheshire Pond, Jaffrey** -A resident on Cheshire Pond in Jaffrey reported sighting milfoil in a beach area. A DES biologist confirmed the milfoil to be exotic. The milfoil probably floated downstream from nearby Contoocook Lake ultimately taking hold in the pond. A temporary drawdown of the pond was initiated during the month of December in an attempt to freeze the milfoil plants.

**Silver Lake, Tilton** - Exotic milfoil was found in Silver Lake in Tilton by the University of New Hampshire lay monitoring officials. DES responded to the problem quickly by hand pulling the plants and digging up the remaining plants during a fall drawdown of the lake. This site will be inspected in the spring of 1995 for signs of regrowth.

**Broad Bay, Freedom** -DES biologists had trouble identifying the milfoil at this site in 1993 because the plant did not exhibit flowers which are critical to a positive identification. However, in 1994 flowers did appear and the plant was identified as exotic milfoil. This site will be chemically treated in 1995.

- Three matching grants were awarded to lake associations in 1994 for the purpose of exotic weed control. They were as follows:

Association	Lake	Town	Type Exotic	Control Method
Locke Lake Assoc.	Locke Lake	Barnstead	Milfoil	Chemical
Meredith Yacht Club	Winnepesaukee	Meredith	Milfoil	Chemical
St. Paul's School	Turkey Ponds	Concord	Milfoil	Mechanical harvesting

- DES biologists performed several underwater exotic weed surveys with the aid of SCUBA equipment. These surveys were done to get an accurate assessment of the milfoil infestations.
- A new sign designed to educate boaters was made and placed at many boat launches throughout the state.
- Northwood Lake in Northwood was lowered in November so that the state could replace the old dam. The lake was drawn down all winter and did slow down the milfoil growth along the shoreline.
- Several informational talks were presented at lake association meetings by DES biologists. A radio talk show on exotic weeds was aired in Lebanon, while a local TV station did a major news segment on the exotic weed control program.
- DES personnel went to a meeting in Vermont to discuss new methods of controlling exotic weeds.
- Several hundred “weed watcher kits” were requested by the public. This volunteer program has been very successful over the past few years.
- Several suspected exotic weed sightings by weed watchers or other concerned lake residents were investigated by DES biologists. Many samples were sent to the Limnology Lab for identification.
- Fifty more exotic weed surveys were performed during the summer. These surveys supplement the weed watcher efforts performed by volunteers.
- Five milfoil contracts were put out to bid in 1994. These weed control projects will occur during the spring of 1995.
- Mountain Pond in Brookfield, which originally had Eurasian milfoil is still empty. There is no sign of any milfoil in the small stream that flows through the empty pond.

## 1995

- The outlet section of Lake Waukegan in Meredith was treated with the herbicide called Aqua Kleen. Aquatic Control Technology, Inc. of Northborough, MA was hired by DES to undertake the project. If the milfoil had not been controlled there was a good chance it may have spread through the rest of the lake. It would have been impossible to treat the main lake since the Town of Meredith uses the lake for drinking water. An inspection of the treatment area with SCUBA gear did not reveal any milfoil plants. The treatment was a success.
- Lower Suncook Lake in Barnstead had six acres of milfoil treated with the herbicide called Reward. Lycott Environmental Research, Inc. of Southbridge Massachusetts was hired by DES to perform the treatment.
- Crescent Lake in Wolfeboro was also treated with the herbicide called Reward. An inspection of the treated area in the fall revealed no milfoil. To date treatment efforts have kept milfoil from invading the main section of nearby Lake Wentworth.
- Mountain Pond in Brookfield is still drained. Still no signs of Eurasian milfoil.
- Eurasian milfoil was found growing in the Connecticut River in Charlestown. A large boat launching facility on the Vermont side of the river is used by fishermen from both states. Vermont officials were notified of the milfoil. They posted warning signs near the launch site. Leaflets informing the public about the milfoil were handed out to the boating public at a toll booth as they crossed from New Hampshire into Vermont.
- A “weed watchers wheel” was developed to distribute to the public to aid them in their search for exotic weeds. The wheel accompanied the standard “weed watcher kit” used

- by lake monitors.
- The proposal to treat Broad Bay in Freedom with herbicides was terminated due to time constraints and permitting problems.
- Contoocook Lake Association received a matching grant from the state to chemically treat small areas of milfoil. The herbicide called Diquat was used in this project.
- Several milfoil talks were given to lake associations during the summer.
- Benthic barriers were installed in a small cove on Wentworth Lake to control a small stand of milfoil.
- Milfoil was hand pulled in Lower Suncook Lake by SCUBA divers from DES.
- Eight proposed herbicide applications for the purpose of milfoil control were submitted to the Governor and Council for approval. The projects were as follows:
  - a. Broad Bay, Freedom
  - b. Lakeshore Park, Gilford
  - c. Mt. View Marina, Gilford
  - d. West Alton Marina, Alton
  - e. Winnisquam Lake, Belmont
  - f. Silver Lake, Belmont
  - g. Cobbetts Pond, Windham
  - h. Fish Cove, Meredith
- Exotic milfoil was found at Claire's Boat Landing on Lake Massabesic in Auburn. This lake is Manchester's water supply. Benthic barriers were placed on a large portion of the milfoil. The use of herbicides was not allowed due to the drinking water status of the lake. Manchester Water Works personnel moved the benthic barriers to other milfoil sites as needed.

## 1996

- Eight herbicide applications to control milfoil occurred during the month of June. They are as follows:
  - a. Broad Bay, Freedom
  - b. Lakeshore Park, Gilford
  - c. Mt. View Marina, Gilford
  - d. West Alton Marina, Alton
  - e. Winnisquam Lake, Belmont
  - f. Silver Lake, Belmont
  - g. Cobbetts Pond, Windham
  - h. Fish Cove, Meredith
- Two new infestations of milfoil were confirmed by the DES staff. Captain Pond in Salem and Lake Massasecum in Bradford now possess the nuisance weed.
- SCUBA divers checked Lake Waukegan for any signs of milfoil regrowth one year after it was treated. No milfoil plants were observed during the dive.
- Milfoil was discovered growing in the northern end of Lake Winnisquam.
- A milfoil education display was presented at the Fish and Game Department "Discover Wild New Hampshire Day."
- A similar display was also presented at "Celebrate Your Lakes Day" held this summer in Meredith.
- Milfoil informational talks were given throughout the summer at many lake association meetings.
- A talk was given to the Fish and Game Department volunteer fishing instructors on how to look for exotic weeds throughout the state.
- Ken Warren attended a National Weed Control Conference held in Burlington Vermont in July. Several papers on new promising control techniques were presented.

- Benthic barriers were placed on a small infestation in Lake Winnisquam.
- Mountain Pond in Brookfield was checked for any regrowth of Eurasian milfoil. No plants were found during the inspection.

### 1997

- Six herbicide applications were performed in the spring to control nuisance growths of exotic aquatic plants:
  - a. Northwood Lake, Northwood
  - b. Lake Winnepesaukee, Mountain View Marina, Gilford
  - c. Lake Winnepesaukee, Meredith Bay, Meredith
  - d. Lake Massasecum, Bradford
  - e. Lake Winnepesaukee, Krainwood Shores, Moultonboro
  - f. Locke Lake, Barnstead
- Benthic barriers were placed in Heath Bog of Lake Wentworth in Wolfeboro, Lake Massabesic in Auburn, Lake Massasecum in Bradford, as well as in small localized areas in other lakes.
- A new infestation of milfoil was documented at Claire's Boat Landing on Lake Massabesic in Auburn, and Powder Mill Pond in Hancock.
- SCUBA divers inspected several small infestations of milfoil and hand-pulled plants where they were encountered in low densities.
- Several displays were presented at summer events and festivals including "Celebrate Your Lakes Day", and "Discover Wild New Hampshire Day."
- Informative presentations were given at a number of lake association meetings throughout the summer.
- HB 181 was passed prohibiting a number of activities associated with exotic aquatic plants.

### 1998

- RSA 487:16-a went into effect on January 1, 1998. This new law prohibits the sale, distribution, importation, purchase, propagation, transportation, or introduction of 14 listed exotic aquatic plants in New Hampshire. The new statute also allows for the designation of restricted use areas on waterbodies.
- On September 5, 1998 new rules were enacted pursuant to RSA 487:16-a.
- Benthic Barriers were placed in Lake Winnepesaukee in Meredith, Lake Wentworth in Wolfeboro, Contoocook Lake in Jaffrey, Hopkinton Lake in Hopkinton, Lake Massabesic in Auburn, and Lake Massasecum in Bradford, as well as in small places in an additional 2-3 lakes.
- Maintenance hand-pulling activities took place at a number of lakes with new and existing milfoil infestations.
- The following herbicide applications were performed during the Spring:
  - a. Forest Lake, Winchester
  - b. Captains Pond, Salem
  - c. Sunrise Lake, Middleton
  - d. Contoocook Lake, Jaffrey
  - e. Lake Winnepesaukee, Gilford
  - f. Lake Winnepesaukee, Moultonborough
  - g. Lake Winnepesaukee, Tommy Cove, Meredith
- A number of summer lake festivals were attended by the Exotic Species Coordinator, including "Celebrate Your Lakes Day," "Naturally Newfound," "Discover Wild New

- Hampshire Days,” and Keene State College “Solarfest.”
- Several presentations were given to towns and lake associations throughout the state on exotic aquatic plants.
- Exotic species signs which are posted at boat launches throughout the state were revised to include the changes in legislation associated with exotic plants.
- A number of milfoil control activities were conducted this summer at Lake Massasecum in Bradford. Benthic barriers were installed, a restricted use area was established in the north cove, and a net was placed across the surface of the water (vertically in water column) to trap floating fragments of milfoil.
- 500 specimens of variable milfoil (*Myriophyllum heterophyllum*) were sent to the Army Corps of Engineers, Waterways Experimental Station in Vicksburg, MS for research on control methods. Garlon 3-A, a new herbicide that is thought to be more effective and environmentally sound than 2,4-D, was used to treat the plants. More extensive research will be conducted this spring.

### 1999

- Eurasian milfoil found in Lake Mascoma in Enfield. Numerous diving operations were conducted to hand remove the milfoil.
- Suspicious patches of milfoil found in Horseshoe Pond in Merrimack and in Belleau Lake, Wakefield. Plants did not flower so positive identifications were not made. Plan to investigate again in 2000.
- Nine herbicide applications were conducted this year. Most were in various portions of Lake Winnepesaukee. Other treatments were conducted at the following waterbodies:
  - Contocook Lake, Rindge
  - Lake Monomonac, Rindge
  - Captains Pond, Salem
  - Crescent Lake, Wolfeboro
  - Lake Wentworth, Wolfeboro
- Numerous presentations were given to lake associations about exotic plants.

### 2000

- New Variable milfoil infestations documented in Little Squam Lake and Squam River, Holderness/Ashland, Danforth Pond, Ossipee, and Rocky Pond, Gilmanton.
- Re-investigations of the two suspect infestations of milfoil from summer of 1999 confirmed that the species of milfoil in Belleau Lake, Wakefield, and Horseshoe Pond, Merrimack were indeed the variable milfoil.
- Herbicide applications conducted at the following locations in 2000:
  - Lake Winnepesaukee, Meredith, Gilford, Center Harbor, Moultonborough, and Alton
  - Northwood Lake, Northwood
  - Locke Lake, Barnstead
  - Lake Monomonac, Rindge
  - Contocook Lake, Rindge

- Innovative milfoil management activities taking place on Lake Massasecum, Bradford. Lake Association, through funding from NHDES, have constructed harvester to repeatedly harvest milfoil in northern cove of lake.
- RUA installed in Little Squam Lake to contain milfoil.
- Hand-pulling conducted on milfoil in channel connecting Big and Little Squam Lakes.
- Research on milfoil impacts to property values initiated at UNH.
- RSA 487:16-b went into effect making it unlawful to knowingly, recklessly, or purposely offer for sale, distribute, sell, import, purchase, propagate, or introduce exotic aquatic weeds into New Hampshire waterbodies. The new law makes it a violation to conduct any of the above listed activities.

### 2001

- New Variable milfoil infestations documented in Lake Sunapee, Sunapee at Georges Mill, and Dublin Lake in Dublin.
- A new invasive plant was first documented in New Hampshire. *Egeria densa*, also known as Brazilian elodea, was found in Nutts Pond in Manchester.
- Herbicide applications conducted in 20 waterbodies, the most waterbodies ever treated in one summer in New Hampshire.
- Innovative milfoil management activities taking place on Lake Massasecum, Bradford. Lake Association, through funding from NHDES, has continued harvesting activities and installing bottom barriers.
- RUA installed in Little Squam Lake and Lake Sunapee to contain milfoil.
- Hand-pulling conducted on milfoil in channel connecting Big and Little Squam Lakes, Dublin Lake, and Lake Sunapee.
- Research on milfoil impacts to property values by UNH suggests a 16+% decline in lakefront property values.

### 2002

- New Variable milfoil infestations documented in Turtle Pond in Concord, Balch Lake in Wakefield (plants found in 2001, but not in flower), Melendy Pond and Lake Potanipo in Brookline and in Brindle Pond in Barnstead.
- DES conducted 25 herbicide applications on various waterbodies throughout the state. This is the most number of treatments that have been conducted in any one year since the program began.
- Innovative harvesting activities continued on Lake Massasecum in Bradford.
- New Hampshire Lakes Association established a pilot Lake Host Program on several waterbodies.
- NHDES began working with Dartmouth College to sequence milfoil genetics and determine if hybridization is occurring.

### 2003

- RSA 487:25 goes into effect establishing the Milfoil and Other Exotic Aquatic Plant Prevention and Research Grant Program.
- First round of Milfoil and Other Exotic Aquatic Plant Prevention Grants awarded to three recipients. New Hampshire Lakes Association, Department of Safety, and Androscoggin River Watershed Council.

- Two new infestations of Variable milfoil documented in Jones Pond in New Durham and in Scobie Pond/Haunted Lake in Frankestown.
- Eurasian milfoil found growing again in Mountain Pond in Brookfield. It was assumed that this infestation was eradicated due to a 3-year drawdown of the pond. Five foot tall plants were found growing in August.

#### **2004**

- Four new infestations were documented this year. Variable milfoil was found in the Merrimack River at the confluence with the Contoocook River in Penacook; in Kimball Pond in Hopkinton, and in the Pemigewasset River in Sanbornton. Fanwort was found in Otternic Pond in Hudson.
- Three Prevention Grants were awarded this year. The New Hampshire Lakes Association, Ossipee Lake Alliance, and the Department of Safety, Division of Safety Services received grants.
- One Research Grant was awarded in 2004. Suncook Lake Association, in participation with the University of New Hampshire, was given a grant to evaluate the effectiveness of a detailed 2,4-D treatment, and to determine if 2,4-D migrates through the substrate and into nearshore wells under normal, and rigorous, pumping regimes.

#### **2005**

- One new infestation was discovered in 2005. Fanwort was found growing in Wilson Lake in North Salem. This infestation was most likely caused by the downstream migration of fragments out of Arlington Mill Reservoir.
- Three Prevention Grants were awarded in 2005. The New Hampshire Lakes Association, the Department of Safety, Division of Safety Services, and the Connecticut River Conservation District Coalition received funds for various projects.
- One Research Grant was awarded during this year. The Suncook Lake Association received a grant to optimize the function of a SCUBA diving device which will aid in efficient milfoil mapping.
- The DES worked closely with a Milfoil Study Committee that was established in 2004. The group met several times throughout the year, and DES was present to provide program updates, status of exotics, and to provide input on future directions that the legislative committee could assist with.

#### **2006**

- MOA with Fish and Game signed regarding development of Long-Term Management Plans for exotic aquatic plants, for all infested waterbodies seeking to perform control activities.
- Three new infestations of exotic plants: 2 variable milfoil infestations and 1 curly-leaf pondweed infestation.

## 2007

- Initiated rulemaking process to add new species to prohibited aquatic plant list, essentially doubling the list of species.
- Increased outreach activities with aquarium and water garden dealers in New Hampshire pursuant to newly amended exotic aquatic plant rules, including extended list of prohibited aquatic plants.
- Two new infestations of variable milfoil: Lake Pemigewasset (New Hampton) and Glen Lake (Goffstown).
- Commissioned the construction of a prototype diver-assisted suction harvester (DASH) for use by DES.
- Initiated the Weed Control Diver Program and Certification Course
- Tracked four pieces of legislation relative to increasing program funding and removing sunset from milfoil funding.
- Rock snot (*Didymo*) first identified in Connecticut River in June. Conducted field sampling and monitoring on *Didymo*.

## 2008

- Field trials and retrofitting the DASH unit.
- Two new infestations of variable milfoil documented: Long Pond (Danville) and Spaulding Pond (Milton).
- Contracted work on developing an Underwater Surveillance Vessel (USV) to enhance mapping techniques of DES biologists.
- No bills were introduced to the legislature this year for milfoil or exotic plant related topics.
- Received final written reports from federally funded milfoil study and posted to DES website.
- Initiated a project with the US Army Corps of Engineers Environmental Research and Development Center. The research focuses on the viability of milfoil seeds in lake sediments. The report from this study should be completed sometime in 2009.
- DES did a number of field demonstrations on the DASH device, including sites in Derry, Rindge, Alton, and Gilford.
- Rule changes that were initiated in 2007 to Env-Wq 1300 were finalized and implemented.

## **Appendix Three**

### Education and Outreach Materials

(for a full array visit <http://des.nh.gov/organization/divisions/water/wmb/exoticspecies/categories/publications.htm>)

# ENVIRONMENTAL Fact Sheet



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WD-BB-40

2007

## Law Prohibits Exotic, Aquatic Plants

On January 1, 1998, the sale, distribution, importation, propagation, transportation, and introduction of key exotic aquatic plants was prohibited (RSA 487:16-a). This law was designed as a tool for lake managers to help prevent the spread of nuisance aquatic plants. Shortly after that, RSA 487:16-6 was added, establishing penalties for violations of this act. It is hoped that by preventing their transport over land, their spread between lakes will be stopped. The following is a list of prohibited exotic aquatic species in New Hampshire.

Latin Name	Common Name
All <i>Myriophyllum</i> species	Milfoils or feather-foils
All <i>Cabomba</i> species	Fanworts
<i>Hydrilla verticillata</i>	Hydrilla or Anacharis
All <i>Trapa</i> species	Water chestnut
<i>Potamogeton crispus</i>	Curly-leaf pondweed
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Phragmites australis</i> or <i>P. communis</i>	Common reed
<i>Egeria densa</i>	Brazilian elodea
<i>Hydrocharis morsus-ranae</i>	European frogbit
<i>Butomus umbellatus</i>	Flowering rush
<i>Najas minor</i>	European naiad
<i>Nymphoides peltata</i>	Yellow floating heart
<i>Crassula helmsii</i>	Swamp stonecrop
<i>Epilobium hirsutum</i>	Great willow herb or hairy willow herb
<i>Glyceria maxima</i>	Reed sweet grass or manna grass
<i>Hygrophila polysperma</i>	East Indian Hygrophila
<i>Ipomoea aquatica</i>	Water spinach
<i>Iris pseudocarus</i>	Yellow iris or yellow flag iris
<i>Lagarosiphon major</i>	African oxygen weed
<i>Limnophila sessiliflora</i>	Ambulia
<i>Marsilea quadriflora</i>	Water fern
<i>Myosotis scorpioides</i>	Water forget-me-not
<i>Sagittaria japonica</i>	Double flowering arrowhead, Japanese arrowhead, or Old World arrowhead
<i>Sagittaria sagittifolia</i>	Giant sagittaria
<i>Typha gracilis</i>	Slender Cattail
<i>Typha laxmanii</i>	Dwarf cattail or Laxman's cattail
<i>Typha minima</i>	Miniature cattail or micro-mini cattail

There are currently over 65 waterbodies in New Hampshire with known exotic plant infestations. In the late 1960s, milfoil and fanwort were the first exotic aquatic plants discovered. Since then, water chestnut, Brazilian clodea, curly-leaf pondweed, and European naiad have also been found in New Hampshire waterbodies.

### **How did this law come about?**

Since the mid-1960s various lakes around the state have been plagued by nuisance aquatic plants such as exotic milfoil and fanwort. Others that do not grow directly in water, but in moist habitats such as roadsides, ditches, and wetlands have been spreading rapidly. The pretty purple flower known as purple loosestrife and the tall tufted reed known as common reed are becoming sights in the state.

To prevent the further spread of these nuisance exotic plants, the NH Department of Environmental Services drafted rules to make RSA 487:16-a and b enforceable. These rules include the above listed prohibited species that are already, or may quickly become nuisance aquatic plants in New Hampshire. These rules are covered in chapter Env-Wq 1300.

### **Why are these particular plants a problem?**

Plants that are native to a particular area have attracted a variety of predators including insects, animals, or pathogens (viruses/fungi), which prevent out-of-control plant growth. Exotic plants have been introduced into the state from areas that are both inside and outside of the United States. Because they are not native to the state, they have no natural predators to moderate their growth. Exotic species are thus able to flourish unchecked in any suitable habitat.

Once established in an area, exotic plants can take over large portions of the ecosystem to which they are introduced. They can cause a decrease in the aesthetic, recreational, and monetary value of New Hampshire's waterbodies and also pose human health risks associated with drowning. Exotic species can also pose a threat to many native species and valuable wildlife habitats.

### **How did these plants find their way to New Hampshire?**

There are a variety of vectors that are believed to have introduced exotic plant species into the state. Some of these sources are natural and hard to control. A natural source may include the widening of the species range due to an increase in the disturbed areas. Interstate transport of exotic plants may also occur when seed and plant pieces become attached to migrating birds and waterfowl.

Other sources revolve around human activities. The sale of aquatic plants, dumping of aquaria into waterbodies, importation of plants for distribution or research, boats, vehicles, and trailers traveling between infested and uninfested waterbodies, and even fishing lures and bait buckets with plant pieces attached can all result in the statewide spread of the nuisance exotic plants. These activities though numerous, are more easily regulated than natural means of transport.

### **What can be done to prevent the spread of exotic aquatic plants?**

Since the law went into effect, activities involving the 29 exotic plants can be effectively managed. To prevent the further spread of these species, always check your boats, motors, trailers, vehicles, fishing lures, bait buckets, dive gear, and any other equipment that may have come into contact with any exotic plant or its habitat. Before you launch your boat and after you pull it out of the water, make sure that you don't have any tag-along plants. Remove all plants that are attached to your boat. Dispose of all plants away from the waterbody. Many launch sites have trash cans where you can dispose of these plants. **DON'T THROW THEM BACK IN THE WATER!**

If you are in any profession or have a hobby that puts you in contact with any exotic aquatic plants listed in the rules associated with RSA 487:16-a, please be aware of the law. If you are a distributor or enthusiast of water garden plants, please destroy all exotic aquatic species. There are many native aquatic plants that are suitable for sale and distribution within the state, including hornwort (*Ceratophyllum*), or native waterweeds (*Elodea*).

### **How does one effectively destroy exotic aquatic plants?**

The best way to eliminate the threat that these plants pose is to insure that they are not able to be transported to an area where they are likely to reproduce themselves. Acceptable means of disposal include burning or incinerating (a permit may be required), land filling, desiccating, and composting (only if plants are exclusively submerged and if applied away from surface waters).

If you have any questions or concerns, or would like a copy of the law or rules, please contact the Exotic Species Program Coordinator at (603) 271-2248. Or, go to the exotic species website at [www.des.nh.gov/wmb/exoticspecies](http://www.des.nh.gov/wmb/exoticspecies).

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# ENVIRONMENTAL Fact Sheet

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WD-BB-4

1999

## Weed Watchers An Association to Halt the Spread of Exotic Aquatic Plants

Milfoil (*Myriophyllum heterophyllum*, *Myriophyllum spicatum*) and fanwort (*Cabomba caroliniana*) are exotic aquatic plants that have become economic and recreational nuisances in some of New Hampshire's lakes and ponds. Dense stands of these plants inhabit shoreline areas frequented by water based recreationalists. Exotic plants can create the following problems:

- Displacement of beneficial wildlife.
- Reduction of aesthetic quality of lakes.
- Devaluation of waterfront property.
- Littering of beaches with plant fragments.
- Makes swimming difficult and dangerous.
- Snags fish lines and stunts fish life.
- Becomes tangled in outboard motor propellers.
- Chokes boat traffic lanes.
- Requires substantial funds for managing.

The spread of these plants to other uninfected waterbodies by transient boat traffic has increased over the last few years. If accidentally introduced into a lake, they grow at explosive rates. Many times new infestations are not discovered by state biologists until the weeds become a nuisance requiring expensive control methods. Once fully established, they are virtually impossible to eradicate. Therefore, education, vigilance, and early detection are key components in keeping these non-native nuisance weeds in check.

**"Weed Watchers,"** a volunteer association dedicated to monitoring the lakes and ponds for the presence of exotic weeds, was formed by the NH Department of Environmental Services in 1988. Volunteers are given a special **"Weed Watchers Kit"** which contains the following:

- Photographs of exotic plants.
- Detailed drawings of the plants.
- An information bulletin on exotics.
- A list of lakes known to have exotic plants, including a map.
- Recommendations on how to conduct a plant survey.
- A complete set of fact sheets and pamphlets on exotics in NH.

The Weed Watchers Kit can be sent to you at no expense. Any individual wishing to participate in the "Weed Watchers" program should contact the Exotic Species Coordinator at:

Department of Environmental Services  
Biology Bureau  
6 Hazen Drive  
PO Box 95  
Concord, New Hampshire 03302-0095  
(603) 271-3503

**What does a Weed Watcher provide?**

All that weed watching involves is a small amount of time during the summer months. Volunteers survey their waterbody once a month from June through August. To survey, volunteers slowly boat around the perimeter of that waterbody and any islands it may contain. Using the materials provided in the Weed Watchers Kit, volunteers will then look for any species that are of suspicion and send them to DES. After a trip or two around the waterbody, volunteers will have a good knowledge of its plant community and will immediately notice even the most subtle changes.

**What happens if a Weed Watcher finds an exotic plant in a waterbody?**

In most cases, volunteers will be instructed to send a plant specimen through the mail or deliver the specimen in person. Please try to collect a portion of the suspect plant when it is in flower. This may be the only way to precisely identify the plant. If the plant is an exotic, a biologist will visit the site to determine the extent of the problem and to formulate a plan of action to control the nuisance infestation.



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# ENVIRONMENTAL Fact Sheet

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WD-BB-44

2005

## **Aquatic Plants and Their Role in Lake Ecology**

Aquatic plants are a common sight in New Hampshire's waterbodies, and many lake residents, as well as visitors to New Hampshire's numerous waterbodies, may question the importance and role of aquatic vegetation. One may ask whether these plants are beneficial or detrimental to the health of a lake ecosystem. This fact sheet will seek to address the most commonly asked questions and concerns regarding aquatic vegetation and their role in lake ecology.

### **What Types of Aquatic Plants Live in My Lake?**

The most common types of aquatic vegetation are those which grow on the shoreland, those which grow partially within a waterbody (emergent), those which grow completely in a waterbody (submerged), and those which float on the surface of a waterbody. Even smaller plants called phytoplankton, commonly known as algae, are also present in our waterbodies. In most cases all of these vegetative types are present in a waterbody, creating a diverse aquatic habitat for a wide range of organisms. All types of aquatic vegetation are beneficial to a lake ecosystem provided that they are native to New Hampshire waters.

### **What Are the Benefits of Aquatic Plants?**

Aquatic plants provide many of the same functions as terrestrial plants. Aquatic plants provide a food source, habitat, removal of carbon dioxide, and production of oxygen through photosynthesis. Plants act as the producers in an ecosystem since they produce their own food as well as food for the consumers or animals of that ecosystem. Aquatic vegetation provides food for tiny microscopic animals called zooplankton, fish, waterfowl, moose and other mammals, and in some cases humans.

Aquatic vegetation also acts as a habitat. Submerged vegetation provides a habitat for small fish which may seek refuge from predators. They may also use this vegetation as spawning beds to lay their eggs. Emergent vegetation provides a habitat for certain songbirds, or wading birds who may nest at these sites or use them as feeding areas.

Not all aquatic plants are nuisances which require removal. Native plants provide many benefits to the lake including spawning and habitat areas for organisms in the lake, as well as fishing and wildlife viewing areas for the residents around the lake.

The wildlife that resides on a lake, as a result of healthy habitats, adds to its serenity. Melodies sung by songbirds, the cry of the common loon, the chirping of frogs, dazzling dragonflies, the painted turtle sunning itself on a rock, and even the majestic herons would be threatened if it weren't for the food and habitat which aquatic vegetation provide.

Aquatic plants also provide several items which humans use. Some of these include rice, cranberries, blueberries, fiber for rope, reeds for caning, herbs, medicinal compounds, and aesthetic items such as flowers and colorful fruits and berries for decoration.

### **What Happens If There Are Too Many Plants?**

As lakes age, plant abundance will naturally increase. However, increased human impacts can cause the aging to occur prematurely. Too much aquatic vegetation within a waterbody may become problematic. Those plants which are not consumed by zooplankton, fish, or waterfowl are consumed in large rates by decomposing bacteria. Excess decomposition by bacteria may deplete oxygen reserves in a waterbody. An increase in decomposition of plant material (in the lower layers of a lake) can cause a buildup of 'muck' at the bottom of a waterbody. This filling in, or 'aging' of a waterbody can cause the depth to decrease and the temperature to increase. A rise in temperature can cause more evaporation and even a lower amount of available oxygen for certain fish species. The addition of sand and sediment may also unnaturally fill a waterbody, creating shallow areas for plants (perhaps exotic) to establish.

### **What Can Be Done To Limit Nuisance Amounts of Plant Growth?**

As a lake resident or concerned citizen, be aware of the activities that take place within the watershed. Nonpoint source pollution is the most common means of nutrient transport into a waterbody. Runoff from roads, septic systems, lawns, and agriculture may bring with it much nitrogen and phosphorus. In freshwater, phosphorus is a nutrient that limits plant growth. The lower the phosphorus levels, the fewer the plants. The best way to protect a waterbody is by protecting its shoreland by maintaining a healthy, well-distributed stand of trees, saplings, shrubs, and groundcover, which act as a filter for nutrients and sediments. Other factsheets are available from DES by contacting the Biology Bureau at (603) 271-3503.

### **Aquatic Plants Are a Natural and Beneficial Part of Your Lake**

Aquatic plants are found in most lakes and ponds in New Hampshire. They are a natural component and vital link to a healthy and diverse aquatic ecosystem. When aquatic plants interfere with human activities, the plants may be quickly viewed as 'weeds,' or nuisances that must be removed. However, complete removal of native plants is not recommended. Not only is it costly and impractical, and may need a permit, it is detrimental to a healthy lake ecosystem. In addition, if the lake is cleared of its native aquatic vegetation, exotic aquatic vegetation may start to colonize the lake. This occurrence has been proven in a number of New Hampshire waterbodies where disturbances to native plant communities have taken place. Maintaining a balanced population of native plant life in a waterbody is the ultimate goal.

# ENVIRONMENTAL Fact Sheet

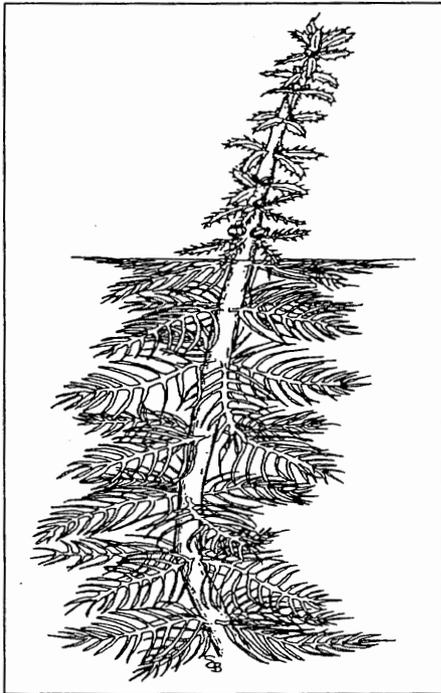


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WD-BB-23

Revised 2002

## Variable milfoil *Myriophyllum heterophyllum* (Michx)



### Species Description/General Information

Milfoil is a submerged aquatic plant with fine densely packed, feather-like leaves whorled around a main stem. It can grow up to 15 feet and may exhibit a three- to six-inch green spike-like flower above the waterline in July. A cross-section of the stem will reveal “pie-shaped” air chambers.

This exotic species of milfoil has been in the state since the late 1960s, and can currently be found in over 50 waterbodies in New Hampshire. There are six native milfoil species present in the state that do not cause problems. Eurasian milfoil is another non-native milfoil found in New Hampshire, but it is less of a threat than variable milfoil due to our water chemistry.

### Why is Milfoil Considered a Nuisance Species?

This species is not native to our state and is very difficult to control once it becomes fully established. Milfoil reproduces through fragmentation whereby plant fragments break off from the parent plant through wind or boat action, grow roots, and settle in a new location. Milfoil spreads rapidly and displaces beneficial native plant life. It makes swimming difficult and can devalue waterfront property. Where this species grows in its native environment, insects and fish may feed on this plant at such a rate as to control its growth. In New Hampshire, milfoil has no natural predators to keep its population in check. Under optimum temperature, light and nutrient conditions, milfoil may grow up to an inch per day.

### How Did Exotic Milfoil Become Established in This State?

It was most likely a “stowaway” fragment attached to a boat or trailer that came to this region. Milfoil can live out of water for many hours if it remains moist, like when it’s wound around a wet carpeted bunk on a boat trailer. Milfoil is usually first found near boat launch sites.

Another theory is that milfoil was introduced to a New Hampshire waterbody through the dumping of a home aquarium. This plant is sometimes used as an ornamental plant in fish aquariums.

### **Once Established, How Does Milfoil Infest Other Areas of a Waterbody?**

Boat propellers will chop milfoil plants into small fragments. These fragments float on the surface and are at the mercy of the wind and lake currents. In a short time, roots form on these fragments. If washed ashore, these plants eventually take hold creating a new colony of milfoil. The cycle goes on until every suitable area is filled in with these weeds. An alternative form of the plants develops during low water. This vegetation type is more succulent than the submerged form.

### **What Methods Are Currently Being Used to Control Milfoil?**

Three methods are currently used to control variable milfoil. Hand-pulling of new infestations is one way to prevent a full-lake infestation, but these patches must be detected early. When the plants become too large to hand-pull, a benthic barrier may be placed on the lake bed by State divers to compress the plants to the bottom and block sunlight. This works only in very small patches. The other method for controlling plants when they become too large to pull or cover is the use of an aquatic herbicide. These herbicides can provide one to three years of control in a waterbody.

There is no way to eradicate the plant once it has become well established in a waterbody. DES is currently working with Dartmouth College to determine the genetics of the milfoil plants and to see if there is a possibility for future genetic control of the plant.

### **Have Chemicals Been Used to Effectively Control Exotic Milfoil?**

One chemical treatment in the spring, during peak plant growth, is sufficient for milfoil control for the remainder of the treatment season, and perhaps into the next. Chemicals are usually the method of choice for small new infestations that are too large for hand-pulling or screening. However, attempts to eradicate extensive areas of weeds using chemicals are rarely effective. In most cases, the treated area becomes re-infested with fragments from other sections of the lake.

It is illegal to apply chemical herbicides to any New Hampshire waters unless you contract with a licensed applicator. The use of chemicals by an untrained person could jeopardize the health and welfare of the lake and its ecology. Inappropriate or inaccurate use of chemicals is life-threatening to people. It should be noted, however, that the state has been conducting herbicide applications for several years, and no negative impacts to non-target plants, animals, or humans have been observed.

For more information on milfoil or other Exotic Species, please contact the Exotic Species Coordinator at 603-271-2248 or [asmagula@des.state.nh.us](mailto:asmagula@des.state.nh.us). Also, visit the Exotic Species website at [www.des.state.nh.us/wmb/exoticspecies/](http://www.des.state.nh.us/wmb/exoticspecies/).

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# ENVIRONMENTAL Fact Sheet

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WD-BB-25

2007

## WANTED!

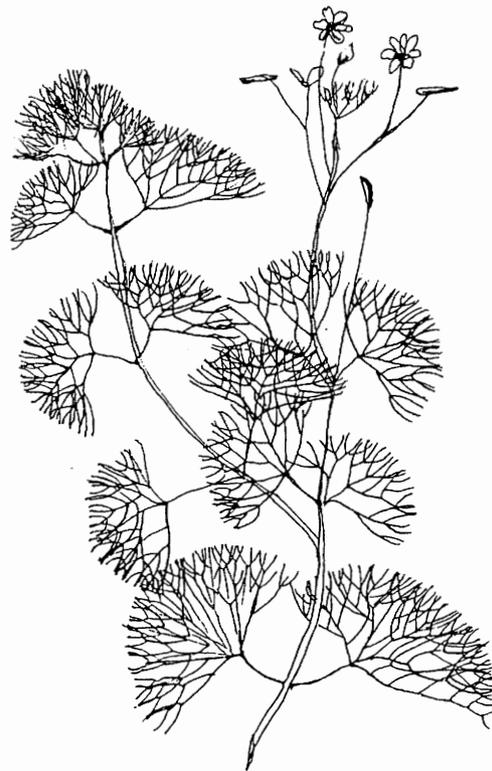
### Information on the location of the exotic plant: FANWORT

#### Species Description

Fanwort is a submerged bright green aquatic plant with leaves arranged in a fan shape manner that are distinctly oppositely arranged on a long and narrow stem. Floating lily-like leaves are found on the water's surface during flower production. Flowers are small, white and emergent. The plant stands approximately 1-10 feet tall. Fanwort flowers from July through September.

#### General Information

Fanwort is a native plant of the southern United States, Latin and South America. It is currently in nine waterbodies in southern New Hampshire. This exotic plant was discovered in New Hampshire in the late 1960s and entered the state via a transient boat trailer, or was dumped from a tropical fish aquarium. Recently, this plant had been spreading at the rate of one new lake each year. Characteristic of many exotic plants introduced to a new environment, Fanwort quickly invades shoreline areas of waterbodies, ultimately impairing recreational activities and aquatic ecology. Please contact the Department of Environmental Services at (603)271-2248 if you have seen this plant. Visit our website for more information: [www.des.nh.gov/wmb/exoticspecies](http://www.des.nh.gov/wmb/exoticspecies).



**Fanwort**  
(*Cabomba caroliniana*)

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# ENVIRONMENTAL Fact Sheet

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WD-BB-24

2007

## WANTED!

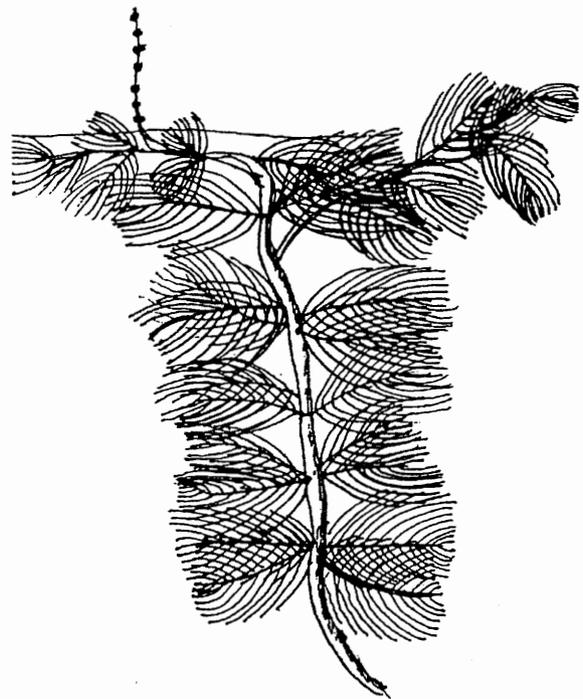
### Information on the location of the exotic plant: EURASIAN MILFOIL

#### Species Description

Eurasian milfoil is a submerged aquatic plant with whorled feather-like leaves that appear to have been clipped on the end. Eurasian milfoil can grow 12-15 feet tall, and exhibits a reddish shoot near the surface. It forms dense mats of tangled plants in lakes and ponds. Leaves have 12 or more pairs of leaflets.

#### General Information

Eurasian milfoil, which originally came to this country from Europe and Asia, is a serious nuisance to many lake residents. **Once introduced to a lake (usually by boats) it grows and spreads very quickly, ultimately ruining the ecology of the system, and value of shorefront property.** There are three waterbodies with the plant in New Hampshire today: Mountain Pond in Brookfield, the Connecticut River south of Hanover, and Mascoma Lake in Enfield. This species can also be found in nearby **Vermont** and **Massachusetts**, and is considered a national problem in lakes and other freshwater systems.



**Eurasian Water-milfoil**  
(*Myriophyllum spicatum*)

**Please inform DES at (603)271-2248 if you see this plant.**

For more information, visit [www.des.nh.gov/wmb/exoticspecies](http://www.des.nh.gov/wmb/exoticspecies).

**Remove all plants from your boat  
and trailer before launching,  
and when you leave.**

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# ENVIRONMENTAL Fact Sheet

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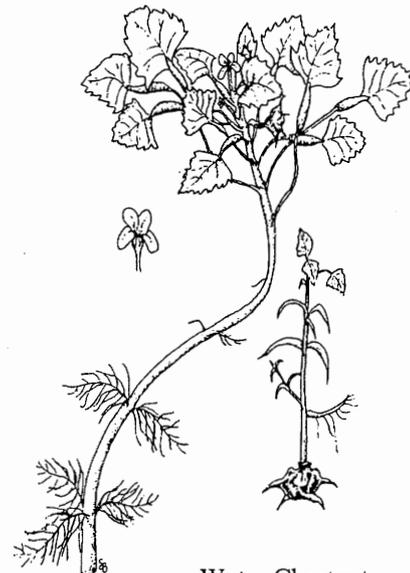
WD-BB-43

2007

## Water Chestnut in New Hampshire Waters

In July 1998, the NH Department of Environmental Services confirmed reports that the exotic aquatic plant, water chestnut, had infested the Nashua River in Nashua. Water chestnut can completely cover the surface of a waterbody and cause ecological hardship to native plants and animals. Fishing and boating can become extremely difficult as well.

This plant is not the same species as the edible water chestnut used in Asian cooking. Water chestnut is a member of the Trapaceae family and derives its name from the single-seeded horned fruits. Each of the four horns on the nut is sharp and has a spine with several barbs. Each plant has two types of leaves: submerged leaves that are feather-like and oppositely paired along the stem, and waxy floating leaves that are triangular and form a rosette on the water's surface. The petiole (leaf stalk) of the floating leaves has a bladder-like swelling filled with air and spongy tissue which provides buoyancy. Cord-like plant stems can attain lengths of up to 16 feet.



Water Chestnut  
(*Trapa natans*)

The water chestnut is an annual plant, which exhibits great reproductive capacity. The seeds germinate in early spring. An individual seed can give rise to 10-15 rosettes, each of which can produce 15-20 seeds. Thus, one seed can give rise to 300 more new seeds in a single year.

Water chestnuts begin to flower in mid to late July, with their nuts ripening approximately one month later. Flowering and seed production continue into the fall when frost kills the floating rosettes. The mature nuts sink to the bottom when dropped and may be able to produce new plants for up to 12 years. The plant spreads either by the rosettes detaching from their stems and floating to another area, or more often by the nuts being swept by currents or waves to other parts of the lake or river. The plant over-winters entirely by seed.

Water chestnut is a nuisance aquatic plant that limits boating and fishing in infested areas. It has the potential to infest wetlands and critical environmental habitats in other areas of the state. Recently, DES has observed the seeds of water chestnut being transported as tag-alongs on the

carpeted bunks of boat trailers.

For more information about exotic aquatic plants, please contact the Exotic Species Program at (603) 271-2248, or go to [www.des.nh.gov/wmb/exoticspecies/](http://www.des.nh.gov/wmb/exoticspecies/).

# ENVIRONMENTAL Fact Sheet



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WD-BB-45

2007

## Purple Loosestrife: An Exotic Menace

### Species Description

Purple loosestrife is an erect perennial herb standing 3-10 feet tall. Its average height is 5 feet. The plant blossoms every July through September with purple flowers that are located in long spikes at the tip of its branches. Its leaves are opposite or whorled on the square, sometimes woody stem. One purple loosestrife plant may grow as an individual stalk or as several stalks clumped together. As beautiful as this plant may appear, its beauty is deceptive, as purple loosestrife is gradually altering our nation's wetlands. Look-alikes of this plant are swamp loosestrife and blue vervain.

### Species Range and Distribution

Purple loosestrife is a problem in New Hampshire and throughout North America and Canada. The northeastern United States and southern Canada are the areas experiencing the greatest impact of purple loosestrife. The distribution of purple loosestrife ranges from being common to abundant, and many areas have been found to support dense stands of this plant.

### How was Purple Loosestrife Introduced?

Purple loosestrife is native to Eurasia. It was originally introduced to eastern North America in the early to mid-1800s. This invasive plant was either accidentally introduced via ship ballasts, deliberately brought over as an ornamental plant, or its seeds were transported by imported raw wool and sheep.

### Where Does Purple Loosestrife Invade?

Optimum habitats for purple loosestrife include freshwater marshes, open stream margins and alluvial floodplains. Purple loosestrife also invades wet meadows, pasture wetlands, cattail marshes, stream and river banks, lake shores, irrigation ditches, drainage ditches, and stormwater retention basins. Purple loosestrife is often associated with cattail, reed canary grass and other moist soil plants.



**Purple Loosestrife**  
(*Lythrum salicaria*)

## **What Makes Purple Loosestrife A Good Invader?**

Purple loosestrife prefers moist organic soils, fluctuating water levels, and full sunlight; all conditions that can stress many native plants. However, this plant can survive in many conditions associated with disturbed sites, such as construction sites for docks and marinas. It can tolerate a wide range of environmental conditions (temperature, sunlight, pH, nutrient levels) and can establish itself on a variety of substrates (gravel, sand, clay, and organic soil). Purple loosestrife has no natural predators (such as disease or insects) on this continent; therefore, it has an incredible ability to out-compete native vegetation and to form dense stands.

## **How Does Purple Loosestrife Spread?**

Purple loosestrife's ability to spread contributes to its success as an invader. One adult purple loosestrife plant can produce 2.5 million to 2.7 million seeds annually. Seeds are roughly the size of ground pepper grains. Seeds from the plant are viable for many years. They may remain dormant in the soil until conditions are right for germination. These seeds are easily dispersed and transported by water, wind, bird feathers, animal fur, footwear, boats, boat trailers, and car tires. Purple loosestrife is also capable of resprouting from broken stems, underground roots, and plant fragments. If mowed, the cut stem pieces will send out new roots and form new plants. The once commercial sale of purple loosestrife also increased the spread of this plant by introducing it to various wetlands and home gardens. It has been illegal to sell, purchase, propagate, import, distribute, and transport *Lythrum* species in New Hampshire since 1999.

## **Why Is Purple Loosestrife a Problem?**

Purple loosestrife negatively affects both wildlife and agriculture. It displaces and replaces native flora and fauna, eliminating food, nesting, and shelter for wildlife. Purple loosestrife forms a single-species stand that no bird, mammal, or fish depends upon, and germinates faster than many native wetland species. If wildlife species are displaced, those that cannot move into new areas may be lost. By reducing habitat size, purple loosestrife has a negative impact on fish spawning and waterfowl habitat. The plant also diminishes wetland recreational values such as boating, fishing, and hunting. This, in turn, may hurt local economies. Purple loosestrife affects agriculture by blocking flow in drainage and irrigation ditches and decreasing crop yield and quality.

## **What Are Some Solutions To The Purple Loosestrife Problem?**

Three possible control methods exist for purple loosestrife. These include physical, biological, and chemical means. None of these methods will completely eliminate purple loosestrife, but they will control the populations within ecologically acceptable limits.

**Physical Control** of purple loosestrife is possible for smaller stands of plants (less than about 100 plants). It involves physically removing the plant from the soil. Removal should ensure that all root and plant pieces are dug out of the soil. The best time to remove purple loosestrife from the soil is prior to seeding time (August/September). Removal after this time will not eliminate the seeds that have already been produced by the plant. Once the plants are removed they should be

burned or tightly bagged to prevent the spread of seeds or resprouting. Composting is not an alternative as the plants may regenerate in the compost pile. Many local conservation commissions, garden clubs, and other specialty groups throughout New Hampshire are initiating their own purple loosestrife monitoring programs involving mapping, hand-pulling, and disposal of this nuisance plant. If hand pulling during flowering time, cut off the flower stalk and bag it before removing the plant and roots to minimize seed dispersal.

**Biological Control** is a method of control involving the release of predators to attack the pest species. Three different species have been used in North America to attempt to control purple loosestrife: two species of beetles and one weevil. These three species are common in Europe where they combine to act on the leaves and roots, thereby controlling its populations. The insects were proven "safe" to our natural environment as a result of extensive research conducted at Cornell University.

The New Hampshire Department of Agriculture and the New Hampshire Department of Transportation have been working on a joint project to introduce beetles into areas infested with purple loosestrife. The beetles feed on the plants, curbing their growth within a five year period, depending on the size of the infestation. We now have over 20 such sites in New Hampshire, with each showing signs of success with thinning purple loosestrife populations.

**Chemical Control:** In dry areas, Round-Up can be used for control. In wetlands or areas with standing water, only a licensed applicator, working under a special permit, can conduct an herbicide treatment.

### **What Can I Do To Help?**

There are many things you can do to help prevent the spread of purple loosestrife. The first step is to **recognize it**. Purple loosestrife is most easily identified when in bloom (July and August), before it goes to seed. The second step is to **report it**. If a large infestation is identified, you can contact the departments of Agriculture, Transportation or Environmental Services. Mapping the infestation is helpful as well. The third step is to **remove it**. Check with authorities prior to removal to determine what permits may be needed and how best to proceed.

For more information about exotic aquatic plants, please contact the Exotic Species Program at (603) 271-2248, or go to [www.des.nh.gov/wmb/exoticspecies/](http://www.des.nh.gov/wmb/exoticspecies/).

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# ENVIRONMENTAL Fact Sheet

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WD-BB-61

2007

## FAQs about Rock Snot in New Hampshire

During the summer of 2007, the first population of Didymo (also called, “rock snot”) was found in the Connecticut River in Pittsburg, N.H. This non-native and invasive alga forms thick mats of felt-like growth on rocks, and can impair the recreational and ecological values of waterways in the state. Below are some frequently asked questions about rock snot, and the answers to each question.



### Q. What is Didymo?

A. Didymo is the common name for *Didymosphenia geminata*, an invasive freshwater diatom (microscopic alga). Didymo can form extensive “blooms” on the bottoms of rocky river beds, essentially smothering aquatic life forms such as macroinvertebrates (aquatic insects), native algae, and other organisms. Didymo uses stalks to attach to rocks and plants in a river system. The diatom actually creates these stalks, which can form masses 3 inches to 5 inches thick on the river bottom, and trail for lengths of 2 feet to 3 feet in the current. It is actually the stalks that are more problematic than the alga. The alga will eventually die off and decompose, while these stalks tend to persist for several months on the river bottom.



### Q. Where did it come from?

A. Didymo is generally a northern circumpolar species, found in colder, low nutrient, high clarity streams. We are noticing, however, a shift in the habitats where Didymo can survive now, which includes streams in warmer climates, streams with more nutrients, and streams with moderate clarities and even some tannic (tea colored) waters. Didymo is currently found in Europe (Scotland, Poland) and it is spreading throughout the Northwest U.S. It is also in

Quebec and British Columbia. New Zealand has been particularly hard hit by the Didymo problem. We believe Didymo was introduced to this region by contaminated fishing/wading gear.

**Q. Why is Didymo a problem?**

- A. Didymo will change the bottom appearance, structure, and food web of a stream. Ecologically, common macroinvertebrates found on the bottoms of well-oxygenated streams will change to more worm-like and snail populated communities. Aesthetically, the brownish-white flowing masses of stalk structures are unpleasant to see and recreate in.

**Q. What is the current distribution in the Northeast?**

- A. As of fall 2007, Didymo extends from just north of Lake Francis in Pittsburg, down through Northumberland, N.H. In other states, portions of the White River in Vermont downstream of the Stony Brook confluence are infested, and the Batten Kill river between Vermont and New York has some populations of Didymo. Most recently, the East and West Branches of the Delaware River in New York and Pennsylvania support populations of this alga.

**Q. What does it look like?**

- A. Didymo is often described as looking similar to a sewage spill with wet toilet paper streaming in the waterbody. This is the result of the stalk material becoming long and shredding at the ends, and bleaching white. These mats have a slimy *appearance*, but are not slimy at all to the touch. Over time, the bloom may take on a brownish/floppy appearance as sediment particles become embedded within the stalks.

**Q. What does it feel like?**

- A. Didymo feels like wet felt, wool, or cotton balls. It is hard to pull apart, and hard to remove from the substrate it has attached to. In contrast, most other algae species feel slimy and will slip through your fingers.

**Q. Does it smell or have an odor?**

- A. Generally, no. There is no distinctive odor or smell associated with the alga or the stalk material.

**Q. In what types of habitats/conditions is Didymo generally found?**

- A. Didymo is found in river systems with stable substrates such as cobble or rock bottoms. Water conditions are usually clear, cool (optimal temperature is about 60°F), have high light penetration, and lower nutrient concentrations. Flow conditions are generally moderate to moderately fast.

**Q. How does Didymo spread?**

A. This alga is so small it can go unobserved when it is a single algal cell on the bottom or in the water column. Additionally, the alga can remain viable for several weeks if kept moist. Because of this, spread of the alga is unfortunately easy. Felt soled waders are often particularly to blame, since fishermen use them to gain a grip on slippery, rocky bottomed areas. The alga easily becomes attached to the felt, and if not properly cleaned or thoroughly dried before use, the diatom can spread to another waterbody. Any other recreational equipment, including bait buckets, neoprene diving gear, water shoes/sandals, canoes, kayaks, and life jackets, to name a few.

**Q. Will we ever get rid of it?**

A. There is no means of “eradication” for this alga. Copper sulfate complexes can be used, but they are not 100 percent effective. Some algae will survive and float downstream and form new colonies. Many researchers across the globe are currently working on control and eradication methods, however.

**Q. Can Didymo grow in lakes?**

A. Yes, since Didymo is an alga, it can certainly grow in lakes, ponds, or other freshwater systems. Didymo generally will not reach bloom conditions in these types of systems, however. Didymo will mostly be a problem in river systems. In fall 2007, biologists from the N.H. Fish and Game Department noted the presence of Didymo attached to some of the nets deployed for a period of time for fisheries sampling in Lake Francis.

**Q. What do I do if I think I saw Didymo?**

A. First, consult the link on the Didymo page at [www.des.nh.gov/wmb/exoticspecies](http://www.des.nh.gov/wmb/exoticspecies) called “How to Tell if You May Be Seeing Didymo” to determine if the specimen is worth collecting. If yes, then collect a representative sample of what you are seeing, and send it to the N.H. Department of Environmental Services or the Vermont Department of Environmental Conservation. Addresses are listed on the identification page. Please send samples to the agency in the state where the sample was collected. Include a location description, estimate of the area that is impacted, and date/time the sample was collected. GPS coordinate are also very helpful, if you have a GPS unit handy. Samples can be folded into a business card, or placed into a jar or plastic baggie.

**Q. What is the response strategy that is being taken to combat this problem species?**

A. The biologists from both the Vermont and the New Hampshire environmental agencies have met and will be coordinating on strategies to track and monitor Didymo spread. Signage is available from either state agency, or by download from [www.des.nh.gov/wmb/exoticspecies](http://www.des.nh.gov/wmb/exoticspecies) on the Didymo page. Laboratory personnel in each state are prepared to examine specimens

that are sent in for identification. We are all now just learning how to respond and contain (if possible) this new threat to our waterbodies. More information will be posted on the New Hampshire/Vermont Didymo websites at it becomes available. A summer 2008 sampling strategy is currently being prepared.

**Q. What should I do?**

A. We prescribe a “CHECK and CLEAN” protocol.

**CHECK** – Remove all visible clumps of algae and plant material from fishing gear, waders, clothing, water shoes and sandals, canoes and kayaks, *and anything else* that has been in the water.

**CLEAN** – Soak and scrub all items for at least 10 minutes in *very hot water* with lots of soap. Felt-soled waders need 30 minutes!

**Q. Who should I contact for more information?**

A. **In New Hampshire:** contact the New Hampshire Department of Environmental Services at (603) 271-2248 or visit [www.des.nh.gov/wmb/exoticspecies/](http://www.des.nh.gov/wmb/exoticspecies/) .

**In Vermont:** contact the Vermont Department of Environmental Conservation at (802) 241-3777 or visit [www.vtwaterquality.org](http://www.vtwaterquality.org) .

# ENVIRONMENTAL Fact Sheet



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WD-BB-17

2007

## Zebra Mussels

### What are Zebra Mussels and Where Do They Come From?

Zebra mussels are small shellfish marked by alternating light and dark bands. They are typically 2 inches or less in size and have a life span of four to eight years. Zebra mussels have an extremely high reproductive rate of 30,000 to 1,000,000 veligers per year and are able to reproduce at one year of age.

Zebra mussels are native to the drainage basins of the Black, Caspian, and Aral seas of Eastern Europe. It is believed that ships originating from European ports carried the mussel in freshwater ballast, which was discharged into ports within the great lakes. The first North American zebra mussel discovery was in Lake St. Clair, Michigan in June of 1988. The mussel has been found in all five of the Great Lakes; the St. Lawrence River; the Finger Lakes region of New York; throughout the Mississippi River basin, Lake Champlain, Vermont; East Twin Lake, Connecticut; and the southern portion of Lake George. With infestations to the south and west, it is anticipated that their arrival in New Hampshire is just a matter of time. The Connecticut River may be the first place we see them.



Zebra Mussel  
(*Dreissena polymorpha*)

Adult and juvenile mussels are transported by waterfowl, boat hull, sea planes, dive gear, live wells and nearly anything else that goes from one waterbody to another. Larvae stage mussels (veligers) can be transported in anglers' bait buckets and boat engine cooling water. Similar to other introduced non-native species such as milfoil, these exotic mussels can reproduce rapidly because natural predators are not present to keep the population in check.

### Why are Exotic Mussels a Concern in North America?

Zebra mussels and the closely related quagga mussel are not native to the United States. They disrupt the ecology and cause problems to humans wherever they have appeared. They are the only freshwater mussels that can secrete durable elastic strands, called byssal fibers, by which they can securely attach to nearly any surface, forming barnacle-like crusts. Through this mechanism these mussels can attach to stone, wood, concrete, iron, steel, aluminum, plastic, fiberglass, and PVC. They have also recently been found growing on softer substrates like plants, mud, and even other zebra mussels.

## What Problems Do Exotic Mussels Cause?

The zebra mussels' ability to rapidly propagate and physically attach to objects creates several problems:

- Zebra mussels filter small particles such as phytoplankton (microscopic plants), small zooplankton (microscopic animals), and detritus (pieces of organic debris) from water. Mussels are capable of filtering up to 1 liter of water within a 24 hour period. Large populations of mussels can severely alter the lake or riverine food web by stripping the water column of algae, which is the base of the aquatic food web.
- Raw water intakes such as those at drinking water, electric generation, and industrial facilities can become infested with zebra mussels. A water supply system serving 50,000 people in a Michigan city had to shut down due to pump failure because of zebra mussels clogging the intake system.
- Beaches in infested areas may be impacted by the sharp shells that wash up in shallow areas, which can cut bathers and litter beaches. Decomposition of mussels can also create obnoxious odors.

Impacts on boating and navigation include:

- Organisms attached to hulls increase drag and reduce speed, thus increasing fuel consumption.
- Growth of larval mussels drawn into a boat's engine cooling water intake may occlude the cooling system, leading to overheating and possible damage to the engine.
- If shells are drawn into the engine, abrasion of cooling system parts, especially impellers, could result.
- Marker buoys can sink under the weight of mussel encrustation.
- Docks can be destabilized or sunk by mussel colonization.

## What Kind of Habitat Do These Mussels Prefer?

	Grow °F	Spawn °F	Current Rate m/sec	Depth m	Salinity Levels parts per th.
Zebra	68-77	53	0.15-0.5	0-28	0.2-40
Quagga	39-48	39	0.15-0.5	Wide range	0.2-40

Zebra mussels prefer lakes that are not overly enriched, but which have a higher calcium content. Given the mussels preference for higher calcium levels, some New Hampshire waterbodies are at a risk for infestation, especially waterbodies with calcium levels greater than 12 ppm, like the Connecticut and Merrimack rivers.

## How Can Exotic Mussels Be Controlled?

An effective way to permanently eliminate infestations has not been found; therefore, emphasis must be placed on controlling impacts on ecosystems and water users. Researching scientists are looking into control by chemical, biological, and physical means. Chemical agents, such as chlorine, are being investigated. However, because the mussels can survive in such a wide range of conditions, the amount of chlorine needed to affect the mussels would likely affect everything

else in the waterbody.

Physical methods include manually removing the mussels, ultraviolet radiation, acoustic vibration, and screens. For drinking water, electrical generation and industrial facilities, screen mesh can exclude adult and juvenile mussels from water intake systems. This method is only effective in excluding those mussels that originate upstream of the screens or filters. Veligers can pass through the screens and infest downstream areas.

Biologic controls make use of predators. These predators include diving ducks (scaup, mallards, canvasbacks, and squaws), and freshwater fish (yellow perch, drum, or sheepshead carp). This method will only work if these species are natural to the area. Diving ducks, for example, are migrating birds and are only in the area seasonally. However, migrating populations have increased around Lake Michigan due to an increase in food (the Zebra mussels).

### **What Can People Do To Help?**

Tell your lake, river or watershed association, your local marina, your municipal officials, or anyone with an interest in water management about the zebra mussel. If you are in the power generation industry, plan now for the mussel's invasion to your facility. Call the UNH Cooperative Extension Services or NH Sea Grant, both in Durham, to learn about their zebra mussel public education program. You can also contact DES, the state agency with the primary responsibility of protecting and managing the state's lakes and rivers. Also visit the Fish and Game website for more information on bait regulations that relate to this topic: [www.wildlife.state.nh.us/](http://www.wildlife.state.nh.us/).

When boating in infested waters, be sure to "de-mussel" your boat before you leave the area. "De-musseling" includes performing the following activities AWAY FROM ANY SURFACE WATER:

- Draining the bilge, live wells and engine cooling system.
- Dumping any bait buckets.
- Inspecting the boat by checking the hull, trim plates, anchors, and the trailer.
- Washing down the boat with hot water (140°F), if mussels are found, and allowing the boat and trailer to sit for 5-7 days dry.
- Wash trailer, boat live well, etc with 10 percent bleach solution.

Participate in a zebra mussel monitoring program. Again, UNH and Sea Grant can be contacted at (603) 749-1565. They will provide you with information you need to identify the zebra mussel so you can actively monitor your river, lake, and/or power generation facility. The best defense is to prevent the zebra mussel from entering the waters of New Hampshire. If they arrive, we will all need to implement the proper controls to prevent these undesirable invaders from spreading.

**Appendix Four**  
Examples of Boat Launch Signs

## Exotic Plant Signs for Boat Launch Areas



Sign posted at uninfested waterbodies



Sign posted at infested waterbodies

## **Appendix Five**

### Prevention and Research Grant Scoring Matrices



## Grant Scoring Guidelines

- 1) Grants must be scored objectively with no bias given for state or personal knowledge of the project or applicant.
- 2) Review applications with whatever method works best for you. We recommend reading all the grants drafting a score for each as you go, then once all the grants have been reviewed, assign your final scores.
- 4) Applications will be judged based on the criteria listed and defined below. Reviewers will score the application from 0-5 for each criterion. Scores will be weighted (see scoring matrix). Adding the weighted scores for the 5 categories will give a Total Score for each application. Each application will be scored by the Grant Review Committee, with the average of the total scores making the Final Score.
- 5) We will fund as many grants as possible within our funding limit. There are no budget limits per application at this time. What is a possible alternative is to grant some applicants partial monies. This will also enable us to give out more grants.
- 6). In the case of tied scores, the Grant Review Committee will re-review the grants in question to break the tie.

### **Scoring Categories:**

*Project Approach:* Through the project narrative as described above in Section VI, the applicant should clearly state the goals of the project and how the goals will be achieved.

*Management Approach:* The applicant must demonstrate the capability to effectively manage the project to successful completion and project funding through a capable project team.

*Community Benefit/Partnership:* Does the project have the support of local partners, including towns, municipalities, abutters, or lake and watershed residents? Letters of support should be attached to the application.

*Creativity:* Is the project creative or innovative in ways that are likely to result in advances or improvements that are transferable across the state?

### **Filling out the Scoring Matrix:**

- Make sure you write your name at the top of the score sheet
- In the first column, be sure to list the applicant name and affiliation.
- For each category, record your score from 0-5; then in the shaded column record the weighted score (your score times the weight listed at the top of the column).
- The last column should be the sum of all the weighted scores from the shaded columns.



## Grant Scoring Guidelines

- 1) Grants must be scored objectively with no bias given for state or personal knowledge of the project or applicant.
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- 6). In the case of tied scores, the Grant Review Committee will re-review the grants in question to break the tie.

### **Scoring Categories:**

*Project Approach:* Does the project have a clearly defined goal, with clear ideas of how the applicant plans to achieve that goal and what the end result should be? The applicant should show a clear understanding of the issue, and the project should aim to address this issue. This information will be conveyed in the Project Narrative. The more organized and structured the project narrative, the more points earned.

*Management Approach:* Can the applicant effectively manage the funds and tasks to achieve the proposed results? Projects should request a reasonable amount of money considering the project scope and goals, and build on other resources such as other grants or the support of other groups. Applicants should provide rationale for their budgets and how monies will be spent.

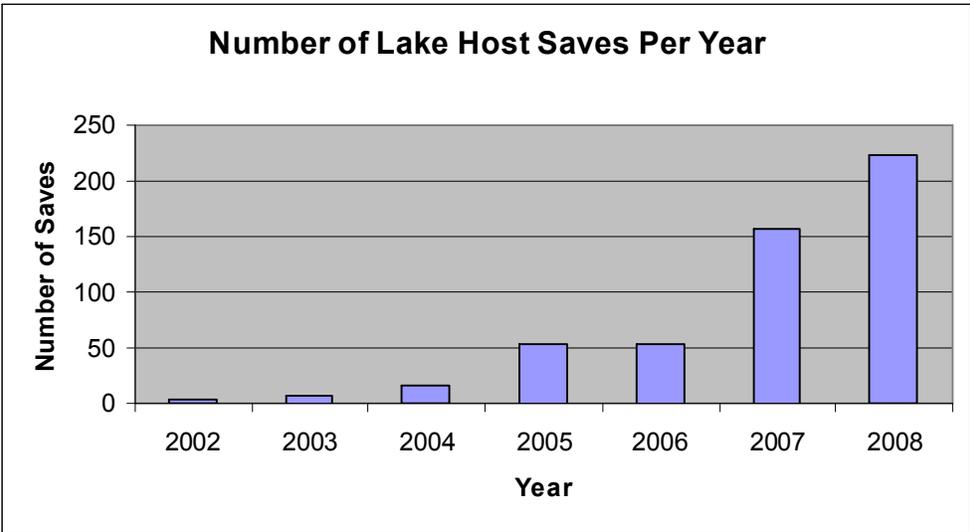
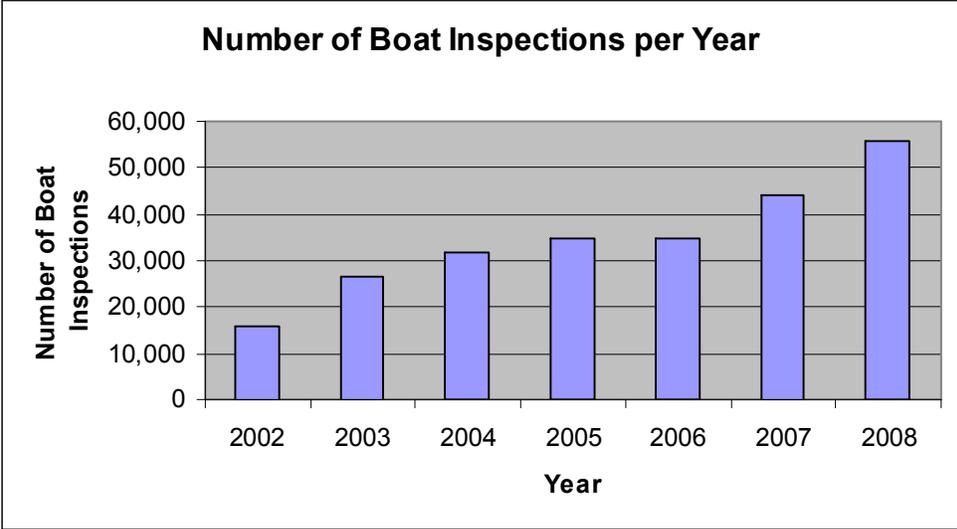
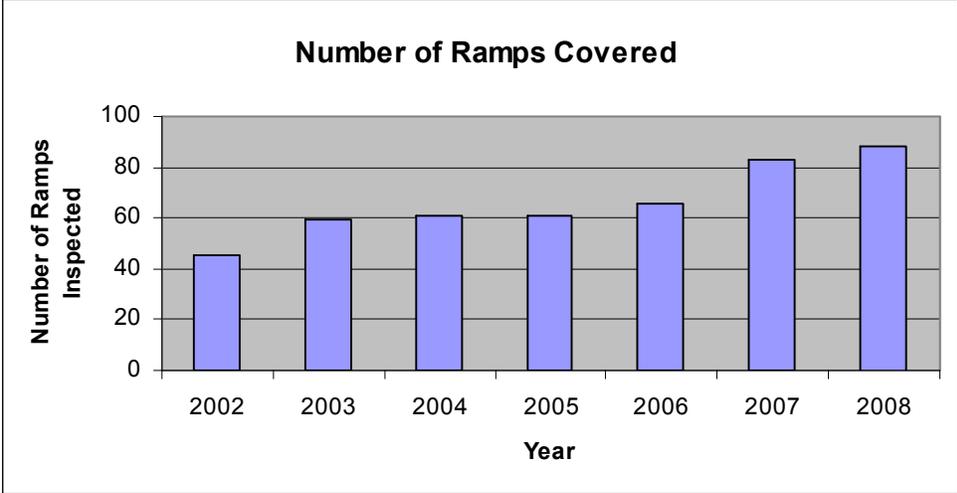
*Community Benefit/Partnership:* Does the project seek to provide benefits which would extend to the community as a whole (i.e., exotic plant management, eradication, etc). Does the project bring in partners with varied backgrounds and areas of expertise?

*Originality and Effectiveness:* Does the project exemplify a well thought out and new or unique approach? Is the project likely to result in advances in prevention or research goals? The more unique and effective the project, the more points awarded.

### **Filling out the Scoring Matrix:**

- Make sure you write your name at the top of the score sheet
- In the first column, be sure to list the applicant name and affiliation.
- For each category, record your score from 1-5; then in the shaded column record the weighted score (your score times the weight listed at the top of the column).
- The last column should be the sum of all the weighted scores from the shaded columns.

**Appendix Six**  
Lake Host Program Key Data



## **Appendix Seven**

### **Selection of Aquatic Plant Management Techniques**

#### **Criteria to Evaluate the Selection of**

**Exotic Aquatic Plant Control Techniques (Working Document)**  
NH Department of Environmental Services  
Water Division

Preliminary Investigations

**I. Field Site Inspection**

- Verify that the plant is an exotic species.
- Map extent of the plant infestation (area, water depth, height of the plant, density of the population and other relevant field data).
- Document any native plant abundances and community structure around and dispersed within the exotic/nuisance plant population, as well as any animal species that are encountered.

**II. Office/Laboratory Research of Waterbody Characteristics**

- Contact Natural Heritage to determine the presence of rare or endangered species in the waterbody or its associated or prime wetlands.
- Determine the basic relevant limnological characteristics of the waterbody (size, bathymetry, flushing rate, nutrient levels, trophic status, wetlands).
- Determine the potential impacts of exotics and/or of control practices to downstream waterbodies based on limnological characteristics (water chemistry, quantity, quality).

Determination of Control Practice Based on Preliminary Investigations

Following are a series of recognized control techniques for exotic aquatic plants. The most appropriate technique(s) based on the determinations of the preliminary investigation should be selected. These techniques should aim for an integrated approach at management that includes defining the problem or need; identifying the desired exotic aquatic plant management goals; making decisions based on site-specific information, using ecosystem, watershed, and cost perspectives to determine long-term strategies; developing a system of integrated exotic plant control methods, including mechanical-physical, biological, chemical, and cultural BMPs; and quantitatively assessing the results of the control methods.

A waterbody-specific long-term management plan should be developed based on this evaluation.

**Restricted Use Areas:**

Restricted Use Areas (RUAs) are a control option for lakes with small, contained infestations of exotic plants, limited to small patches or embayments. This is often the case in waterbodies with newly-discovered infestations or in waterbodies where control practices have reduced an infestation to a small isolated area. RUAs are a legal

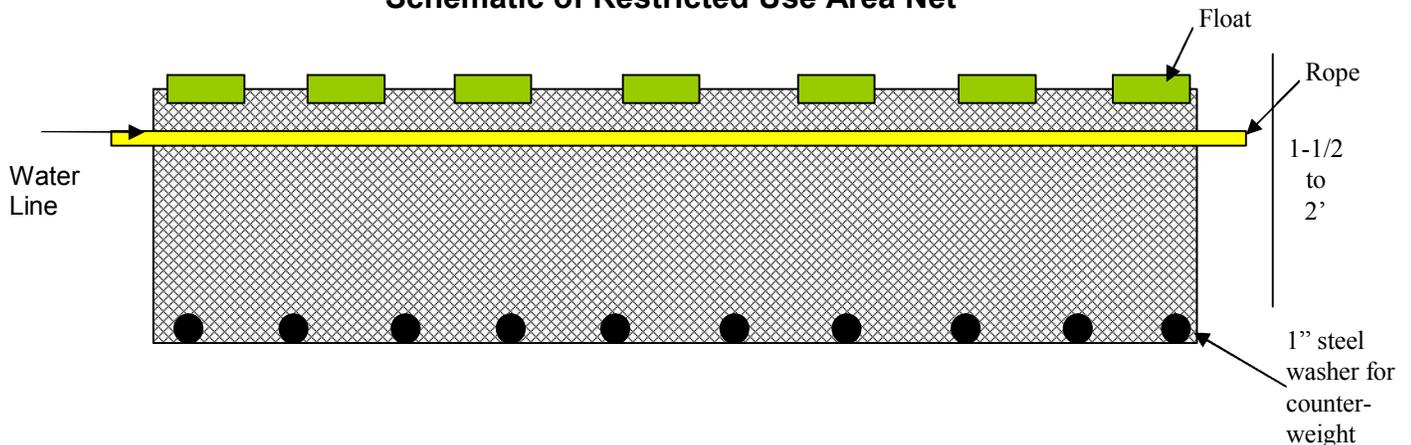
designation that restricts access to all recreational activities in a delineated area to minimize plant fragmentation and thereby reduce the spread of milfoil. These areas are cordoned off with regulatory buoys that indicate the restriction.

DES, in consultation with the Department of Safety, has the authority to install RUAs.

#### Fragment Barriers:

Fragment barriers can be used alone or in combination with a RUA. Fragment barriers are a method of protection from fragment migration. The fragment barrier is constructed of a shallow net that is held vertically in the water column with a combination of floats at the top and counterweights along the bottom of the net. The net is approximately 1.5-2.0 feet in height and does not reach to the bottom of the waterbody. The top of the net is set to extend four inches above the surface of the water, while the remainder is positioned below the surface of the water (see figure below). This configuration prevents the movement of floating fragments from infested areas to uninfested areas. Due to the size and nature of net construction, there is no impediment to fish migratory patterns or spawning activities.

**Schematic of Restricted Use Area Net**



DES, in consultation with Fish and Game and the Department of Safety, has the authority to install fragment barriers.

#### **Hand-pulling:**

When infestations of exotic aquatic plants begin as single scattered stems or small patches, DES biologists or other specially licensed individuals SCUBA dive to selectively hand-pull the exotic plants.

The whole plant, including the roots, should be removed in this process, while leaving the beneficial native species intact. This technique works best in softer sediments, with shallow rooted species and for smaller, scattered infestation areas. When hand pulling nuisance species, the entire root system and all fragments of the plants must be collected and put into a fine mesh net dive bag since small root or stem fragments could result in additional growth of the species. The process must be repeated often to control

re-growth of the exotic plants. For a new infestation, hand-pulling activities are typically conducted several times during the first season, with follow-up inspections for the next 2-5 years or until no re-growth is observed.

This control practice has proven successful in many waterbodies at eliminating exotic plants before they form a large infestation.

DES divers and individuals holding a specialty Weed Control Diver (WCD) certification can perform hand-pulling activities without a permit. All others seeking to hand remove aquatic plants should consult the DES Wetlands Bureau to determine if a permit is needed.

### **Diver Assisted Suction Harvesting**

Diver Assisted Suction Harvesting (DASH) is a method whereby a diver works to hand remove exotic plants from the bottom sediments, and rather than depositing them into a dive bag for containment, they are fed into a suction tube that brings the materials topside for containment, de-watering, and disposal. This method can allow for larger-scale removal projects and potentially lower turbidity than simple diving and hand-removal with a dive bag.

Generally, the DASH unit is comprised of a floating platform that is set up with a suction pump and associated hoses, and some type of catchment basin that is lined with fine mesh net to entrain the plants and to filter the water through and back into the lake.

A team comprised of one or two divers and one or two topside tenders are needed to operate the DASH unit.

Only DES divers and individuals holding a specialty WCD certification and that have been trained on DASH can perform suction harvesting activities without a permit.

### **Mechanical Harvesting**

The process of mechanical harvesting is conducted by using machines which cut and collect aquatic plants, much like a lawnmower cuts grass. These machines can cut the plants up to twelve feet below the water surface. The weeds are cut and then collected by the harvester or other separate conveyer-belt driven device where they are stored in the harvester or barge, and then transferred to an upland site for disposal.

The advantages of this type of weed control are that cutting and harvesting immediately opens an area such as boat lanes or swim areas, and it removes the upper portion of the plants.

Due to the size of the equipment, mechanical harvesting is limited to water areas of sufficient size and depth. It is important to remember that mechanical harvesting can leave plant fragments in the water, which if not collected, may spread the plant to new areas; therefore this technique is generally not recommended for milfoil, fanwort, and other plants that spread by vegetative means. Additionally harvesters may impact fish and insect

populations in the area by removing them in harvested material. Cutting plant stems too close to the bottom can result in re-suspension of bottom sediments and nutrients. This management option is only recommended when nearly the entire waterbody is infested, and harvesting is needed to open navigation channels through the infested areas.

DES will make a determination on the feasibility of performing this technique. Permits will be needed for any mechanical removal projects.

### **Benthic Barriers:**

When a small infestation of exotic aquatic plants occurs in clusters of growth as opposed to scattered stems, a permeable fiberglass coated screen material can be placed over the area of infested lake sediments.

The permeable fabric screening allows for gas release from the sediments while effectively blocking sunlight and compressing the plants into the sediment, inhibiting photosynthesis and eventually killing the plant. Occasionally, in some lakes, gas release from the sediments or boating activity can cause the uplifting of screening, so it is critical to adequately secure the barriers to the sediments.

Benthic barriers have two basic applications. These practices are used to cover pioneering infestations and prevent the spread of the plant. Bottom barriers are installed across small portions of lake bottoms infested with invasive aquatic plants. The disadvantage of benthic barriers is that they are not selective in controlling just one species. There is also a limitation on how big of an area can or should be covered. Additionally, these physical barriers prevent the growth of all vegetation in an area, which is a necessary component of fish and wildlife habitat.

Bottom barriers are attached to the bottom of a water body by re-bar attached to the edges and across the middle of the material. Rocks or other heavy objects may also be used to anchor the barrier. Bottom barriers are transported to the shoreline adjacent to where installation is to occur. They are then cut to fit the treatment site and rolled onto a length of pipe. Divers carry the roll into the water at the start of the treatment site and secure one edge of the material to the lake bottom. The divers then roll out the remainder of the material and continue to secure it to the bottom sediments. This process is repeated until the plants in the treatment are covered.

Bottom barriers are generally considered for small localized areas rather than lakewide application. Bottom barriers provide 100% control of this weed in areas where they are installed. They also provide long-term control. An ongoing maintenance operation is required to inspect the bottom barrier and clear the mats of sediment buildup.

Benthic barriers are not recommended for application in river systems, as flow can easily uplift the barrier.

DES Wetlands permits may be needed for the installation of benthic barriers.

### **Targeted Application of Herbicides:**

The use of aquatic herbicides is often a consideration in a long-term plan to control an exotic plant, particularly if the infestation covers a number of acres within the subject waterbody, and other non-chemical controls have proven ineffective at reducing growths of the target plant.

In the last 15 to 20 years the use and review of herbicides has changed significantly in order to accommodate safety, health, and environmental concerns. Currently no herbicide product can be labeled for aquatic use if it has more than a one in a million chance of causing significant harmful effects to human health, wildlife, or the environment. Because of this, the number of effective and US Environmental Protection Agency (EPA) approved herbicides for aquatic weeds are limited. In most cases the cost and time of testing and registration, rather than environmental issues, limits the number of potentially effective compounds. In addition to federal testing protocols, DES has funded research projects to further identify products that provide effective and long-term control of key exotic aquatic plants that are common in New Hampshire, with the overall goal of reduce the frequency of herbicide treatments because of extended control.

All herbicide applications in New Hampshire are performed under special aquatic permits issued by the New Hampshire Department of Agriculture, Division of Markets and Food, Bureau of Pesticide Control. Only specially licensed applicators can conducted these treatments.

Depending on the type of plant infestation DES will work with licensed applicators and other scientists to determine the most appropriate herbicide for use in controlling the target plant species.

### **Extended Drawdown:**

Water drawdown is used for control of some species of aquatic macrophytes. Drawdown requires some type of mechanism to lower water levels, such as dams or water control structures and use is thus limited. It is most effective when the drawdown depth exceeds the depth or invasion level of the target plant species.

In northern areas, drawdown will result in plant and root freezing during the winter for an added degree of control. Drawdown is typically inexpensive and has intermediate effects (two or more years). However, drawdown can have other environmental effects and interfere with other functions of the waterbody, e.g., drinking water supply, aquatic life/ecology, recreation, or aesthetics. Drawdown can result in the rapid spread of highly opportunistic annual weed species, which in most cases is the plant that is targeted for control.

Drawdowns have been used in the past for plant control. In theory, the drying of the plants in the summer, or the freezing of the plants in the winter, will eliminate or limit plant growth. However, some exotic plants, like milfoil, often form a more succulent terrestrial

form during drawdown conditions and the succulent form of the plant can remain viable for long periods of time without submergence, making the practice ineffective. This strategy can be used for control of some native plant species, but is very dependent of weather conditions during the drawdown.

The DES Dam Bureau should be consulted prior to any drawdowns to determine proper notifications and other protocols for drawing down or altering flow of any waterbody.

### **Dredging**

Dredging is a means of physically removing aquatic plants from the bottom sediments using a floating or land-based dredge. Dredging can create a variety of depth gradients creating multiple plant environments allowing for greater diversity in lakes plant, fish, and wildlife communities. However due to the cost, potential environmental effects, and the problem of sediment disposal, dredging is rarely used for control of aquatic vegetation alone.

### **Hydro-Raking**

Hydro-raking is a technique to remove plants and their rooting systems. A device that resembles a floating back-hoe is outfitted with a York rake. The rake is drawn through the bottom sediments to remove root systems and above sediment biomass. A typical hydro-rake can operate in water as shallow as a few inches to a maximum of 12 feet. The material is off-loaded on shore or onto a barge for transport to shore. Hydro-raking can be effective on species like water-lilies or emergent plants with substantial root systems in the sediments. A hydro-raking operation can provide seasonal to 1-3 years of effective plant control, depending on the targeted species. An advantage to hydro-raking is the absence of chemical introduction to a waterbody. This makes hydro-raking appealing for clearing swimming areas, as well as boating and fishing lanes. Hydro-raking also minimizes shoreline impact because the entire operation takes place on the water. This operation is also much more cost effective than bottom dredging.

Hydro-raking projects would require a permit through the DES Wetlands Bureau.

### **Biological Control:**

There are no approved biological controls for submersed exotic aquatic plant at that time in New Hampshire, though through research partnerships we are exploring possible future options. Significant research is required to ensure that any biological controls are safe for the environment, and that they will not pose more of a risk than the target species itself.

DES and the Department of Agriculture, among other agencies, would be involved if a biological control option is considered.

## **Appendix Eight**

### Expenditures for the Exotic Species Program and Clean Lakes Program

## Summary of SFY 2006 revenues and expenditures for 1430 by Class and Program

July 1, 2005 through June 30, 2006

	Clean Lakes	Exotics Control	Exotics Prevention	Totals
	(L)	(M)	(P)	
<i>Revenue from boat registrations</i>				
fee (\$/boat)	\$0.50	\$1.50	\$3.00	\$5.00
Income	\$54,133.13	\$159,364.50	\$318,735.00	\$532,232.63
<b>EXPENSES</b>				
<b>1. Personnel &amp; related costs</b>				
10-full-time salary	\$21,090.00	\$21,185.25	\$33,946.38	\$76,221.63
18-overtime	\$3,670.96	\$4,020.46	\$1,440.52	\$9,131.94
22-rental prop	\$7,144.00	\$6,504.00	\$0.00	\$13,648.00
26-membership fees	\$170.00	\$230.00	\$0.00	\$400.00
27-transfers to OIT	\$902.15	\$1,665.25	\$1,238.02	\$3,805.42
28-rent	\$2,094.16	\$1,045.42	\$1,045.42	\$4,185.00
40-indirect costs	\$990.89	\$2,778.11	\$0.00	\$3,769.00
49-DAS, Sec, EAP	\$6,318.90	\$2,810.69	\$0.00	\$9,129.59
50-intern salary	\$7,558.17	\$2,607.89	\$0.00	\$10,166.06
60-staff/intern benefits	\$10,025.14	\$11,778.03	\$21,407.97	\$43,211.14
70-in-state travel	\$6,966.95	\$720.99	\$0.00	\$7,687.94
80-out-of-state travel	\$887.30	\$3,728.82	\$0.00	\$4,616.12
<b>Total</b>	<b>\$67,818.62</b>	<b>\$59,074.91</b>	<b>\$59,078.31</b>	<b>\$185,971.84</b>
<b>2. Lab/field/outreach materials</b>				
20-supplies	\$6,267.06	\$14,243.04	\$0.00	\$20,510.10
30-equipment	\$2,905.64	\$1,160.00	\$313.00	\$4,378.64
<b>Total</b>	<b>\$9,172.70</b>	<b>\$15,403.04</b>	<b>\$313.00</b>	<b>\$24,888.74</b>
<b>3. Pass through by contracts</b>				
90-contracts	\$3,183.91	\$36,725.65	\$218,281.43	\$258,190.99
<b>Total Expenses</b>	<b>\$80,175.23</b>	<b>\$111,203.60</b>	<b>\$277,672.74</b>	<b>\$469,051.57</b>
<b>Ratios program category:total expenses (%)</b>				
Personnel	85%	53%	21%	40%
Lab/field/outreach	11%	14%	0%	5%
Pass through	4%	33%	79%	55%

**Summary of SFY 2007 revenues and expenditures for 1430 by Class and Program**

July 1, 2006 through June 30, 2007

	Clean Lakes	Exotics Control	Exotics Prevention	Totals
	(L)	(M)	(P)	
<i>Revenue from boat registrations</i>				
fee (\$/boat)	\$0.50	\$1.50	\$3.00	\$5.00
Income	\$52,076.50	\$155,776.56	\$311,124.00	\$518,977.06
<b>EXPENSES</b>				
<b>1. Personnel &amp; related costs</b>				
10-full-time salary	\$22,798.50	\$22,530.00	\$44,900.89	\$90,229.39
18-overtime	\$235.90	\$5,524.58	\$3,128.23	\$8,888.71
22-rental prop	\$6,668.00	\$7,168.00	\$0.00	\$13,836.00
26-membership fees	\$70.00	\$250.00	\$0.00	\$320.00
27-transfers to OIT	\$1,992.76	\$1,699.86	\$1,213.19	\$4,905.81
28-rent	\$1,625.53	\$2,626.47	\$0.00	\$4,252.00
40-indirect costs	\$1,132.13	\$2,912.87	\$0.00	\$4,045.00
49-DAS, Sec, EAP	\$8,753.93	\$378.08	\$0.00	\$9,132.01
50-intern salary	\$5,310.92	\$607.68	\$0.00	\$5,918.60
60-staff/intern benefits	\$10,353.53	\$10,662.57	\$26,773.93	\$47,790.03
70-in-state travel	\$2,474.48	\$3,887.06	\$0.00	\$6,361.54
80-out-of-state travel	\$2,038.10	\$2,626.86	\$0.00	\$4,664.96
<b>Total</b>	<b>\$63,453.78</b>	<b>\$60,874.03</b>	<b>\$76,016.24</b>	<b>\$200,344.05</b>
<b>2. Lab/field/outreach materials</b>				
20-supplies	\$4,961.93	\$18,839.04	\$322.88	\$24,123.85
30-equipment	\$0.00	\$25,456.02	\$0.00	\$25,456.02
<b>Total</b>	<b>\$4,961.93</b>	<b>\$44,295.06</b>	<b>\$322.88</b>	<b>\$49,579.87</b>
<b>3. Pass through by contracts</b>				
90-contracts	\$300.00	\$75,338.03	\$206,310.92	\$281,948.95
<b>Total Expenses</b>	<b>\$68,715.71</b>	<b>\$180,507.12</b>	<b>\$282,650.04</b>	<b>\$531,872.87</b>
<b>Ratios program category:total expenses (%)</b>				
Personnel	92%	34%	27%	38%
Lab/field/outreach	7%	25%	0%	9%
Pass through	0%	42%	73%	53%

## Summary of SFY 2008 revenues and expenditures for 1430 by Class and Program

July 1, 2007 through June 30, 2008

	Clean Lakes	Exotics Control	Exotics Prevention	Totals
	(L)	(M)	(P)	
<i>Revenue from boat registrations</i>				
fee (\$/boat)	\$0.50	\$1.50	\$3.00	\$5.00
Income	\$49,314.78	\$148,502.13	\$295,526.00	\$493,342.91
<b>EXPENSES</b>				
<b>1. Personnel &amp; related costs</b>				
10-full-time salary	\$23,652.01	\$23,889.00	\$52,827.01	\$100,368.02
18-overtime	\$1,721.17	\$8,022.63	\$4,614.61	\$14,358.41
22-rental prop	\$6,750.00	\$6,950.00	\$0.00	\$13,700.00
24-maintenance-other	\$0.00	\$165.00	\$0.00	
26-membership fees	\$200.00	\$110.00	\$0.00	\$310.00
27-transfers to OIT	\$4,688.02	\$6,127.98	\$0.00	\$10,816.00
28-rent	\$5,999.31	\$4,645.10	\$0.00	\$10,644.41
40-indirect costs	\$1,518.94	\$1,483.60	\$1,706.46	\$4,709.00
42-additional fringe benefits	\$3,817.54	\$1,246.05	\$1,290.41	\$6,354.00
49-DAS, Sec, EAP	\$725.00	\$4,005.00	\$0.00	\$4,730.00
50-intern salary	\$4,372.60	\$6,377.84	\$0.00	\$10,750.44
60-staff/intern benefits	\$12,141.30	\$13,055.87	\$28,496.15	\$53,693.32
70-in-state travel	\$3,855.74	\$4,109.06	\$0.00	\$7,964.80
80-out-of-state travel	\$1,961.29	\$3,167.51	\$0.00	\$5,128.80
<b>Total</b>	<b>\$71,402.92</b>	<b>\$83,354.64</b>	<b>\$88,934.64</b>	<b>\$243,692.20</b>
<b>2. Lab/field/outreach materials</b>				
20-supplies	\$13,506.74	\$16,381.56	\$0.00	\$29,888.30
30-equipment	\$3,806.13	\$6,894.40	\$0.00	\$10,700.53
<b>Total</b>	<b>\$17,312.87</b>	<b>\$23,275.96</b>	<b>\$0.00</b>	<b>\$40,588.83</b>
<b>3. Pass through by contracts</b>				
90-contracts	\$0.00	\$109,565.00	\$221,233.21	\$330,798.21
<b>Total Expenses</b>	<b>\$88,715.79</b>	<b>\$216,195.60</b>	<b>\$310,167.85</b>	<b>\$615,079.24</b>
<b>Ratios program category:total expenses (%)</b>				
Personnel	80%	39%	29%	40%
Lab/field/outreach	20%	11%	0%	7%
Pass through	0%	51%	71%	54%

## **Appendix Nine**

NHDES Exotic Aquatic Plant Program

Control Grant Rating Worksheet Under RSA 487:18

**Priority Rating Worksheets for Awarding Matching Grants  
for Exotic Plant Control Under RSA 487:18  
(updated in 2008)**

<b>LAKE</b>	<b>SITE</b>											
<b>TOWN</b>	<b>APPLICANT</b>	<b>PRIORITY POINTS</b>										
<b>TYPE OF INFESTATION</b> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:70%;">Description</th> <th style="width:30%;">Priority points</th> </tr> </thead> <tbody> <tr> <td>In flowing waters</td> <td align="center">0</td> </tr> <tr> <td>Widespread and well established in lake/pond</td> <td align="center">1</td> </tr> <tr> <td>Established in pond but spreading into new areas</td> <td align="center">2</td> </tr> <tr> <td>Infestations have remained small or localized in pond</td> <td align="center">3</td> </tr> </tbody> </table> <p>Notes:</p>		Description	Priority points	In flowing waters	0	Widespread and well established in lake/pond	1	Established in pond but spreading into new areas	2	Infestations have remained small or localized in pond	3	X4 =
Description	Priority points											
In flowing waters	0											
Widespread and well established in lake/pond	1											
Established in pond but spreading into new areas	2											
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<b>TREATMENT TYPE</b> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:70%;">Description</th> <th style="width:30%;">Priority points</th> </tr> </thead> <tbody> <tr> <td>Herbicide only</td> <td align="center">0</td> </tr> <tr> <td>Herbicide followed by non-chemical maintenance efforts (hand pulling, diving, etc)</td> <td align="center">1</td> </tr> <tr> <td>Non-herbicide treatment (harvesting, barrier screens,etc)</td> <td align="center">2</td> </tr> <tr> <td>New innovative approach</td> <td align="center">3</td> </tr> </tbody> </table> <p>Notes:</p>		Description	Priority points	Herbicide only	0	Herbicide followed by non-chemical maintenance efforts (hand pulling, diving, etc)	1	Non-herbicide treatment (harvesting, barrier screens,etc)	2	New innovative approach	3	X3 =
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Herbicide only	0											
Herbicide followed by non-chemical maintenance efforts (hand pulling, diving, etc)	1											
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Description	Priority points											
Private pond	0											
Public waters but no known public access	1											
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Public waters; public boat ramp present	3											

<b>LAKE USE</b>											
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Notes:		X2 =									
<b>IMPACT OF INFESTATION</b>											
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Notes:											
<b>IMPACT OF INFESTATION TO ECOLOGICAL VALUES OF WATERBODY</b>											
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Notes:											
<b>TREATMENT HISTORY</b>											
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Site not previously treated	3										
Notes:											

LOCAL SUPPORT		
Description	Priority points	
Propose to provide minimum 50 % match	0	
Provide 65% match	1	
Provide 80% match	2	
Provide 90% match	3	
Notes:		
		<b>TOTAL POINTS</b>

**§ 487:18 Project Prioritization.** – Project approval shall be based upon prioritization factors to be established by rules adopted under RSA 541-A. Such rules shall give first priority for expenditure of available funds to the eradication of new infestations of exotic aquatic weeds pursuant to RSA 487:17, II(b) and second priority to all reasonable measures to control exotic aquatic weeds. Otherwise, preference shall be given to lakes that have public access or that serve as a public drinking water supply. Implementation measures shall be based upon an assessment of potential success, technical feasibility, practicability, and cost effectiveness. Restoration and preservation projects shall include watershed management plans to control and reduce incoming nutrients wherever possible through best management practices. Repeated short-term solutions shall be discouraged where long-term solutions are feasible and cost effective. Treatments shall be designed to minimize any adverse effect upon fish and wildlife, their habitats, and the environment. **Source.** 1990, 143:2, eff. June 18, 1990.