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NH Department of
Environmental Services
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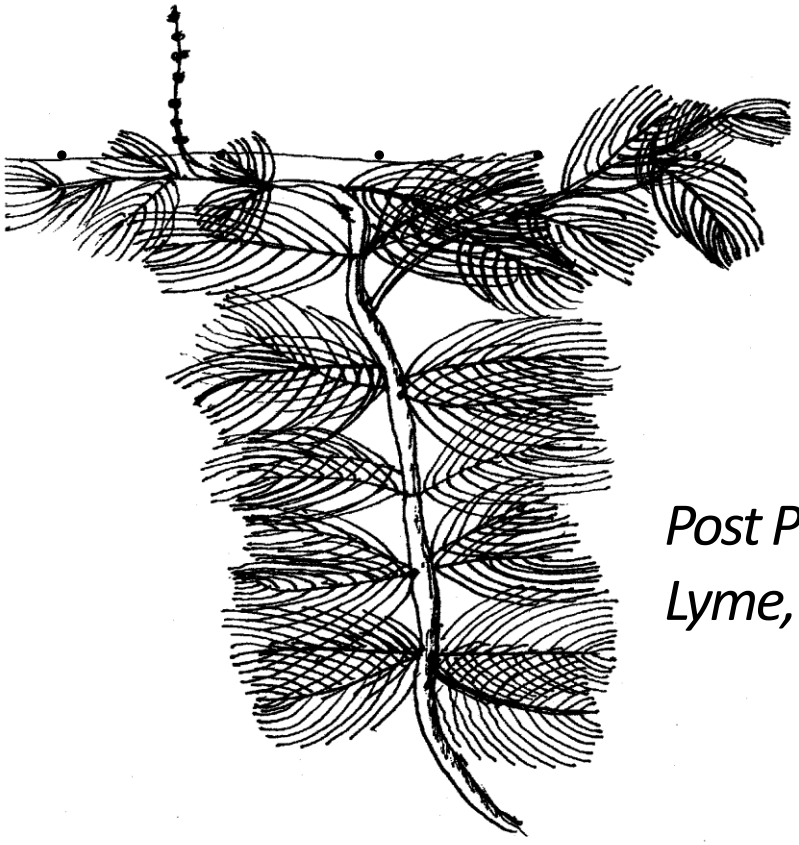
Long-Term Eurasian Water-Milfoil Management Plan



Post Pond
Lyme, NH

Contents

Purpose

The purposes of this exotic aquatic plant management and control plan are:

1. To identify and describe the historic and current exotic aquatic infestation(s) in the waterbody;
2. To identify short-term and long-term exotic aquatic plant control goals;
3. To minimize any adverse effects of exotic aquatic plant management strategies on non-target species;
4. To recommend exotic plant control actions that meet the goals outlined in this plan; and
5. To evaluate control practices used in this waterbody over time to determine if they are meeting the goals outlined in this plan.

This plan also summarizes the current physical, biological, ecological, and chemical components of the subject waterbody as they may relate to both the exotic plant infestation and recommended control actions, and the potential social, recreational and ecological impacts of the exotic plant infestation.

The intent of this plan is to establish an adaptive management strategy for the long-term control of the target species (in this case Eurasian water-milfoil) in the subject waterbody, using an integrated plant management approach.

Appendix A and Appendix B detail the general best management practices and strategies available for waterbodies with exotic species, and provide more information on each of the activities that are recommended within this plan.

Invasive Aquatic Plant Overview

Exotic aquatic plants pose a threat to the ecological, aesthetic, recreational, and economic values of lakes and ponds (Luken & Thieret, 1997, Halstead, 2000), primarily by forming dense growths or monocultures in critical areas of waterbodies that are important for aquatic habitat and/or recreational use. Under some circumstances, dense growths and near monotypic stands of invasive aquatic plants can result, having the potential to reduce overall species diversity in both plant and animal species, and can alter water chemistry and aquatic habitat structure that is native to the system.

Since January 1, 1998, the sale, distribution, importation, propagation, transportation, and introduction of key exotic aquatic plants have been prohibited (RSA 487:16-a) in New Hampshire. This law was designed as a tool for lake managers to help prevent the spread of nuisance aquatic plants.

New Hampshire lists 27 exotic aquatic plant species as prohibited in the state (per Env-Wq 1303.02) due to their documented and potential threat to surface waters of the state.

According to the federal Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology (CALM), "exotic macrophytes are non-native, fast growing aquatic plants, which can quickly dominate and choke out native aquatic plant growth in the surface water. Such infestations are in violation of New Hampshire regulation Env-Wq 1703.19, which states that surface waters shall support and maintain a balanced, integrated and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region" (DES, 2006). In fact, waterbodies that contain even a single exotic aquatic plant do not attain water quality standards and are listed as impaired.

Eurasian water-milfoil Infestation in Post Pond

Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) was documented in Post Pond in Lyme, New Hampshire on August 18, 2010, by a DES biologist and volunteer monitor during routine water quality monitoring activities. Based on a survey of the pond and the distribution of the Eurasian water milfoil, the introduction of this plant to the pond likely occurred in the 2008 or 2009 growing season based on the pattern and degree of growth identified in 2010.

Eurasian water-milfoil is still relatively sparse in Post Pond, but has been on the increase each year. This increased growth, despite management efforts, is the likely result of rapid spread of the plant through fragmentation, drift of fragments, and settling of the fragment to form a new plant. The stems of the Eurasian water-milfoil are very brittle in this pond, and even very little flow or disturbance results in fragmentation. The pond also receives a fair amount of wind, from varying directions, and the fragments have been seen to drift and accumulate in cove areas around the waterbody. Shoreline residents have been asked to remove fragments as they are encountered, so

as to limit the further spread of the plant, while management actions are ongoing.

EWM was seen to flower in many area of Post Pond late in 2012, and seeds may be a factor moving forward with management. DES biologists trimmed off flower/seed stalks as encountered (in between diving activities), but some may have been missed.

Figure 1 illustrates the distribution of EWM in Post Pond since it was first documented. The table below outlines the details of the growth each year since it was documented. Figure 2, across several maps, shows historical and proposed management actions over time.

Area	Location/Area Description	Year	Description of EWM Growth
D2	Northeastern cove, location of public access site and sailboat moorings. Silty/sandy substrates with areas of exposed ledge.	2010	Original location of EWM documentation in pond, right at boat launch area.
		2011	EWM expanded in front of and to west and east of launch site
		2012	Continued expansion west and east of launch site
		2013	Considerable increase in EWM by late August (suspect fragment settling and growth deep in water column). Post treatment survey performed when plants were still responding to herbicide treatment, so points indicate standing "dead" plants. Later season survey by contractor showed that these standing dead plants had senesced.
		2014	Scattered patchy stands of growth in June, none observed late season post control
		2015	Much reduced growth compared to past years. No growth observed in this zone in 2015.
		2016	Scattered single stems of EWM mixed in with native plants along the shoreline. Less dense than in past years, though still present.
		2017	No growth observed in 2017.
		2018	Scattered plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation.
		2020	Scattered plants close to shore late season, no growth during the summer months.
		2021	EWM mixed in as single stems or small clusters of stems among native plant areas, particularly in shallow near-shore zones

Area	Location/Area Description	Year	Description of EWM Growth
		2022	Scattered single stems and small patches of variable milfoil
		2023	Common EWM mixed in with native vegetation and stands off shore around sailboat mooring area.
D3	Eastern shoreline, silty/sandy sediments.	2010	No EWM observed
		2011	Scattered stems and clusters of 10-15 stems.
		2012	Scattered plants early season, several clusters late season. Flower stalks observed.
		2013	Considerable increase in EWM by late August (suspect fragment settling and growth deep in water column). Post treatment survey performed when plants were still responding to herbicide treatment, so points indicate standing "dead" plants. Later season survey by contractor showed that these standing dead plants had senesced.
		2014	Small to medium sized patchy areas of growth in June, none observed post treatment.
		2015	Reduced growth compared to previous years, but some patchy EWM was present in this zone in June. Post treatment minimial milfoil observed.
		2016	Patches of milfoil around the boat moorings, and sparsely scattered single stems along shore.
		2017	Small scattered stems.
		2018	Scattered plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation.
		2020	Scattered stems and a small patch of growth late season, no growth during summer months
		2021	EWM mixed in as single stems or small clusters of stems among native plant areas, particularly in shallow near-shore zones
		2022	Scattered single stems and small patches of EWM
		2023	Scattered stems and small patches of EWM
B4, C4, D4	Southern shoreline, silty/sandy substrates.	2010	No EWM observed
		2011	Few scattered stems. None observed in B4.
		2012	Isolated scattered stems, one clump in about 8' of water. None observed in B4.
		2013	Some increases in EWM by late August (suspect fragment settling and growth deep in water column), particularly in area of sailboat

Area	Location/Area Description	Year	Description of EWM Growth
			moorings in . Post-treatment survey performed when plants were still responding to herbicide treatment, so points from 9/27/13 indicate standing “dead” plants. Later season survey by contractor showed that these standing dead plants had senesced.
		2014	Scattered stems and patches of growth in June, none observed late season following control actions.
		2015	EWM reduced but still present in this zone, as small patches close to shore and in small coves.
		2016	Scattered single stems or small clusters of plants
		2017	Patchy moderately dense areas of growth
		2018	Scattered plants and patches along shore, mostly in C4 and D4, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation, denser in C4, and extending off shore farther this year.
		2020	Scattered plants in SE cove, no other growth in other southern zones
		2021	Clusters of EWM plants in SE cove, no other growth in other southern zones
		2022	No growth observed in B4, low density growth in C4 and D4
		2023	Scattered stems and clusters of stems of EWM
A4	Southwestern cove. Silty/sandy substrates.	2010	Scattered in southwestern-most cove, <a dozen stems.
		2011	Scattered plants from shallow to deep (12’) of water.
		2012	Scattered clumps of plants and drifting fragments, flower stalks observed.
		2013	Some increases in EWM by late August, despite diving efforts. Post-treatment survey performed when plants were still responding to herbicide treatment, so points from 9/27/13 indicate standing “dead” plants. Later season survey by contractor showed that these standing dead plants had senesced.
		2014	Tall single stems in cove in June, none observed late season following control actions.
		2015	Scattered clumps in nearshore shallows in June, including in the westernmost cove in this zone.
		2016	Lower density than in past years, scattered single stems of milfoil near shore and in small

Area	Location/Area Description	Year	Description of EWM Growth
			coves
		2017	Patchy growth and scattered single stems
		2018	Scattered plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation, increasing density along this shoreline, and extending farther off shore than in past years.
		2020	A couple of plants in the SW cove, much reduced density as compared to prior years
		2021	A few scattered EWM stems mixed in with native vegetation
		2022	No milfoil documented in this area in 2022
		2023	A few stems of EWM
A2, A3	Western shoreline. Ledgy, giving way to silty substrates.	2010	No EWM observed
		2011	No EWM observed other than a few stems in westernmost shallow cove area in A3
		2012	Scattered stems in westernmost cove in area A3
		2013	Slight increase in growth in this area, including new plant locations along western shoreline, which were hand removed by divers.
		2014	Scattered stems observed post treatment, none observed post treatment.
		2015	Reduced growth compared to past years
		2016	Scattered single stems
		2017	Scattered single stems
		2018	Sparse plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation.
		2020	No growth observed
		2021	Limited EWM growth, a couple stems in this area
		2022	One single stem of milfoil documented in the western cove in A3
		2023	A couple of stems of EWM
B1, B2	North cove and small wetland downstream of pond. Silty substrates.	2010	No EWM observed
		2011	No EWM observed
		2012	Scattered stems observed early season, several patches/clumps observed late season, with growth interspersed in dense floating-leaved plants near shore.
		2013	Increased clumps of growth over the 2013 growing season. Divers attempted to remove, but the plants were very brittle and

Area	Location/Area Description	Year	Description of EWM Growth
			fragmenting, and some were mixed into floating plant beds and hard to access.
		2014	None observed in 2014
		2015	Large dense patch of EWM found farther off shore than previously documented, standing to surface in roughly 7-8 feet of water by June survey. Reduced post treatment, with scattered single stems close to shore.
		2016	Small to medium sized patchy growth in this cove
		2017	Scattered plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2018	Scattered plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation.
		2020	No EWM observed
		2021	Scattered clusters of EWM plants along shoreline of lake. Small pond to north (downstream) of Post Pond was indicated as having growth of EWM, not surveyed in 2021, but treatment indicated for 2022, if a field survey yields areas of active EWM growth.
		2022	No milfoil observed in this area
		2023	A few stems of EWM
C2	North center shoreline. Silty/sandy substrates.	2010	No EWM observed
		2011	No EWM observed
		2012	No EWM observed
		2013	New scattered stems documented during 2013 growing season, managed by divers.
		2014	New growth observed on western edge of swim beach lines, none post treatment.
		2015	No growth observed in this zone in 2015
		2016	A couple of stems
		2017	Scattered single stems
		2018	Scattered plants and patches along shore, mixed in with native vegetation in nearshore zone.
		2019	Scattered plants and clusters of plants mixed with native vegetation.
		2020	No EWM observed
		2021	A few scattered stems of EWM
		2022	No milfoil observed in this area
		2023	A couple of stems of EWM mixed in with native vegetation

There are approximately 20 houses around the shoreline of Post Pond and no back lots or additional properties with access rights. There is a swim beach owned by the town at the northern end of the pond where the EWM growth has started to expand.

Milfoil Management Goals and Objectives

The aquatic plant management plan outlines actions to eradicate the infestation of Eurasian water-milfoil in Post Pond (*Myriophyllum spicatum)* while maintaining native plant communities whenever Eurasian water-milfoil control actions are being implemented. The plan also addresses early detection activities and preventing further establishment of EWM in Post Pond.

Local Support

Town or Municipality Support

The town of Lyme appreciates the importance of keeping the Post Pond system usable and controlling the Eurasian water-milfoil. The town appropriate funds in 2012 for control actions, and seeks to do the same for 2013. Also, the town is working for form a special committee to track and coordinate EWM control efforts around Post Pond.

The issue of the milfoil has been discussed by both the Board of Selectmen and Conservation Commission (CC) at their regular meetings. Both boards are concerned and supportive of eradication efforts.

Post Pond Association Support

There is no coordinated lake association on this waterbody. Local residents have been sampling Post Pond through the Volunteer Lake Assessment Program for a number of years and are very familiar with the pond. In 2022, NHDES met with a group of interested lake/watershed residents about the possibility of starting a local volunteer Weed Control Diver team to assist with the hand harvesting of Eurasian water milfoil from Post Pond. Some volunteers did go on to take the course, and began diving in the lake in late summer, 2022. Several other volunteers have agreed to Weed Watch, and offer topside support for divers. Many thanks to these volunteers for generously donating time to help clear invasive plants from Post Pond. This effort will indeed make a significant difference to the long-term reduction of Eurasian water milfoil in the system.

The town of Lyme takes the lead at this time in coordinating and funding milfoil management.

Waterbody Characteristics

The following table summarizes basic physical and biological characteristics of Post Pond, including the Eurasian water-milfoil infestation. Note that a current review of the Natural Heritage Bureau (NHB) database was requested and the results from that search are included below, as well as in other relevant sections of this plan.

Parameter/Measure	Value/Description
Lake area (acres)	111
Watershed area (acres)	8,316.5
Shoreline Uses (residential, forested, agriculture)	Mainly forested, some camps and beaches
Max Depth (ft)	38
Mean Depth (ft)	23
Trophic Status	Mesotrophic
Color (CPU) in Epilimnion	9.5
Clarity (ft)	15.5
Flushing Rate (yr-1)	4.4
Natural waterbody/Raised by Damming/Other	Natural
Invasive Plants (Latin name)	Eurasian water-milfoil *(Myriophyllum spicatum)*
Infested Area (acres)	See Figures
Distribution (ringing lake, patchy growth, etc)	See Figures
Sediment type in infested area (sand/silt/organic/rock)	Sandy/rocky/silty
Rare, Threatened, or Endangered Species in Waterbody (according to NH Natural Heritage Bureau (NHB) Inventory review)	2024 Review: Common loon (*Gavia immer*) Beck's water marigold (*Bidens beckii*) Water stargrass/grass-leaved mud-plantain (*Heteranthera dubia*) Marsh wren (*Cistothorus palustris*) Bald eagle (*Haliaeetus leucocephalus*)

A native aquatic vegetation map and key of native plants by the NHDES Biology Section is shown in Figure 3. A bathymetric map is shown in Figure 4.

Beneficial (Designated) Uses of Waterbody

In New Hampshire, beneficial (designated) uses of our waterbodies are categorized into five general categories: Aquatic Life, Fish Consumption, Recreation, Drinking Water Supply, and Wildlife (CALM).

Of these, Aquatic Life, Wildlife and Recreation are the ones most often affected by the presence of invasive plants, though drinking water supplies can also be affected as well in a number of ways.

Following is a general discussion of the most potentially impacted designated uses, including water supplies and near shore wells, as they relate to this system and the actions proposed in this long-term plan.

The goal for aquatic life support is to provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of the region.

Aquatic Life

Fisheries Information

Post Pond in Lyme is a 111 acre natural lake with high alkalinity values compared to other NH lakes. According to the NH Fish and Game Department, it is general regulation water, open year-round to fishing. It is stocked annually with 1000 rainbow trout yearlings. Other species in the pond include brown bullhead, largemouth bass, yellow perch, sunfish spp., chain pickerel and rainbow smelt. It was stocked with yearling walleye in the early 1990s, with no apparent success.

Wildlife Information

According to Natural Heritage Bureau (NHB) reviews, the only listed animal species of special concern in Post Pond are the common loon (*Gavia immer*) and the Marsh Wren (*Cistothorus palustris*).

Common loon: The common loon is listed as threatened in New Hampshire. DES has observed a nesting loon each year since management began on Post Pond, with generally two chicks hatched each year. Eurasian water-milfoil control practices will be small and relatively isolated in the pond, with as little impact to the loon population as is feasible. The New Hampshire Fish and Game Department has requested that herbicide treatments for exotic aquatic plants not be permitted within 100 meters of any nests. New

Hampshire Fish and Game is concerned that the method of application, by motorboat and/or airboat, may result in nest abandonment and loss of eggs and/or loon chicks, as well as herbicide damage to the floating aquatic plants. No chemical or non-chemical treatments, such as hand pulling should occur between May 15 and July 15th within 100 meters of any known or suspected loon nests to avoid "take" under RSA 212-Aof the Endangered Species Conservation Act.

Bald Eagle:

Marsh Wren: This bird can be found in wetland habitats with tall vegetation such as cattails and rushes. Impacts appear to be a result of habitat impacts. Eurasian water milfoil management is aimed at submersed habitats, but DES will work with contractors to ensure that wetland habitats are not impacted by physical milfoil control activities, or by overspray related to herbicide treatments.

There are no NH F&G Wildlife Management Areas within a mile of this waterbody. The Post Pond Preserve, and Clark & Grant lots encompass approximately 48 acres of conservation land abutting this waterbody. No species are being managed in this area currently.

Recreational Uses and Access Points

Post Pond is used for numerous recreational activities, including boating (small motor boats, sailboats and sunfish), fishing, and swimming by both pond residents and transient boaters.

There is one designated public access site on Post Pond; it is located along the northern shore of the pond. This sand/gravel access site has somewhat limited parking.

There are generally less than five power boats from 'off the lake' that come in each day.

There is one designated beach on Post Pond which is owned by the town. A designated beach is described in the CALM as an area on a waterbody that is operated for bathing, swimming, or other primary water contact by any municipality, governmental subdivision, public or private corporation, partnership, association, or educational institution, open to the public, members, guests, or students whether on a fee or free basis. Env-Wq 1102.14 further defines a designated beach as *"a public bathing place that comprises an area on a water body and associated buildings and equipment,*

intended or used for bathing, swimming, or other primary water contact purposes. The term includes, but is not limited to, beaches or other swimming areas at hotels, motels, health facilities, water parks, condominium complexes, apartment complexes, youth recreation camps, public parks, and recreational campgrounds or camping parks as defined in RSA 216-I:1, VII. The term does not include any area on a water body which serves 3 or fewer living units and which is used only by the residents of the living units and their guests.

In addition to the designated beach, there are a few small private swim beaches located on private properties around the pond. There are 21 floating docks and swim platforms around the pond as well. Figure 6 shows the locations commonly used for swimming, and the locations of swim platforms and docks on Post Pond, as well as the location of the access site.

Macrophyte Community Evaluation

The littoral zone is defined as the nearshore areas of a waterbody where sunlight penetrates to the bottom sediments. The littoral zone is typically the zone of rooted macrophyte growth in a waterbody.

The littoral zone of Post Pond is characterized by a mix of native and non-native (Eurasian water-milfoil) plant growth (Figure 3). Native species include a mix of floating plants (white and yellow water-lilies, watershield), emergent plants (pickerelweed, three-way sedge, cattail, bulrush, bur-reed), and submergent plants (pondweeds, grassy spike rush, water stargrass, waterweed, water marigold). Native plant communities are mixed around the entire lake, and are characterized as 'scattered' by the DES.

An NHB review of the system revealed the possible presence of two state-listed endangered aquatic plants in Post Pond: *Heteranthera (or Zostrella) dubia*, and *Bidens beckii*. Figure 5 shows the locations of these plants around the shallows of Post Pond.

Water stargrass: *Heteranthera (or Zosterella) dubia* is listed as threatened in New Hampshire. It is demonstrably widespread, abundant and secure globally, and not listed federally. Records for this plant are from 1947 and again from 2003 in Post Pond, and its presence was verified by DES in 2011 and again in 2012. Herbicides were not used near this species in a 2011 application to control Eurasian water-milfoil, but they were in 2012, 2013, 2014, 2015, and 2016 with no observable impact to this species.

Water marigold: *Bidens beckii* is listed as threatened in New Hampshire. The plant was first reported in 1947 in Post Pond. It is scattered around the shallows of Post Pond, growing in depths of up to 6-8 feet, but is generally present in 3-5 feet of water.

In 2021, NHDES and Natural Heritage Bureau Biologists, and other regional botanists, conducted site visits to survey for both RTE species. Water marigold is scattered in locations around the shoreline of the lake, and the water stargrass is locally abundant in some of the shallow coves around the lake.

We understand that NHB has growing concerns about these two species of concern as a result of the herbicide treatments in the pond. All efforts will be made to avoid or minimize impacts to these two threatened plants (as well as other native plants). DES continues to track pre- and post control populations using GPS and visual observation, and has not yet observed any declines in either species as a result of milfoil control activities.

Wells and Water Supplies

Figure 7 shows the location of wells, water supplies, well-head protection areas, and drinking water protection areas around the subject waterbody, based on information in the DES geographic information system records. Note that it is likely that Figure 7 does not show the location of all private wells.

Note that the map in Figure 7 cannot be provided on a finer scale than 1:48,000. Due to public water system security concerns, a large-scale map may be made available upon agreement with DES' data security policy. Visit DES' OneStop Web GIS, http://www2.des.state.nh.us/gis/onestop/ and register to Access Public Water Supply Data Layers. Registration includes agreement with general security provisions associated with public water supply data. Paper maps that include public water supply data may be provided at a larger-scale by DES' Exotic Species Program after completing the registration process.

In the event that an herbicide treatment is needed for this waterbody, the applicator/contractor will provide more detailed information on the wells and water supplies within proximity to the treatment areas as required in the permit application process with the Division of Pesticide Control at the

Department of Agriculture. It is beyond the scope of this plan to maintain updated well and water supply information other than that provided in Figure 7.

Historical Control Activities

DATE	ACTION	HERBICIDE TREATMENT REPORTED IN ACRES, DIVING/DASH IN GALLONS OF MATERIAL REMOVED	CONTRACTOR
8/27/2010	HAND PULL	~ 1 GALLON	DES
9/15/2010	DASH	40 GALLONS	DES
10/11/10	HAND PULL	25 GALLONS	TED ALDRICH
10/13/10	HAND PULL	25 GALLONS	TED ALDRICH
6/16/2011	HAND PULL	3 HOURS, 60 GALLONS	DES
6/23/2011	HAND PULL	2 HOURS, 20 GALLONS	DES
7/20/2011	BENTHIC BARRIER INSTALLED AND HAND PULL	1.5 HOURS, 10 GALLONS	DES
7/28/2011	BENTHIC BARRIER REMOVED (BOATS RIPPED UP), HAND PULL	2.5 HOURS, 50 GALLONS	DES
9/6/2011	2,4-D TREATMENT	3.4 ACRES	AQUATIC CONTROL TECHNOLOGY
10/6/2011	HAND PULL	2.5 HOURS, 50 GALLONS	DES
7/20/2012	HAND PULL	4.0 HOURS, 20 GALLONS REMOVED	DES
9/12/2012	HAND PULL	3 HOURS, 50 GALLONS REMOVED	DES
9/24/2012	2,4-D (G)	5 ACRES	AQUATIC CONTROL TECHNOLOGY
10/10/2012	HAND PULL	3 HOURS, 50 GALLONS REMOVED	DES
8/23/2013	DIVER HAND PULL	3 HOURS- 60 GALLONS	DES
9/3/2013	2,4-D & TRICLOPYR (G)	19 ACRES	AQUATIC CONTROL TECHNOLOGY
10/4/2013	HAND PULL	1 HOUR- 30 GALLONS	DES
7/11/2014	2,4-D BEE	23.1 ACRES	ACT
6/17/2015	HAND PULL	2 HOURS, 20 GALLONS	DES
8/7/2015	HAND PULL	3 HOURS, 75 GALLONS	DES
9/2/2015	2,4-D BEE	16.3 ACRES	ACT
6/10/2016	HAND PULL	1.5 HOURS, 2 GALLONS	DES
9/14/2016	HAND PULL	2 HOURS, 20 GALLONS	DES

DATE	ACTION	HERBICIDE TREATMENT REPORTED IN ACRES, DIVING/DASH IN GALLONS OF MATERIAL REMOVED	CONTRACTOR
9/21/2016	2,4-D BEE (G)	2244 LBS FOR 13.2 ACRES	SOLitude LAKE MANAGEMENT
9/6/2017	2,4-D BEE (G)	1020 LBS FOR 6 ACRES	SOLitude LAKE MANAGEMENT
9/6/2018	2,4-D BEE (G)	2830 LBS FOR 17.1 ACRES	SOLitude LAKE MANAGEMENT
8/6/2019	HAND PULL	50 GALLONS	AB AQUATICS
8/7/2019	HAND PULL	40 GALLONS	AB AQUATICS
8/8/2019	HAND PULL	40 GALLONS	AB AQUATICS
8/8/2019	HAND PULL	5 GALLONS	AB AQUATICS
8/9/2019	HAND PULL	5 GALLONS	AB AQUATICS
8/9/2019	HAND PULL	35 GALLONS	AB AQUATICS
8/9/2019	HAND PULL	10 GALLONS	AB AQUATICS
9/23/2019	Procellacor EC (Florpyrauxifen benzyl)	16.3 ACRES	SOLitude LAKE MANAGEMENT
Sep-20	HAND PULL	5 GALLONS	NHDES DIVE+A22:E36RS
9/8/2021	Procellacor EC (Florpyrauxifen benzyl)	5.7 ACRES	SOLitude LAKE MANAGEMENT
9/6/2021	DASH	60 GALLONS	AE COMMERCIAL DIVERS
9/15/2021	DASH	100 GALLONS	AE COMMERCIAL DIVERS
9/2/2022	DIVER HAND PULL	35 EURASIAN MILFOIL PLANTS	Dan Pontbriand, Jane Henry
9/17/2022	DIVER HAND PULL	502 EURASIAN MILFOIL PLANTS	Dan Pontbriand, Jane Henry
6/22/23-6/27/23	DASH/DIVING	242.5 GALLONS	JAY WHITEHAIR
7/17/2023	PROCELLACOR EC	5.7 ACRES	SOLITUDE LAKE MANAGEMENT
8/5/2023	DIVER HAND PULL	62 EURASIAN MILFOIL PLANTS	Dan Pontbriand, Kamrron, Joe Clifford
8/11/2023	DIVER HAND PULL	6 PLANTS	Don Pontbriand, Harmon Clifford, Faith
9/10/2023	DIVER HAND PULL	Approximately 30 Plants	Dan Pontbriand, Jane Henry

Aquatic Invasive Plant Management Options

The control practices used should be as specific to the target species as feasible. No control of native aquatic plants is intended.

Exotic aquatic plant management relies on a combination of proven methods that control exotic plant infestations, including physical control, chemical control, biological controls (where they exist), and habitat manipulation.

Integrated Pest Management Strategies (IPM) are typically implemented using Best Management Practices (BMPs) based on site-specific conditions so as to maximize the long-term effectiveness of control strategies. Descriptions for the control activities are closely modeled after those prescribed by the Aquatic Ecosystem Restoration Foundation (AERF) (2004). This publication can be found online at http://www.aquatics.org/bmp.html.

Criteria for the selection of control techniques are presented in Appendix A. Appendix B includes a summary of the exotic aquatic plant control practices currently used by the State of New Hampshire.

Feasibility Evaluation of Control Options in this Waterbody

DES has evaluated the feasibility of potential control practices on the subject waterbody. The following table summarizes DES' control strategy recommendations for the subject waterbody:

Control Method	Use on Post Pond
Restricted Use Areas (RUAs) and/or Fragment Barriers	The purpose of RUAs and fragment barriers is to contain small areas of exotic aquatic plant growth to prevent them from spreading further in a system. If Eurasian water-milfoil is reduced by other integrated approaches outlined in this plan, then RUAs and fragment barriers may be a future consideration based on the size, configuration and location of remaining areas of growth. Due to the configuration of Post Pond (basically a circle), there are no deep embayments, so this approach may be a challenge, but will still be considered as appropriate.
Hand-pulling	Hand-pulling has been used as a primary approach at management in Post Pond since the EWM was first documented, and will continue to be a significant control method in this waterbody.

Control Method	Use on Post Pond
	Routine monitoring (by local Weed Watchers) is strongly recommended, and if Weed Watchers can mark growth for divers that will be a significant time savings for divers, who can focus more on removal than surveying. DES divers will continue to assist as feasible, but in the near-term there will be a need for stepped-up diving, likely a few days per month, and DES divers will not be able to provide that much time due to commitments elsewhere. Contract divers should be on retainer to perform this work as needed, and grant funds can be used for this type of work.
Mechanical Harvesting/Removal	Not recommended due to the risk of fragmentation and drift, and subsequent further spread of the invasive plant. The EWM is very brittle and fragments easily in this waterbody.
Benthic Barriers	Recommended for small patches that are 20' x 20' in size or less, and where practical. Fragment barriers may be used on a wider scale in some areas of Post Pond.
Herbicides	Herbicide treatment is recommended as a primary means of control only where infestations of the exotic plant are too widespread and/or dense for non-chemical means of control to be effective, or where native plants are too thick to effectively allow divers to hand remove stems of the EWM.
Extended Drawdown	Not feasible or practical for this waterbody due to lack of an impoundment structure.
Dredge	Cost prohibitive and not often effective for controlling invasive aquatic plants.
Biological Control	No biological controls are yet approved for use on Eurasian water-milfoil.
No Control	The Eurasian water-milfoil infestation has been spreading quickly in this waterbody, and a no-control option would only lead to widespread growth around the pond, in the entire photic zone of the pond.

Recommended Actions, Timeframes and Responsible Parties

An evaluation of the size, location, and type of Eurasian water-milfoil infestation, as well as the waterbody uses was conducted at the end of the last growing season (see attached figures for findings). Based on this survey the following recommendations are made for Eurasian water-milfoil control in the system:

Year	Action	Responsible Party	Schedule
2022	Work with Lyme Conservation Commission and interested parties on developing a local diving group to assist with hand harvesting of EWM from the pond.	NHDES and local interested residents	Spring/ summer
	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through Sept
	Survey and planning for summer/fall milfoil control actions	NHDES	June and August
	Diver/DASH work as needed and recommended (areas to be determined based on updated spring survey)	Contract Diver and/or local certified weed control divers	Growing season as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on updated spring survey)	SŌLitude Lake Management, LLC.	As appropriate
	Survey waterbody and planning for next season's control actions	NHDES	September
2023	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through Sept
	Survey and planning for summer/fall milfoil control actions	NHDES	June and August

Year	Action	Responsible Party	Schedule
	Diver/DASH work as needed and recommended (areas to be determined based on updated spring survey)	Contract Diver and/or local certified weed control divers	Growing season as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on updated spring survey)	SŌLitude Lake Management, LLC.	As appropriate
	Survey waterbody and planning for next season's control actions	NHDES	September
2024	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through Sept
	Survey and planning for summer/fall milfoil control actions	NHDES	June and August
	Diver/DASH work as needed and recommended (areas to be determined based on updated spring survey)	Contract Diver and/or local certified weed control divers	Growing season as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on updated spring survey)	SŌLitude Lake Management, LLC.	As appropriate
	Survey waterbody and planning for next season's control actions	NHDES	September
2025	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through Sept
	Survey and planning for summer/fall milfoil control actions	NHDES	June and August

Year	Action	Responsible Party	Schedule
	Diver/DASH work as needed and recommended (areas to be determined based on updated spring survey)	Contract Diver and/or local certified weed control divers	Growing season as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on updated spring survey)	SŌLitude Lake Management, LLC.	As appropriate
	Survey waterbody and planning for next season's control actions	NHDES	September
2026	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through Sept
	Survey and planning for summer/fall milfoil control actions	NHDES	June and August
	Diver/DASH work as needed and recommended (areas to be determined based on updated spring survey)	Contract Diver and/or local certified weed control divers	Growing season as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on updated spring survey)	SŌLitude Lake Management, LLC.	As appropriate
	Survey waterbody and planning for next season's control actions	NHDES	September
2027	Update and revise Long-Term Eurasian water-milfoil Control Plan	DES and Interested Parties	Fall/ Winter

Notes

Target Specificity

Aquatic herbicide applications are conducted in a specific and scientific manner. To the extent feasible, the permitting authority favors the use of selective herbicides that, where used appropriately, will control the target plant with little or no impact to non-target species, such that the ecological functions of native plants for habitat, lake ecology, and chemistry/biology will be maintained. *Not all aquatic plants will be impacted as a result of an herbicide treatment.*

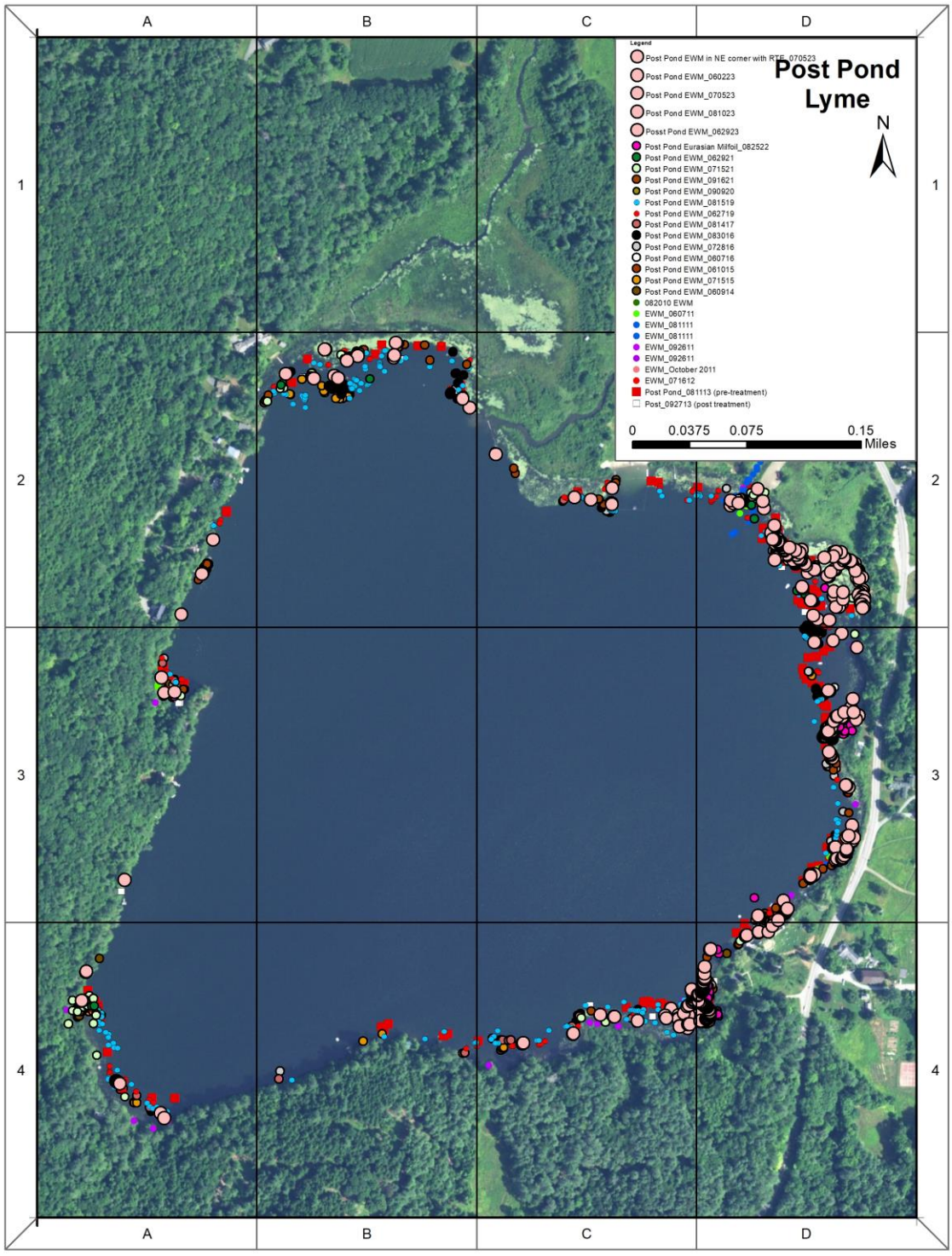
Adaptive Management

Because this is a natural system that is being evaluated for management, it is impossible to accurately predict a management course over five years that could be heavily dependent on uncontrolled natural circumstances (weather patterns, temperature, adaptability of invasive species, etc).

This long-term plan is therefore based on the concept of adaptive management, where current field data (from field survey work using DES established field survey standard operating procedures) drive decision making, which may result in modifications to the recommended control actions and timeframes for control. As such, this management plan should be considered a dynamic document that is geared to the actual field conditions that present themselves in this waterbody.

If circumstances arise that require the modification of part or all of the recommendations herein, interested parties will be consulted for their input on revisions that may be needed to further the goal of Eurasian water-milfoil management in the subject waterbody.

Figure 1: Map of Eurasian water-milfoil Infestations Over Time



2022 Post Pond Eurasian Water Milfoil Growth

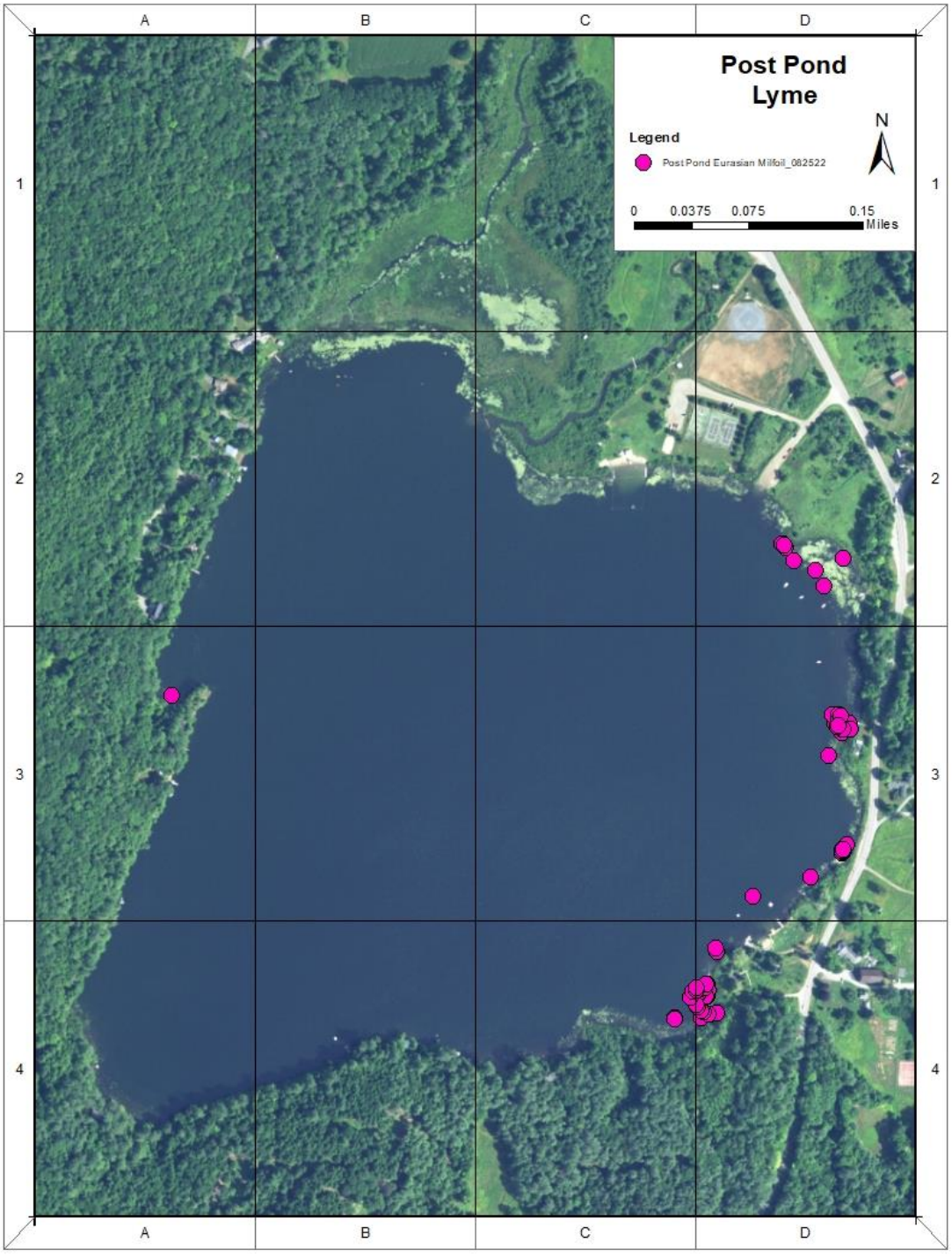
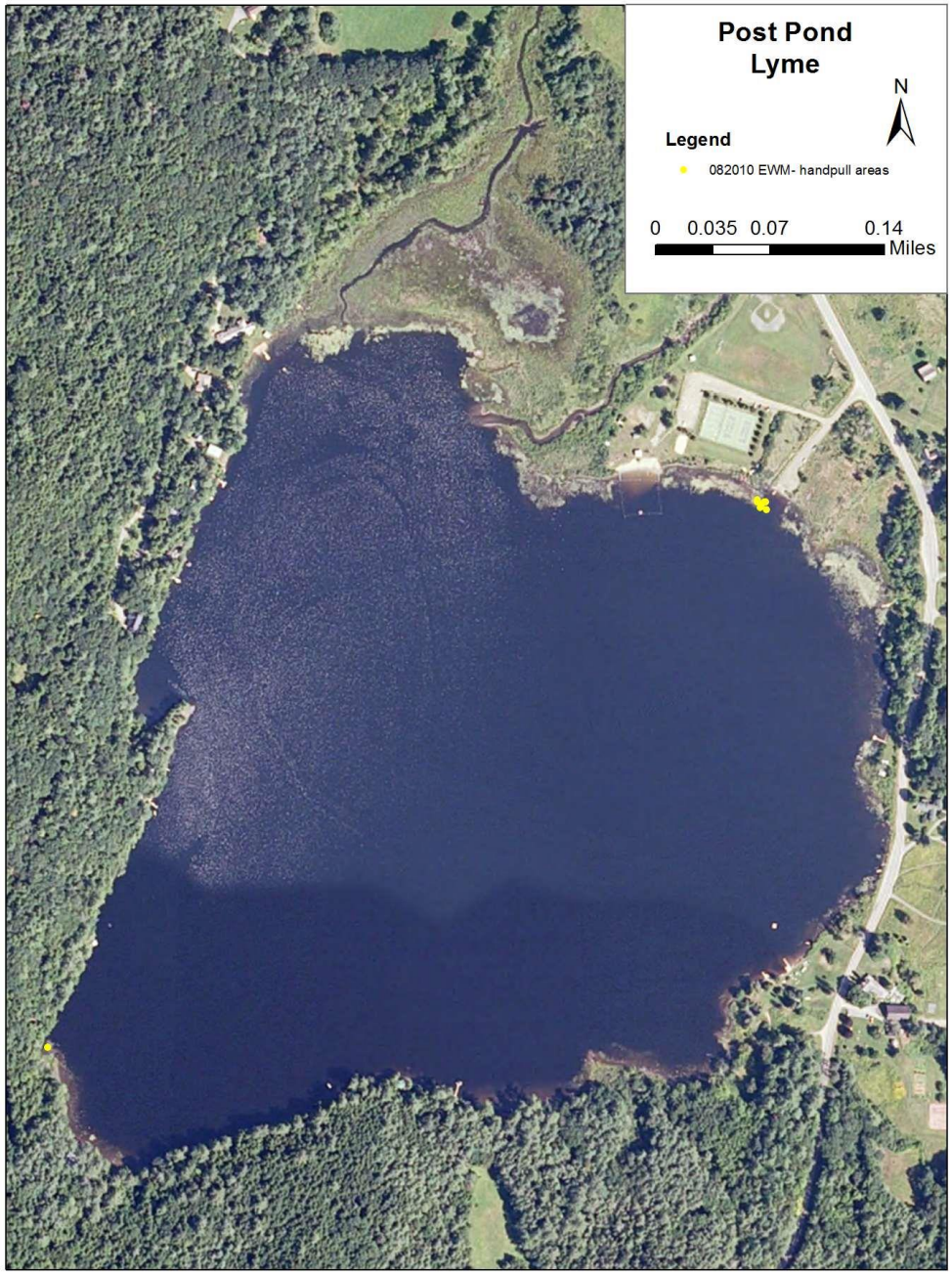
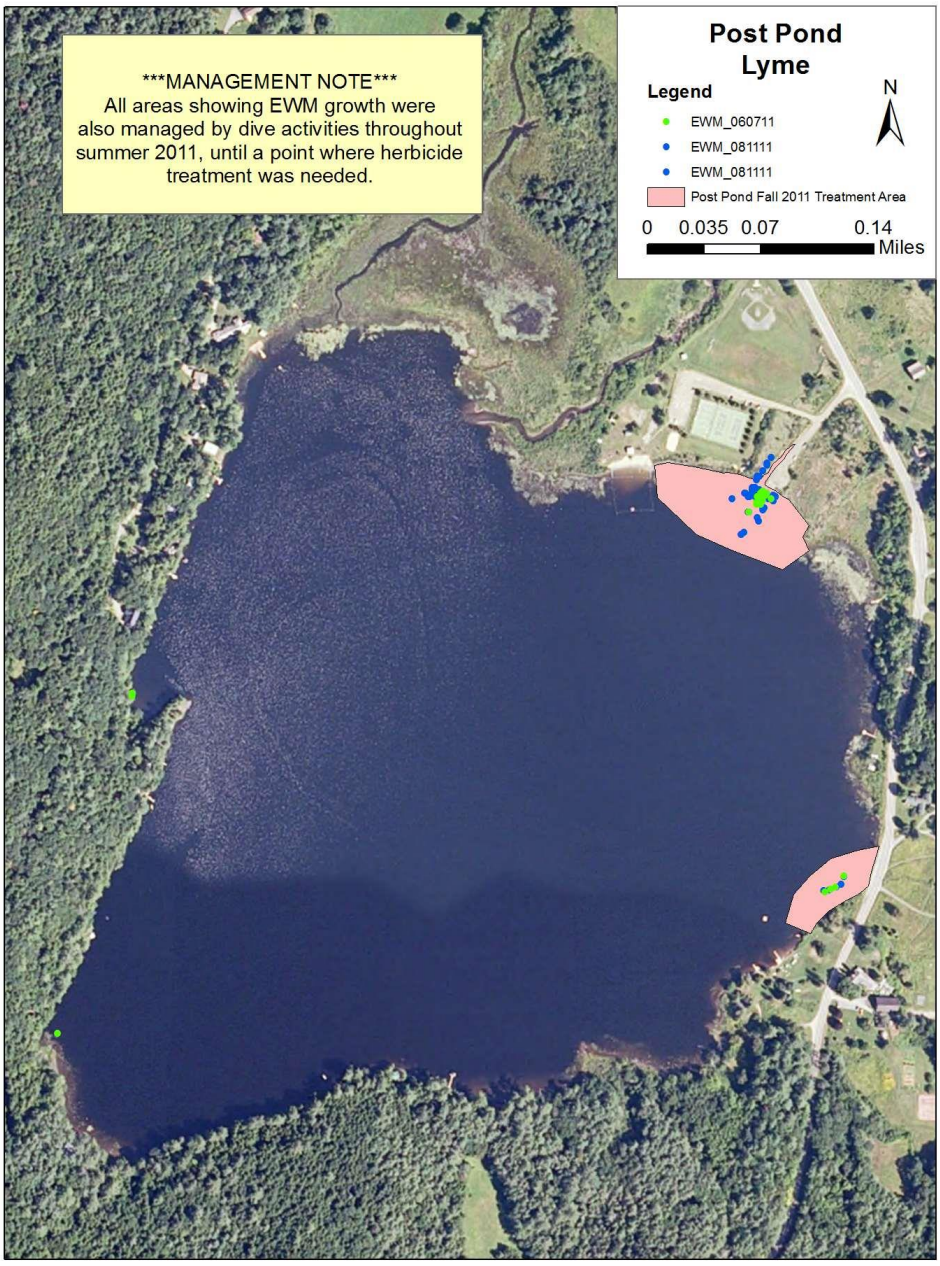


Figure 2: Map of Control Actions Over Time

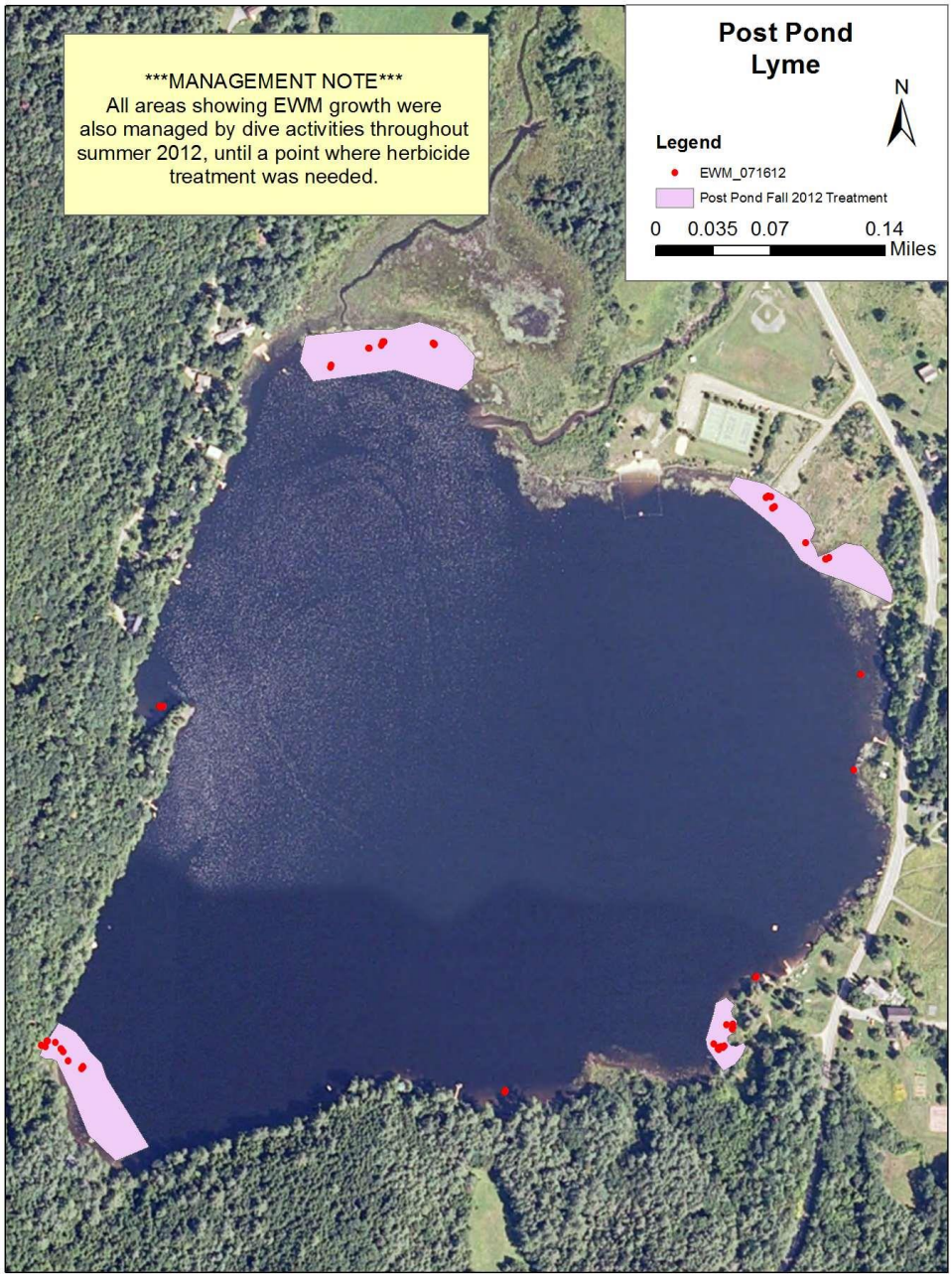
2010



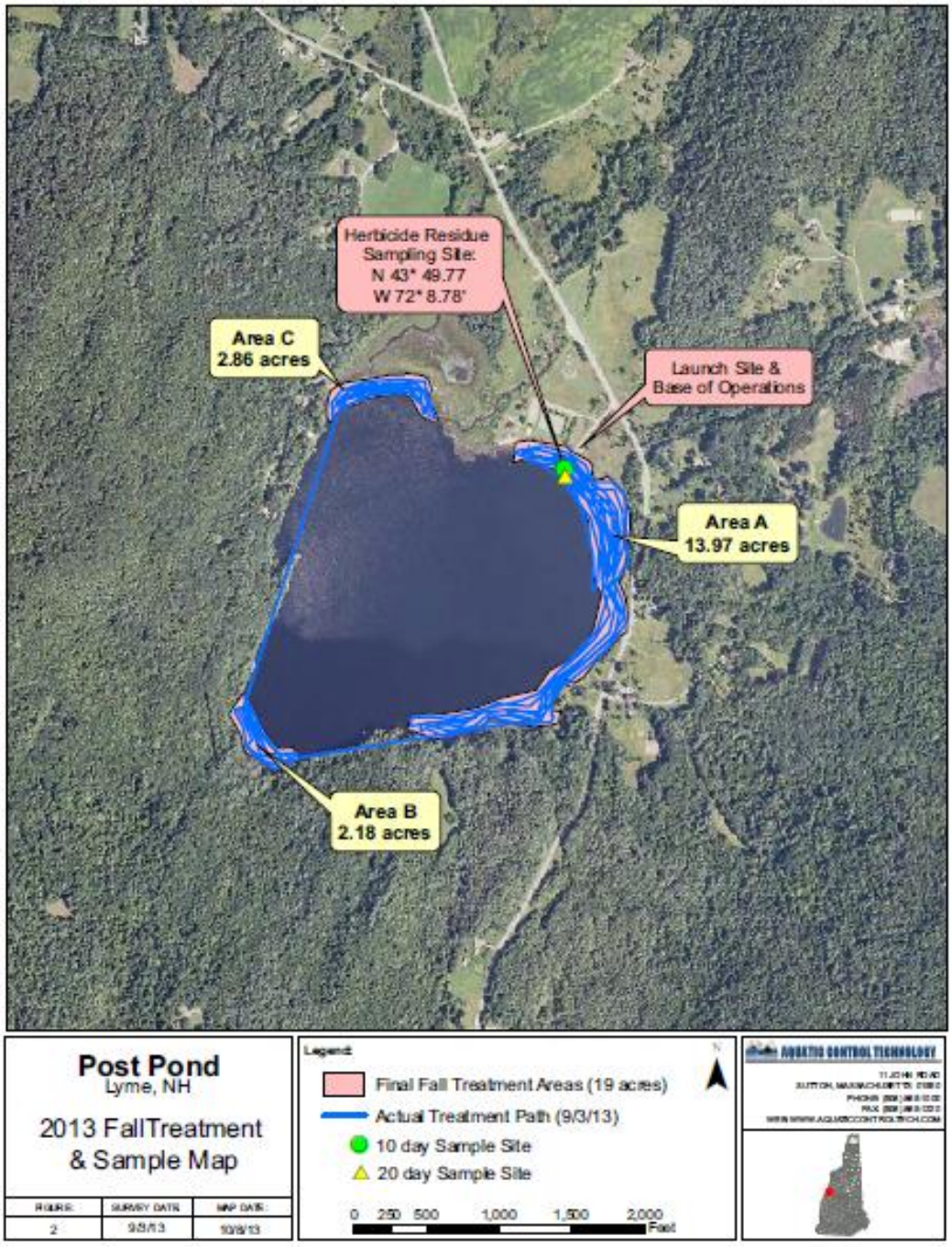
2011


MANAGEMENT NOTE
All areas showing EWM growth were also managed by dive activities throughout summer 2011, until a point where herbicide treatment was needed.
Post Pond
Lyme
Legend
N
EWM_060711
EWM_081111
EWM_081111
Post Pond Fall 2011 Treatment Area
0 0.035 0.07 0.14
Miles

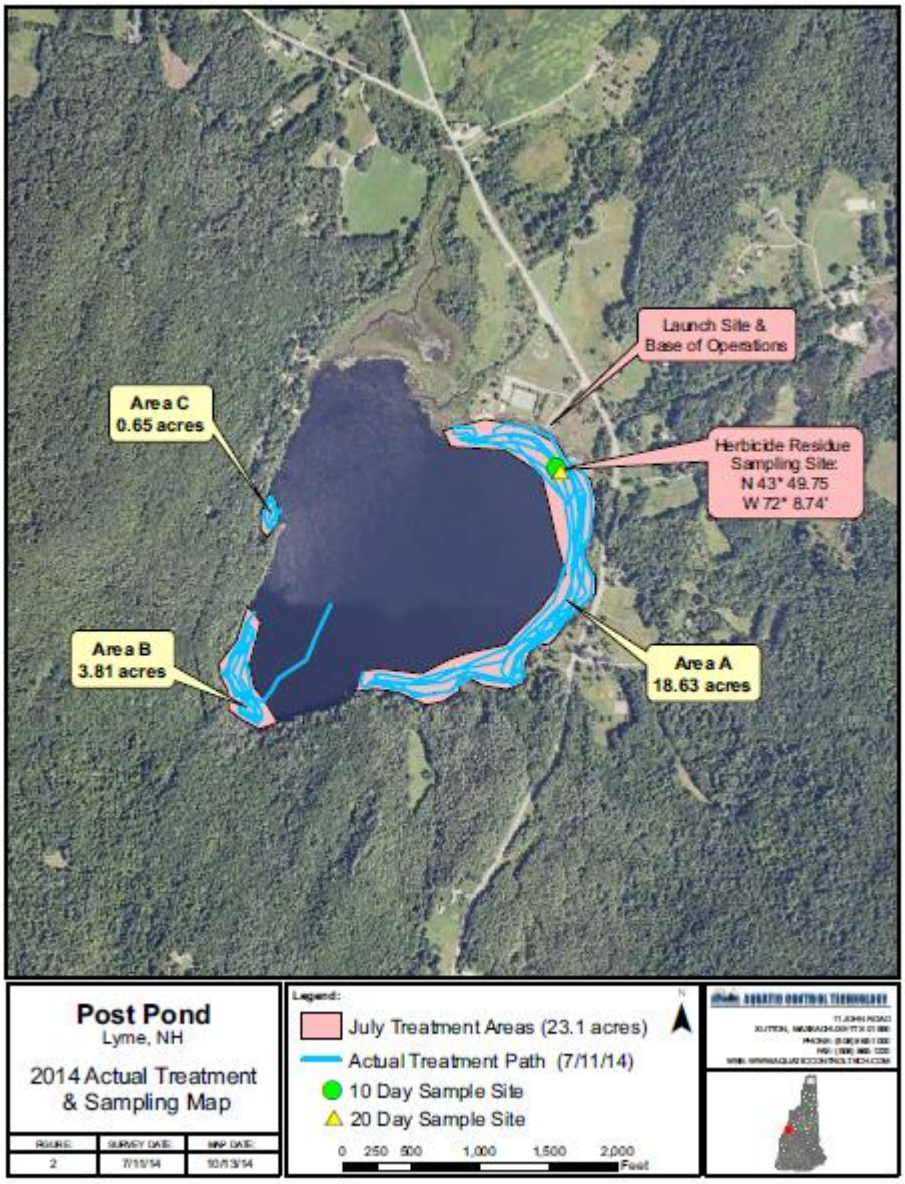
2012


MANAGEMENT NOTE
All areas showing EWM growth were also managed by dive activities throughout summer 2012, until a point where herbicide treatment was needed.
Post Pond
Lyme
N
Legend
EWM_071612
Post Pond Fall 2012 Treatment
0 0.035 0.07 0.14
Miles

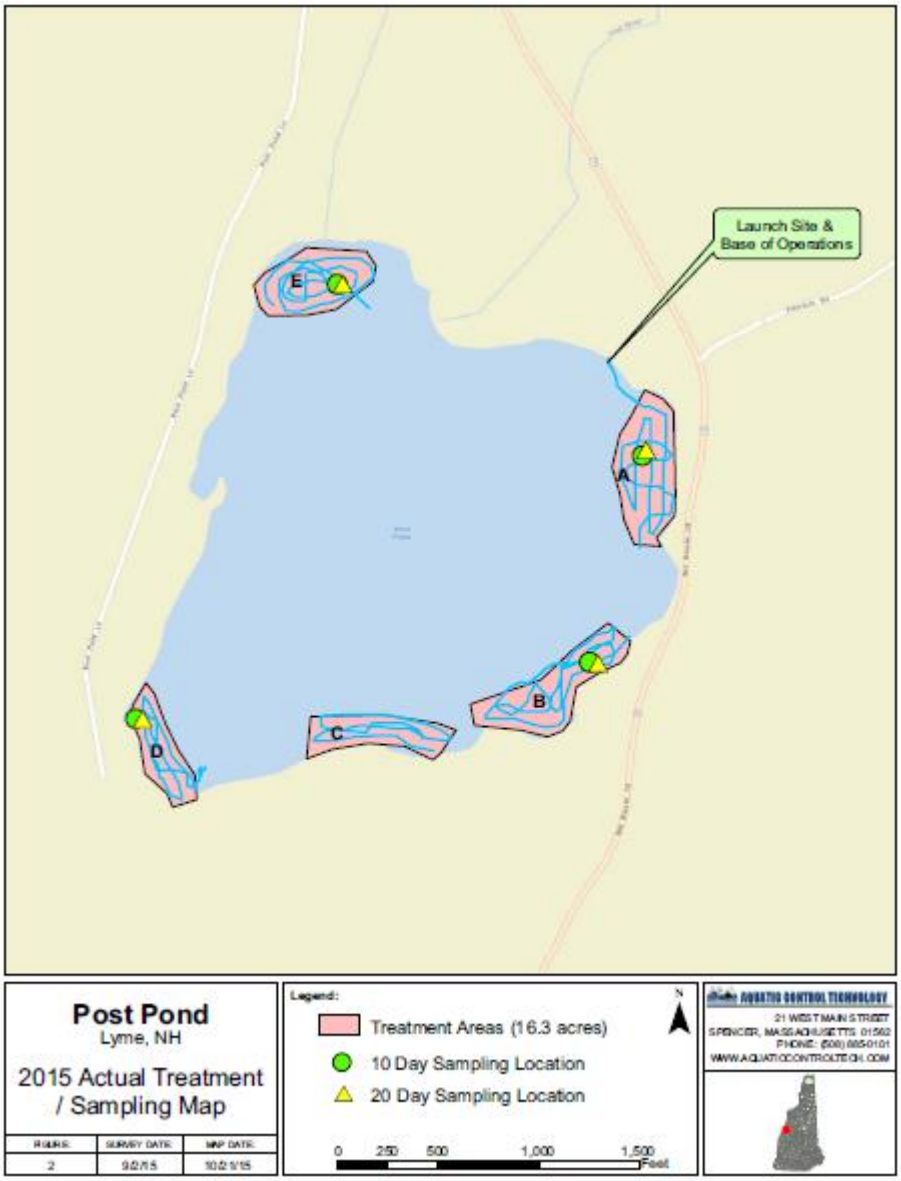
2013 (Actual)


Herbicide Residue Sampling Site:
N 43° 49.77
W 72° 8.78'
Area C
2.86 acres
Launch Site & Base of Operations
Area A
13.97 acres
Area B
2.18 acres
Post Pond
Lyme, NH
2013 FallTreatment & Sample Map
FIGURE:
SURVEY DATE:
MAP DATE:
2
9/3/13
10/9/13
Legend:
Final Fall Treatment Areas (19 acres)
Actual Treatment Path (9/3/13)
10 day Sample Site
20 day Sample Site
0 250 500 1,000 1,500 2,000
Feet
AQUATIC CONTROL TECHNOLOGY

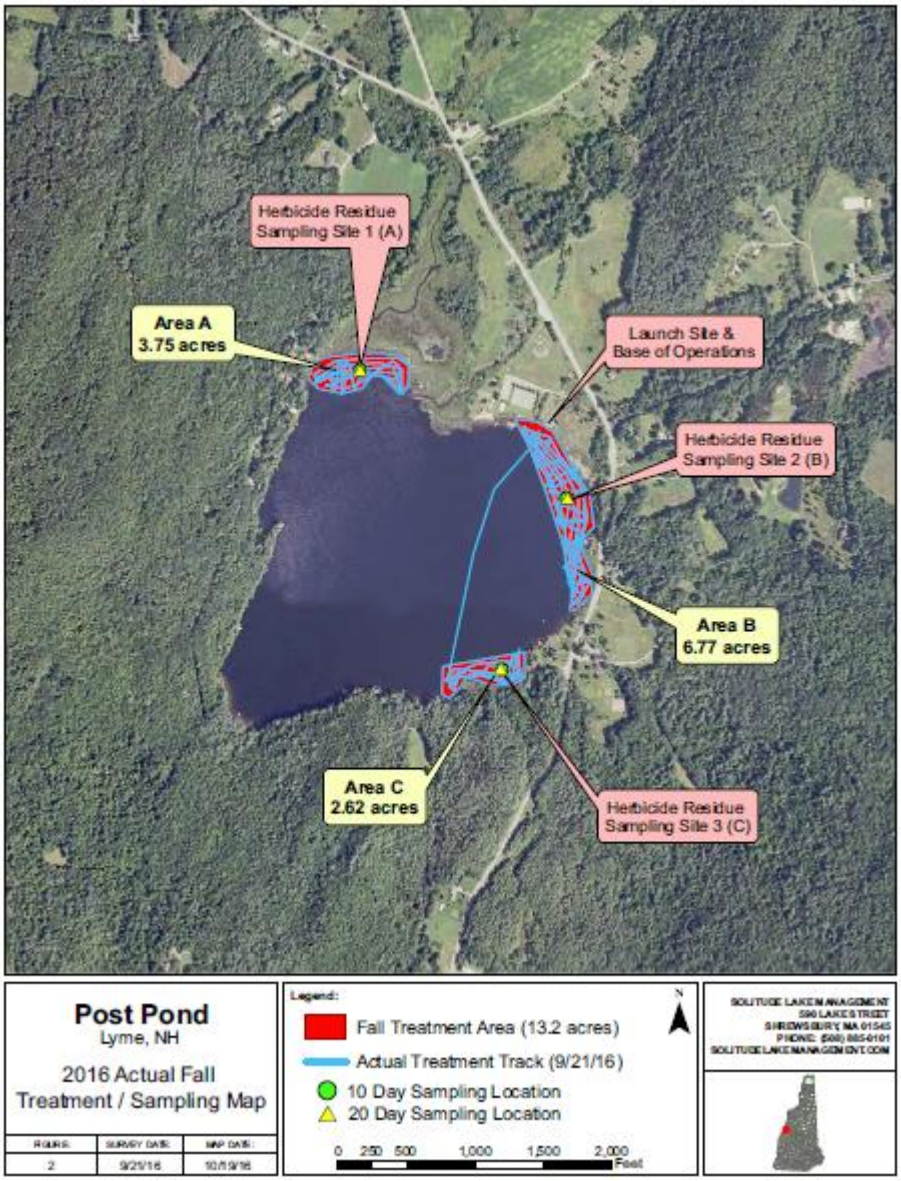
2014 (Actual treatment areas)



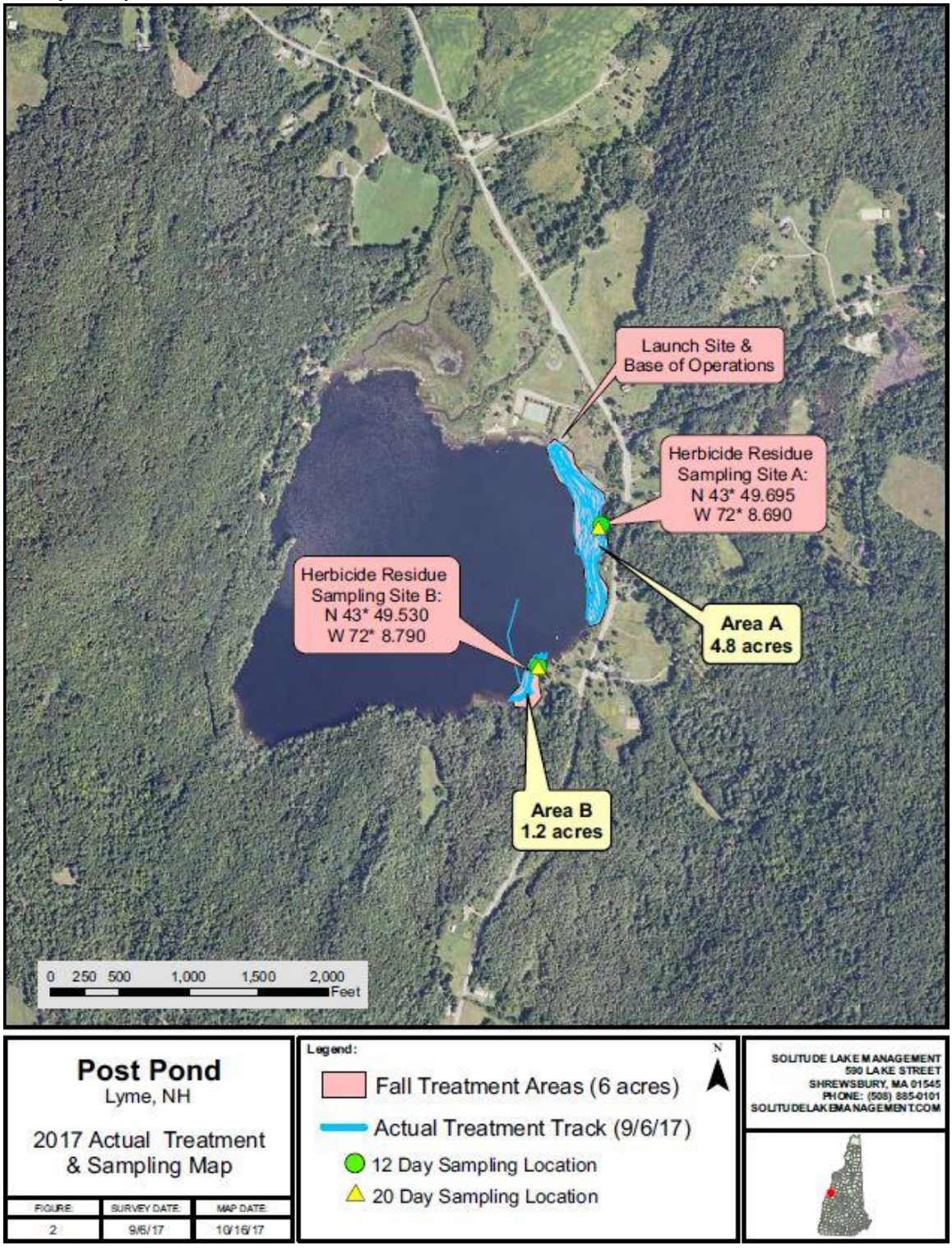
2015 (Actual)


Launch Site &
Base of Operations
E
A
B
C
D
Post Pond
Lyme, NH
2015 Actual Treatment
/ Sampling Map
Legend:
Treatment Areas (16.3 acres)
10 Day Sampling Location
20 Day Sampling Location
0 250 500 1,000 1,500
Feet
N
21 WEST MAIN STREET
SPENCER, MASSACHUSETTS 01562
WWW.AQUATICCONTROLTECH.COM

2016 (Actual)


Herbicide Residue Sampling Site 1 (A)
Area A 3.75 acres
Launch Site & Base of Operations
Herbicide Residue Sampling Site 2 (B)
Area B 6.77 acres
Area C 2.62 acres
Herbicide Residue Sampling Site 3 (C)
Post Pond
Lyme, NH
2016 Actual Fall Treatment / Sampling Map
Legend:
Fall Treatment Area (13.2 acres)
Actual Treatment Track (9/21/16)
10 Day Sampling Location
20 Day Sampling Location
0 250 500 1,000 1,500 2,000 Feet
N
SOLITUDE LAKE MANAGEMENT
590 LAKE STREET
SHREWSBURY, MA 01545
PHONE: (508) 865-0191
SOLITUDELAKEMANAGEMENT.COM

2017 (Actual)


Launch Site &
Base of Operations
Herbicide Residue
Sampling Site A:
N 43* 49.695
W 72* 8.690
Herbicide Residue
Sampling Site B:
N 43* 49.530
W 72* 8.790
Area A
4.8 acres
Area B
1.2 acres
0 250 500 1,000 1,500 2,000
Feet
Post Pond
Lyme, NH
2017 Actual Treatment
& Sampling Map
FIGURE: 2
SURVEY DATE: 9/6/17
MAP DATE: 10/16/17
Legend:
Fall Treatment Areas (6 acres)
Actual Treatment Track (9/6/17)
12 Day Sampling Location
20 Day Sampling Location
N
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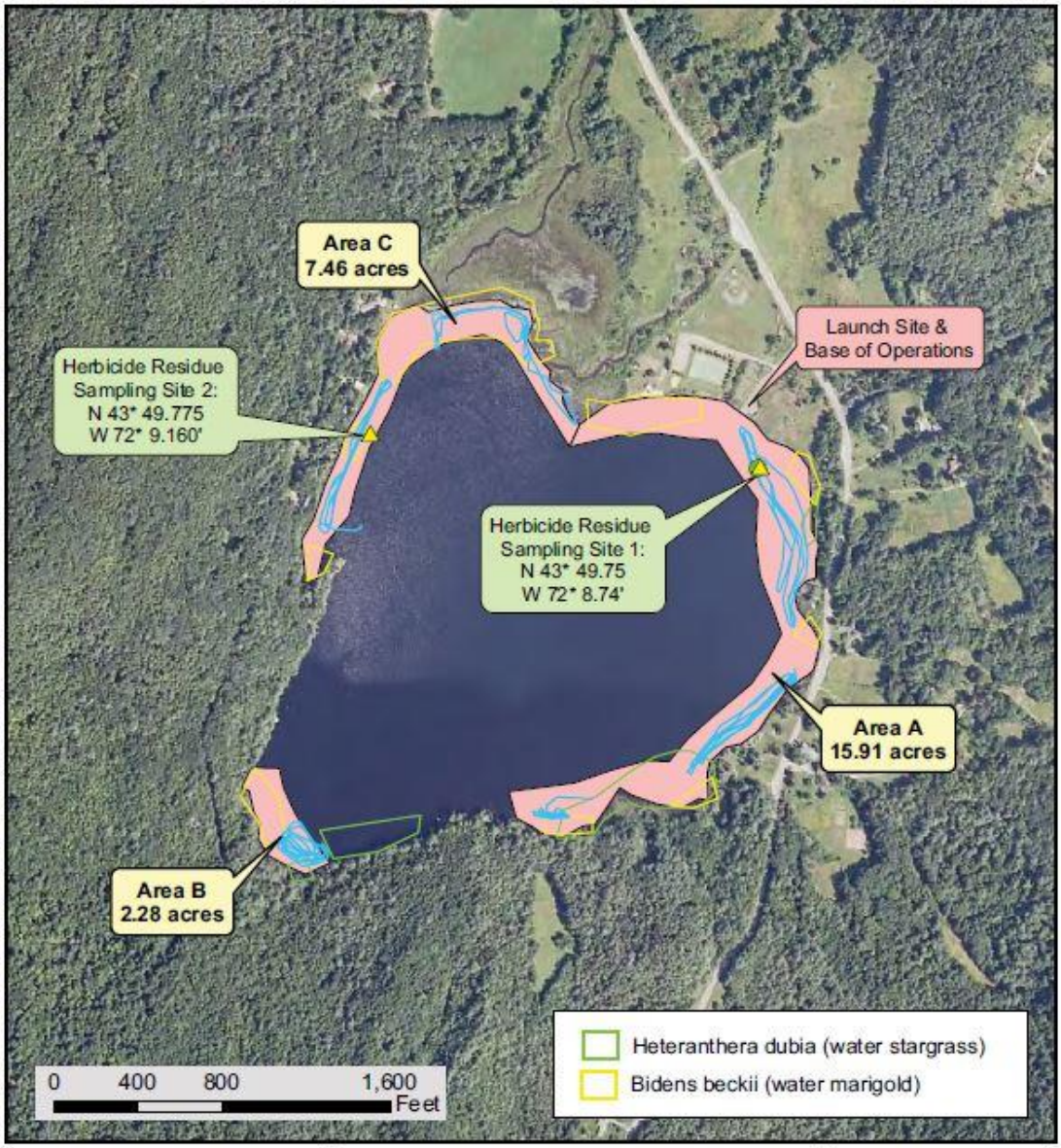
590 LAKE STREET
SHREWSBURY, MA 01545
PHONE: (508) 885-0101
SOLITUDELAKEMANAGEMENT.COM

2018 (Actual)



Post Pond
Lyme, NH

2018 Actual Fall Treatment & Sampling Map

FIGURE:	SURVEY DATE:	MAP DATE:
2	9/6/18	10/24/18

Legend:

N

Fall Treatment Areas (25.65 acres*)

*Only ~17.1 acres were treated due to presence/visual observation and historical records of Water Stargrass and Water Marigold (Condition #5 of SP-158)

11 Day Sampling Location

20 Day Sampling Location

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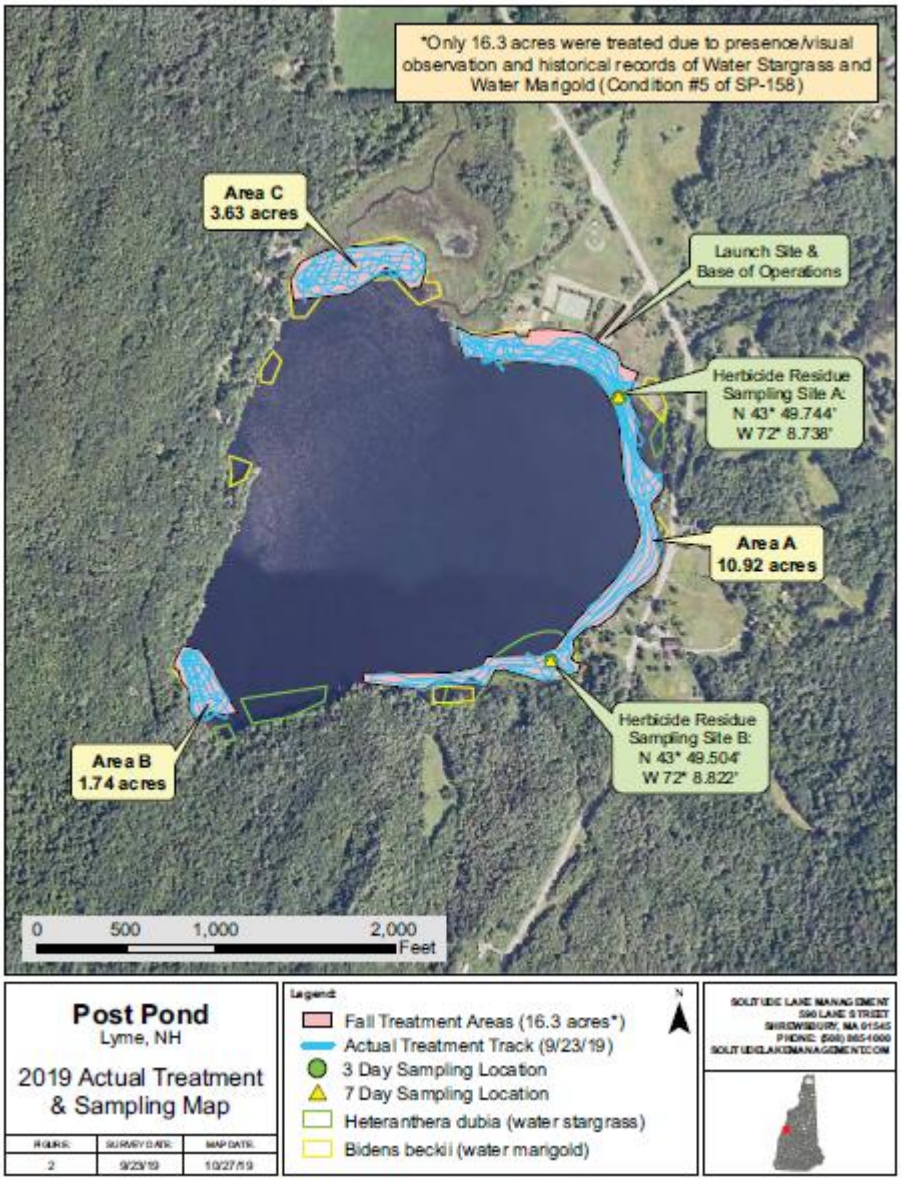
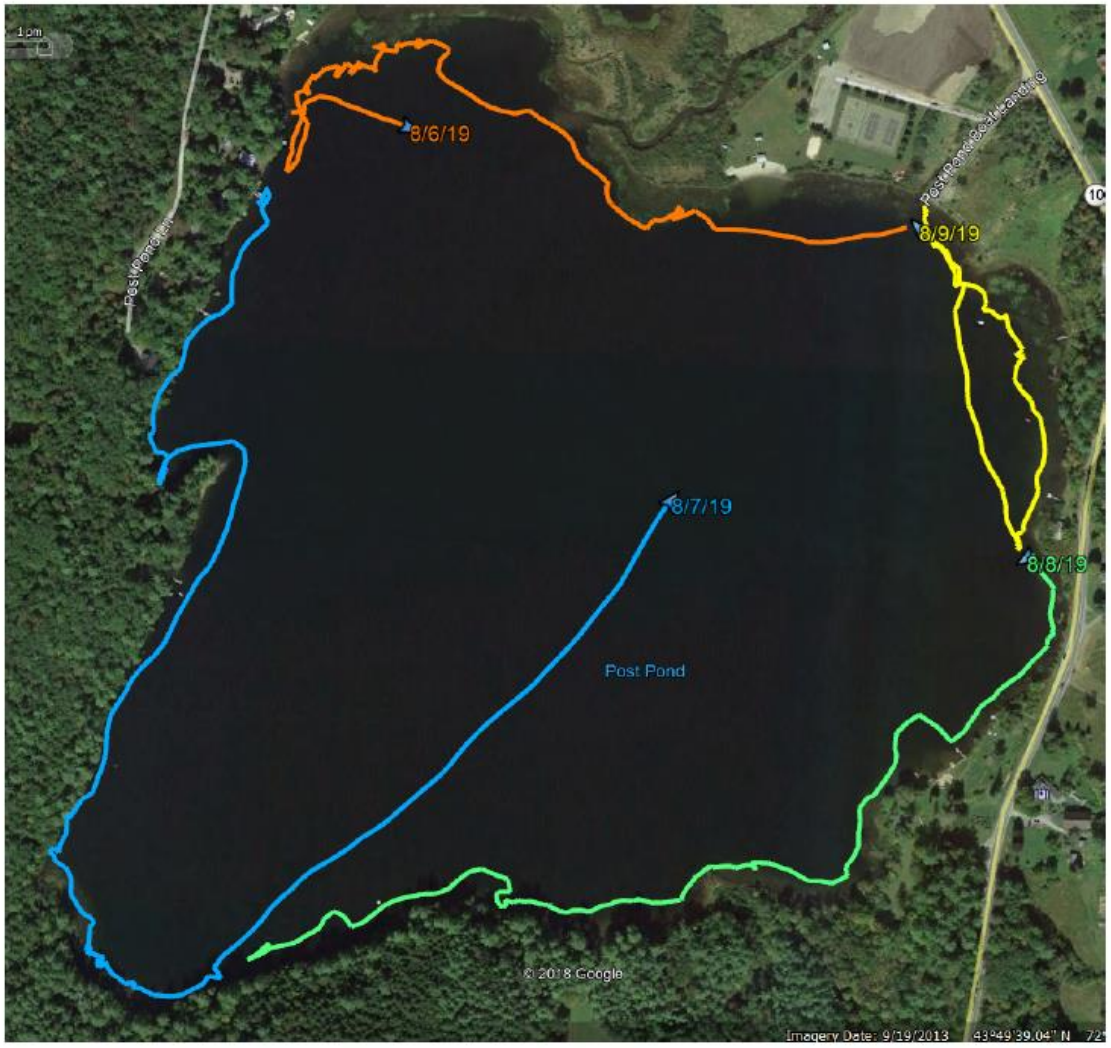
PHONE: (508) 865-1000
SOLITUDELAKEMANAGEMENT.COM

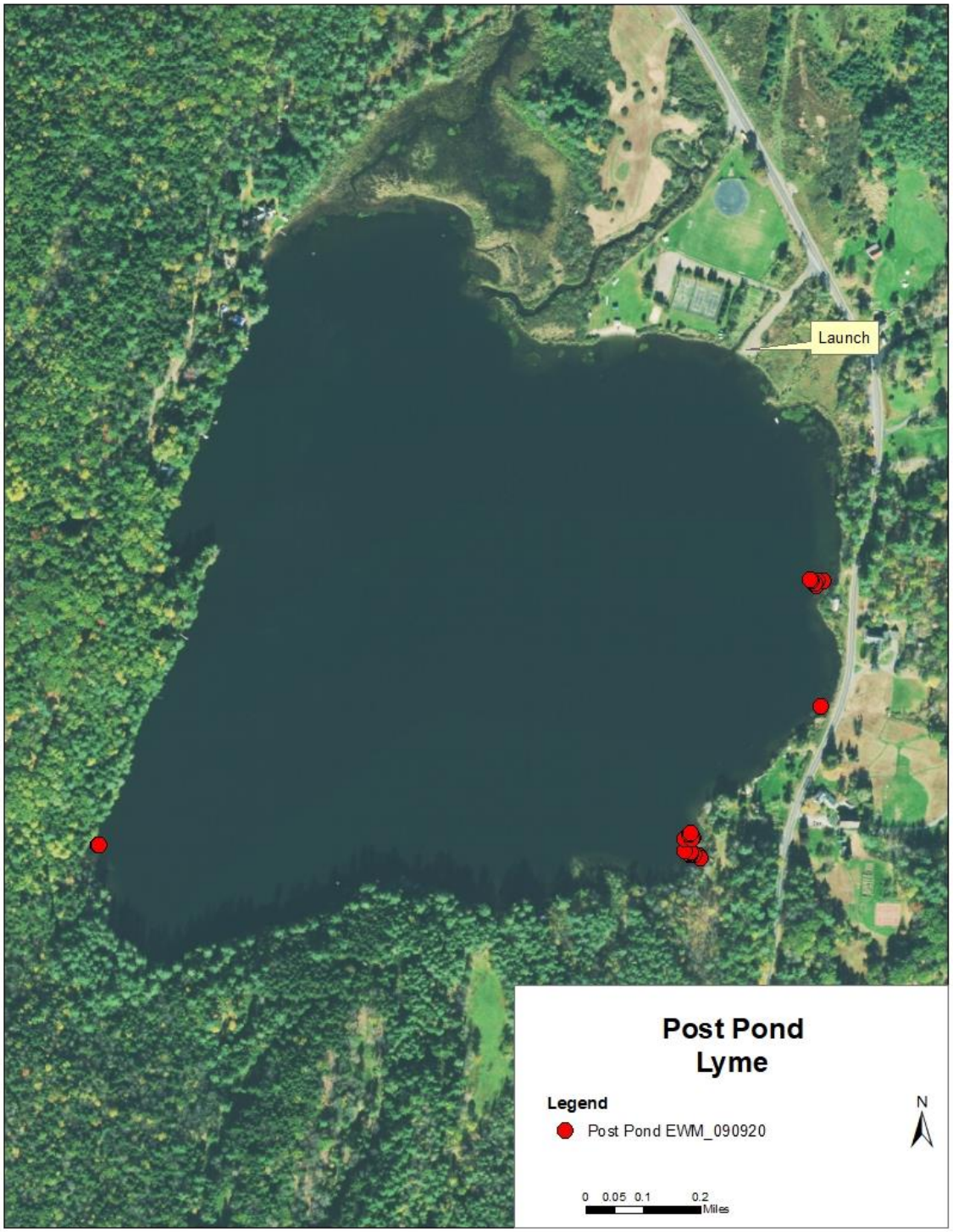
2019 Actual


*Only 16.3 acres were treated due to presence/visual observation and historical records of Water Stargrass and Water Marigold (Condition #5 of SP-158)
Area C
3.63 acres
Launch Site &
Base of Operations
Herbicide Residue
Sampling Site A:
N 43° 49.744'
W 72° 8.738'
Area A
10.92 acres
Herbicide Residue
Sampling Site B:
N 43° 49.504'
W 72° 8.822'
Area B
1.74 acres
0
500
1,000
2,000
Feet
Post Pond
Lyme, NH
2019 Actual Treatment
& Sampling Map
FIGURE
SURVEY DATE
MAP DATE
2
9/23/19
10/27/19
Legend
N
Fall Treatment Areas (16.3 acres*)
Actual Treatment Track (9/23/19)
3 Day Sampling Location
7 Day Sampling Location
Heteranthera dubia (water stargrass)
Bidens beckii (water marigold)
SOLITUDE LAKE MANAGEMENT
590 LANE STREET
SHREWSBURY, MA 01545
PHONE: (508) 865-1000
SOLITUDELAKEMANAGEMENT.COM

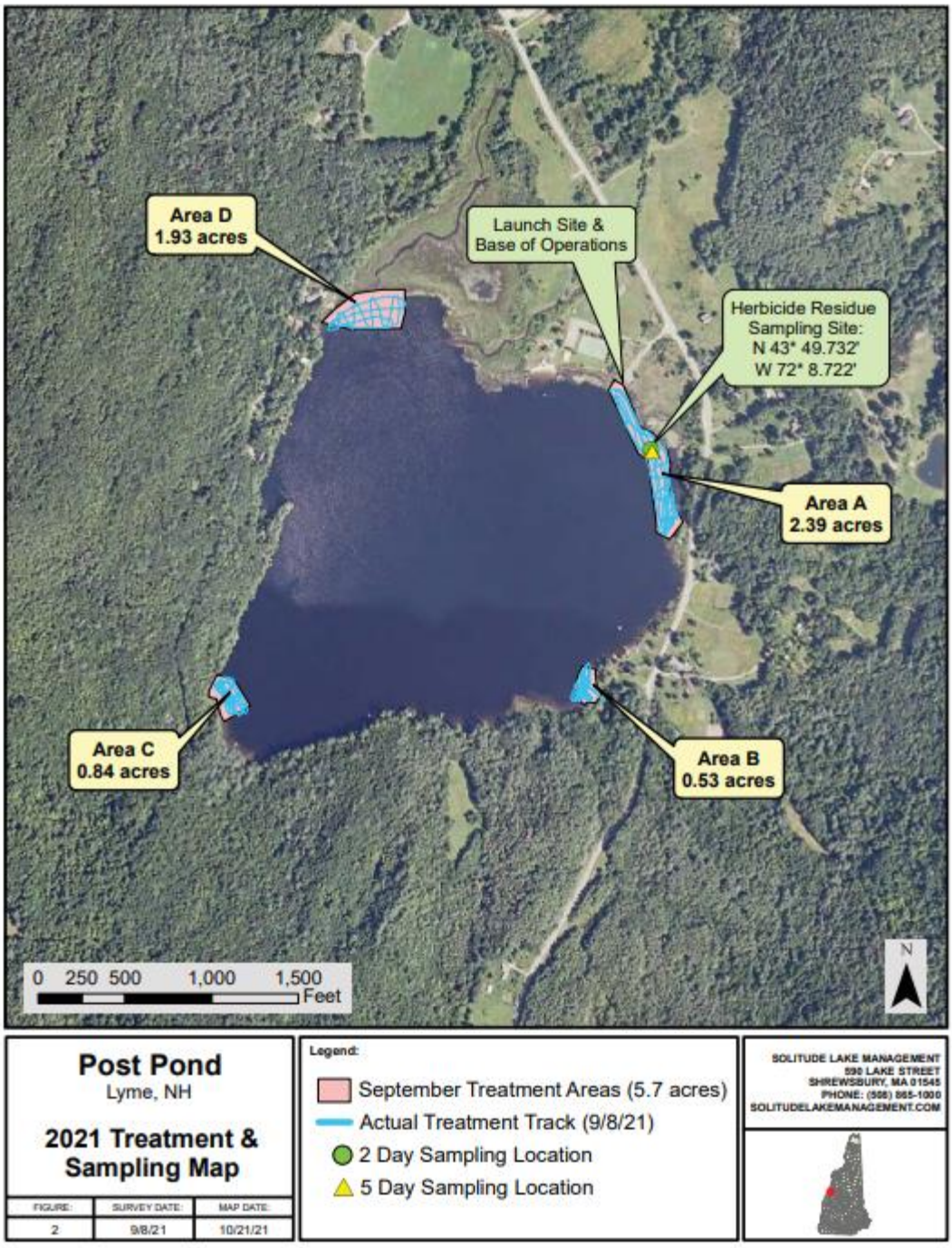
Map showing path of divers working around the shoreline of the lake:



2020 Actual (dive areas)



2021 Actual


Area D
1.93 acres
Launch Site &
Base of Operations
Herbicide Residue
Sampling Site:
N 43° 49.732'
W 72° 8.722'
Area A
2.39 acres
Area C
0.84 acres
Area B
0.53 acres
0 250 500 1,000 1,500
Feet
N
Post Pond
Lyme, NH
2021 Treatment &
Sampling Map
FIGURE: 2
SURVEY DATE: 9/8/21
MAP DATE: 10/21/21
Legend:
September Treatment Areas (5.7 acres)
Actual Treatment Track (9/8/21)
2 Day Sampling Location
5 Day Sampling Location
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590 LAKE STREET
SHREWSBURY, MA 01545
PHONE: (508) 865-1000
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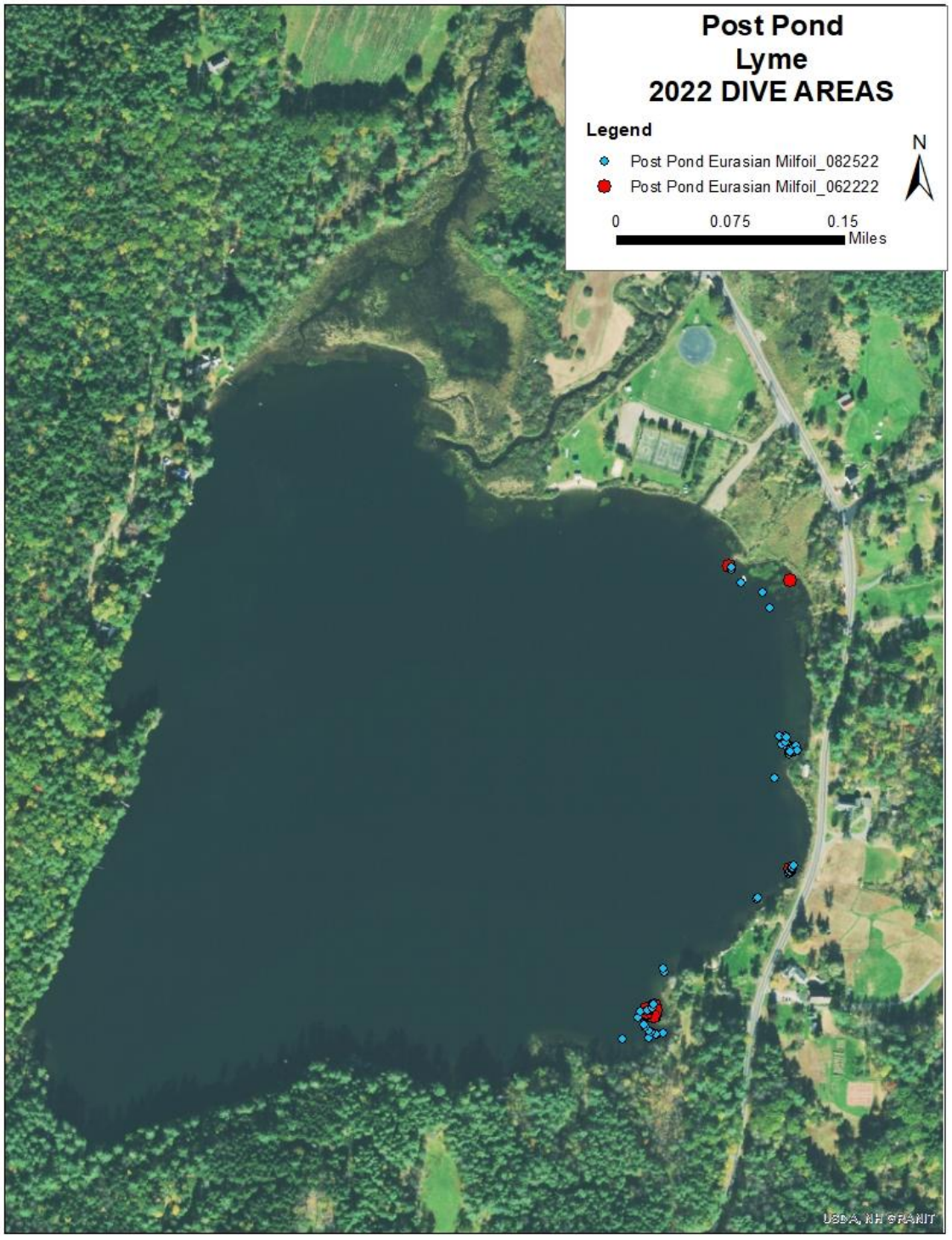
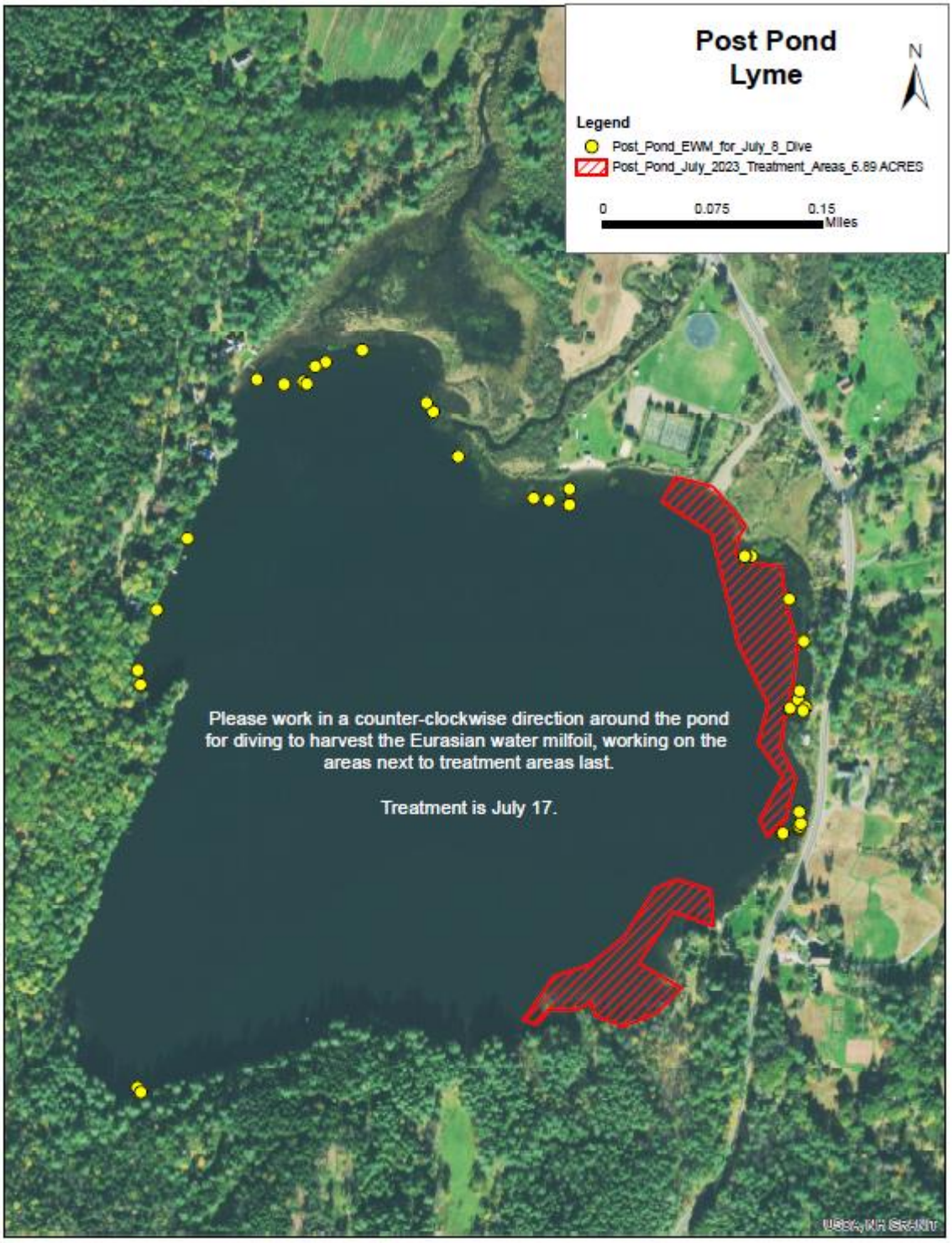
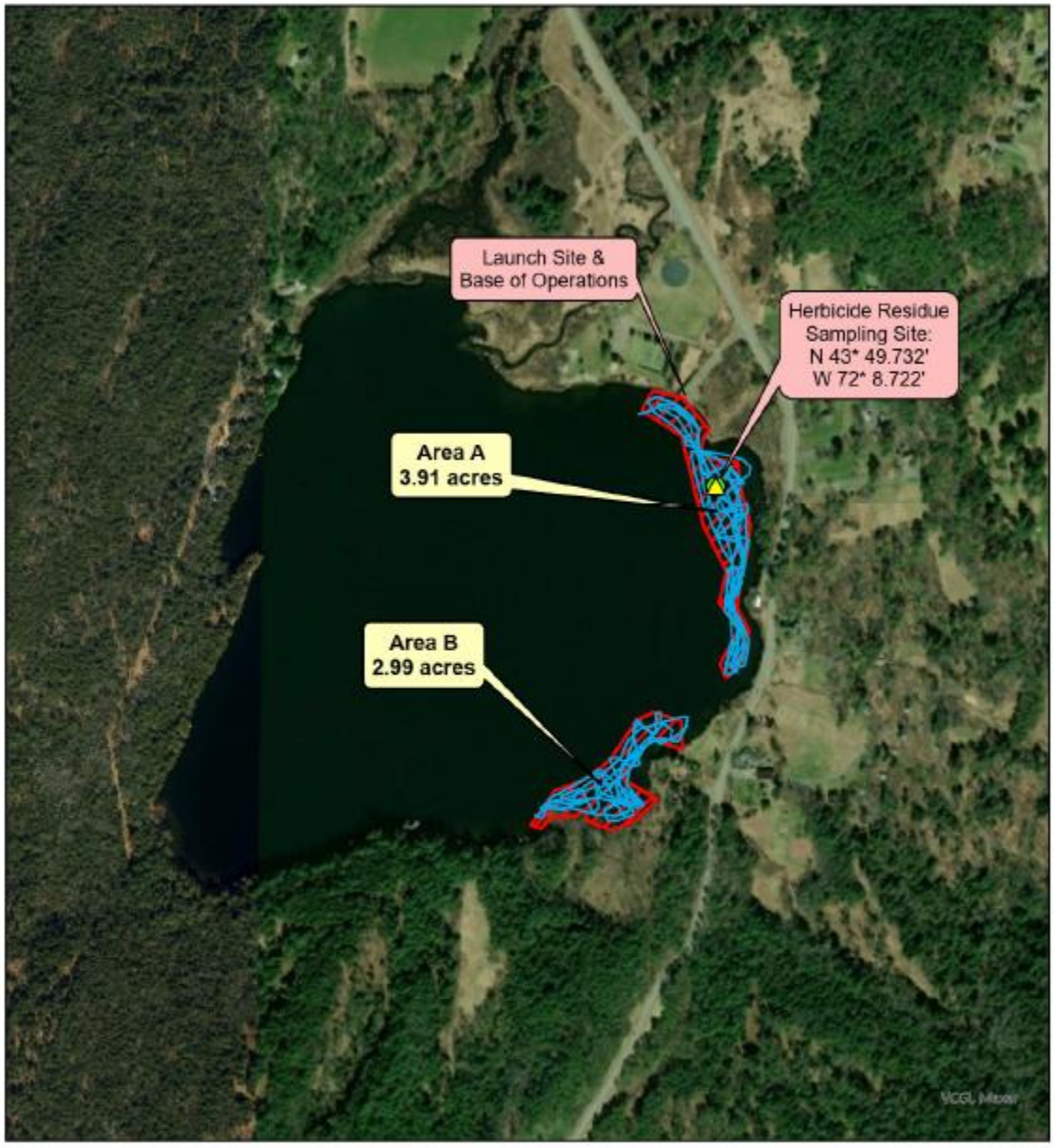
2022 Actual


Post Pond
Lyme
2022 DIVE AREAS
Legend
Post Pond Eurasian Milfoil_082522
Post Pond Eurasian Milfoil_062222
N
0
0.075
0.15
Miles
USDA, NH GRANIT

2023 Actual


Post Pond
Lyme
N
Legend
Post_Pond_EWM_for_July_8_Dive
Post_Pond_July_2023_Treatment_Areas_6.89 ACRES
0
0.075
0.15
Miles
Please work in a counter-clockwise direction around the pond for diving to harvest the Eurasian water milfoil, working on the areas next to treatment areas last.
Treatment is July 17.
USDA, MA GRANIT



Post Pond
Lyme, NH

2023 Actual Treatment & Sampling Map

FIGURE	SURVEY DATE	MAP DATE
2	7/17/23	10/11/23

Legend:
- July Treatment Areas (6.89 acres)
- Actual July Treatment Track (7/17/23)
- 2 Day Sampling Location
- 4 Day Sampling Location

N

0 400 800 1,600 Feet

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590 LAKE STREET
SHREWSBURY, MA 01545
PHONE: (866) 480-1271
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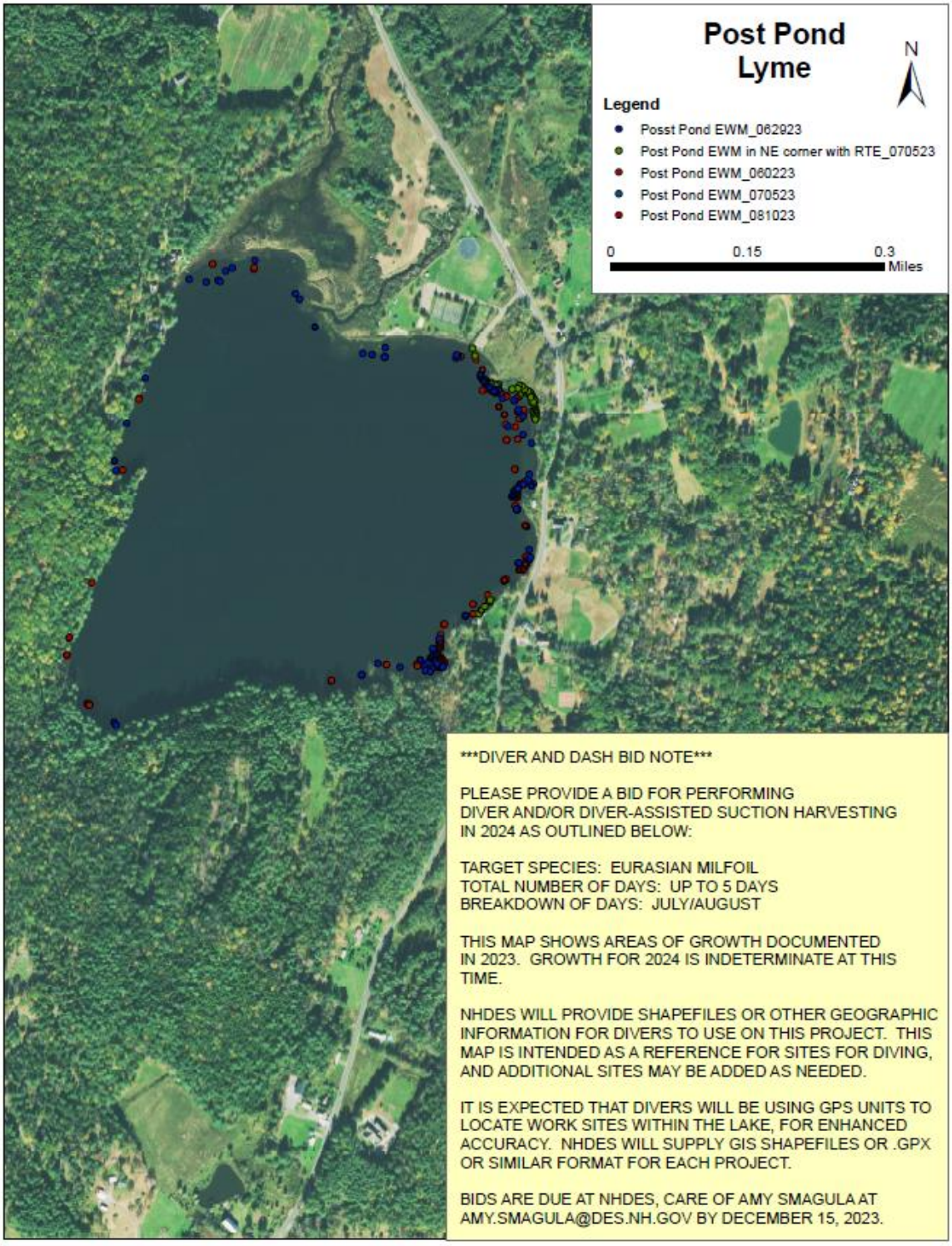
2024 Actual


Post Pond
Lyme
N
Legend
Posst Pond EWM_062923
Post Pond EWM in NE corner with RTE_070523
Post Pond EWM_060223
Post Pond EWM_070523
Post Pond EWM_081023
0
0.15
0.3
Miles
DIVER AND DASH BID NOTE
PLEASE PROVIDE A BID FOR PERFORMING DIVER AND/OR DIVER-ASSISTED SUCTION HARVESTING IN 2024 AS OUTLINED BELOW:
TARGET SPECIES: EURASIAN MILFOIL
TOTAL NUMBER OF DAYS: UP TO 5 DAYS
BREAKDOWN OF DAYS: JULY/AUGUST
THIS MAP SHOWS AREAS OF GROWTH DOCUMENTED IN 2023. GROWTH FOR 2024 IS INDETERMINATE AT THIS TIME.
NHDES WILL PROVIDE SHAPEFILES OR OTHER GEOGRAPHIC INFORMATION FOR DIVERS TO USE ON THIS PROJECT. THIS MAP IS INTENDED AS A REFERENCE FOR SITES FOR DIVING, AND ADDITIONAL SITES MAY BE ADDED AS NEEDED.
IT IS EXPECTED THAT DIVERS WILL BE USING GPS UNITS TO LOCATE WORK SITES WITHIN THE LAKE, FOR ENHANCED ACCURACY. NHDES WILL SUPPLY GIS SHAPEFILES OR .GPX OR SIMILAR FORMAT FOR EACH PROJECT.
BIDS ARE DUE AT NHDES, CARE OF AMY SMAGULA AT AMY.SMAGULA@DES.NH.GOV BY DECEMBER 15, 2023.

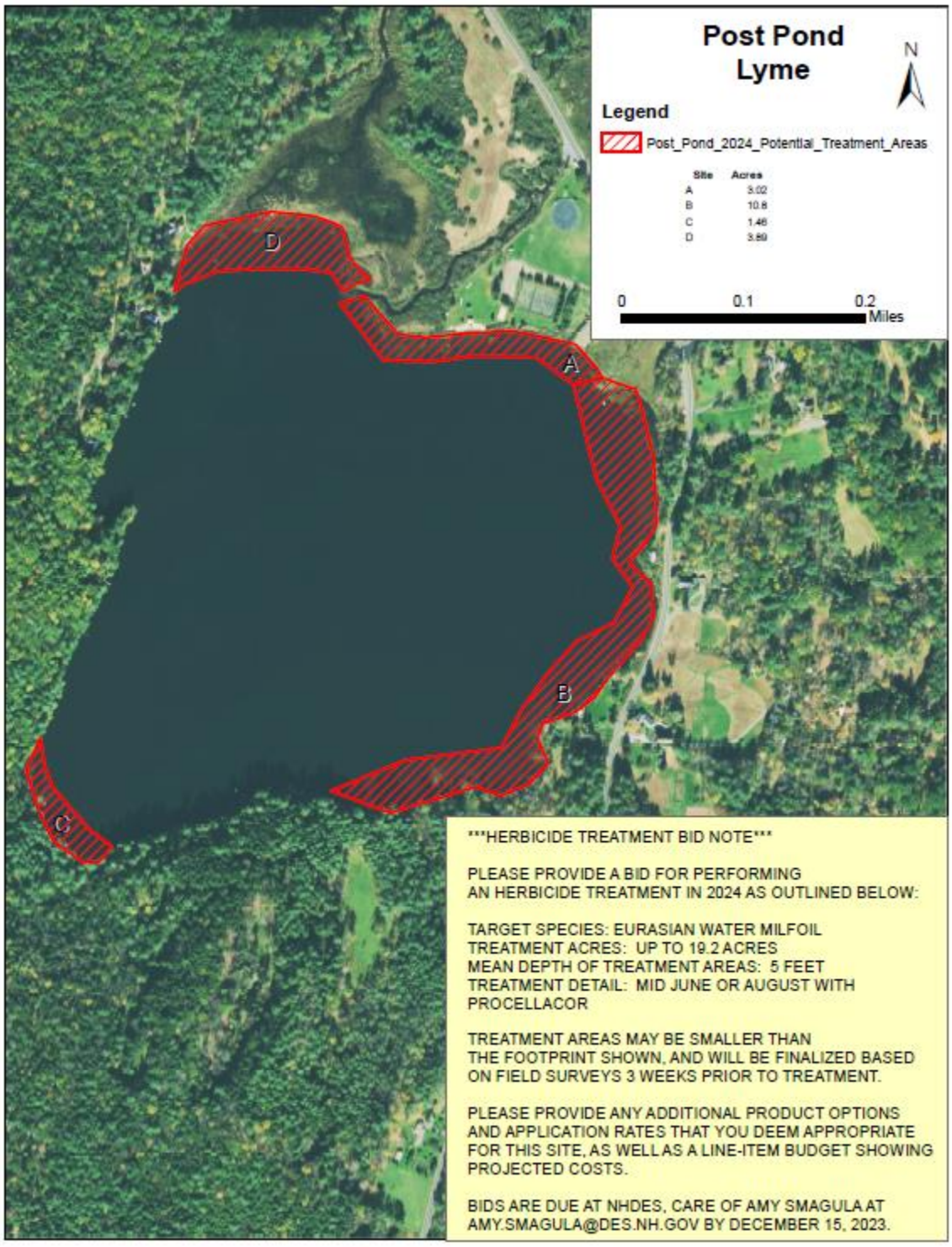
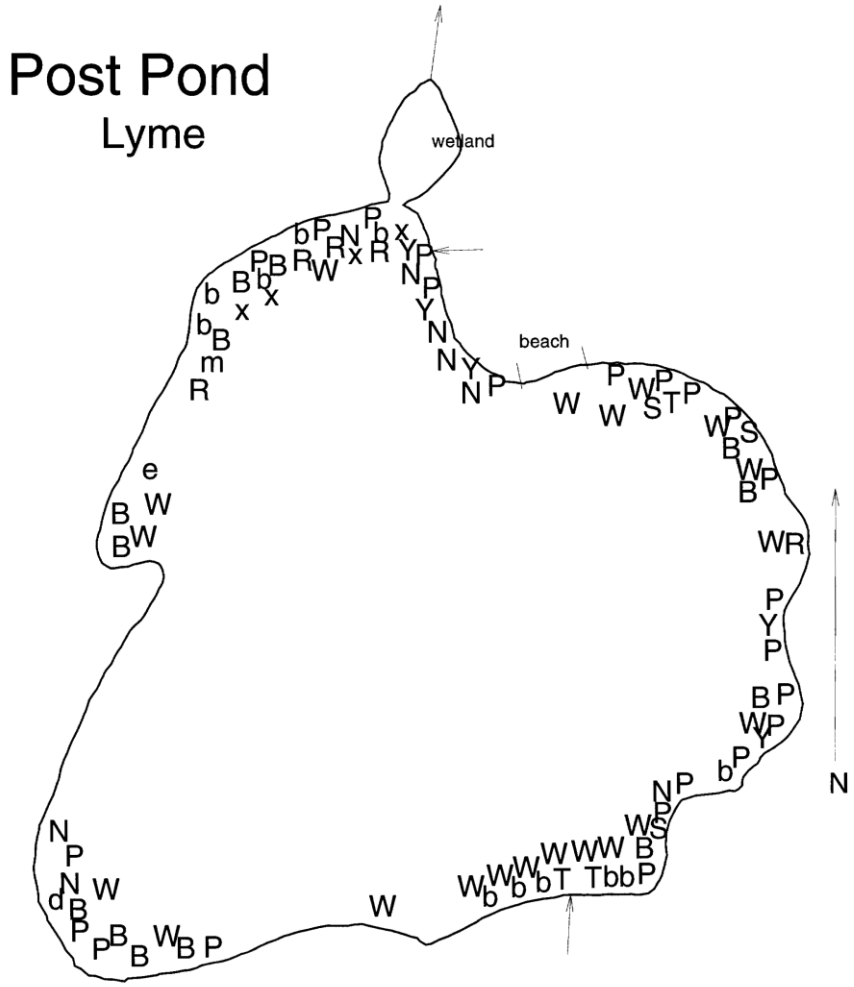

Post Pond
Lyme
N
Legend
Post_Pond_2024_Potential_Treatment_Areas
Site Acres
A 5.02
B 10.8
C 1.46
D 3.89
0 0.1 0.2
Miles
D
A
B
C
HERBICIDE TREATMENT BID NOTE
PLEASE PROVIDE A BID FOR PERFORMING
AN HERBICIDE TREATMENT IN 2024 AS OUTLINED BELOW:
TARGET SPECIES: EURASIAN WATER MILFOIL
TREATMENT ACRES: UP TO 19.2 ACRES
MEAN DEPTH OF TREATMENT AREAS: 5 FEET
TREATMENT DETAIL: MID JUNE OR AUGUST WITH
PROCELLACOR
TREATMENT AREAS MAY BE SMALLER THAN
THE FOOTPRINT SHOWN, AND WILL BE FINALIZED BASED
ON FIELD SURVEYS 3 WEEKS PRIOR TO TREATMENT.
PLEASE PROVIDE ANY ADDITIONAL PRODUCT OPTIONS
AND APPLICATION RATES THAT YOU DEEM APPROPRIATE
FOR THIS SITE, AS WELL AS A LINE-ITEM BUDGET SHOWING
PROJECTED COSTS.
BIDS ARE DUE AT NHDES, CARE OF AMY SMAGULA AT
AMY.SMAGULA@DES.NH.GOV BY DECEMBER 15, 2023.

Figure 3: Map of Native Aquatic Macrophytes



Key to Macrophyte Map

Symbol	Common Name	Latin Name
P	Pickerelweed	*Pontedaria cordata*
N	White water-lily	*Nymphaea*
B	Watershield	*Brasenia schreberi*
d	Three-way sedge	*Dulichium arundinaceum*
T	Cattail	*Typha*
b	Bulrush	*Scirpus*
R	Robbins pondweed	*Potamogeton robbinsii*
W	Pondweed sp.	*Potamogeton sp.*
X	Water stargrass	*Heteranthera dubia*
m	Water marigold	*Megalodonta beckii*
e	Waterweed	*Elodea nuttallii*
Y	Yellow water-lily	*Nuphar*
S	Bur-reed	*Sparganium*

Figure 4: Bathymetric Map

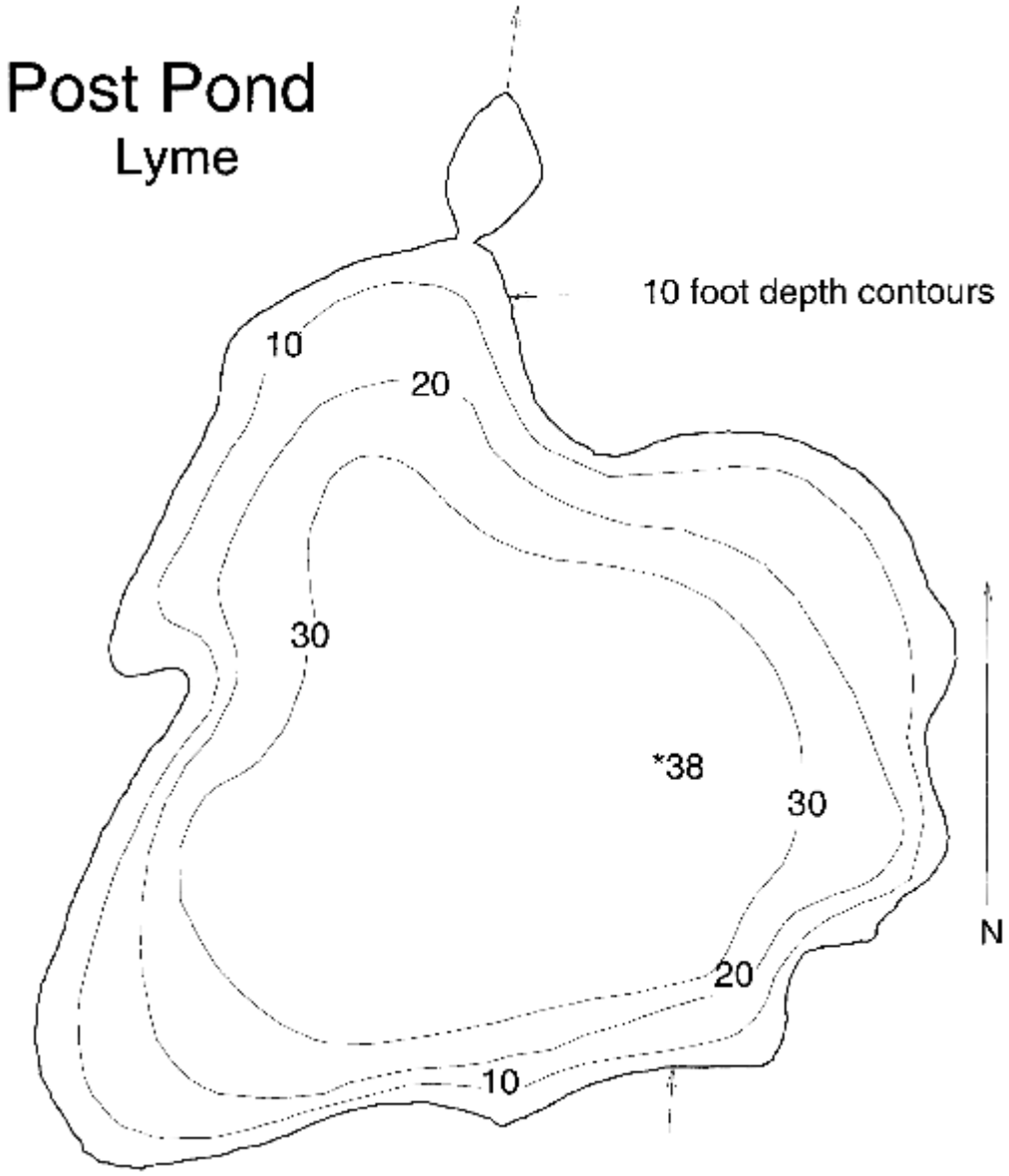


Figure 5: Critical Habitats or Conservation

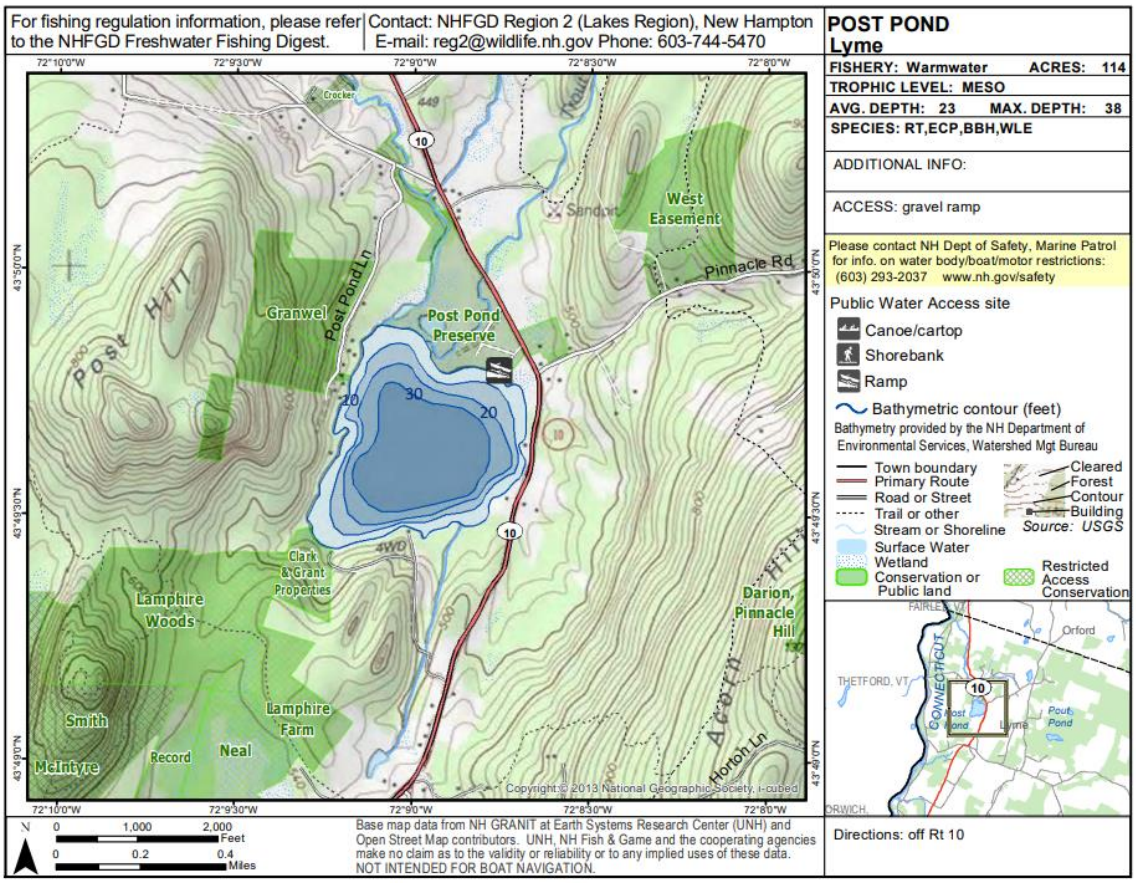


Figure 6: Public Access Sites, Swim Areas, Docks and Swim Platforms

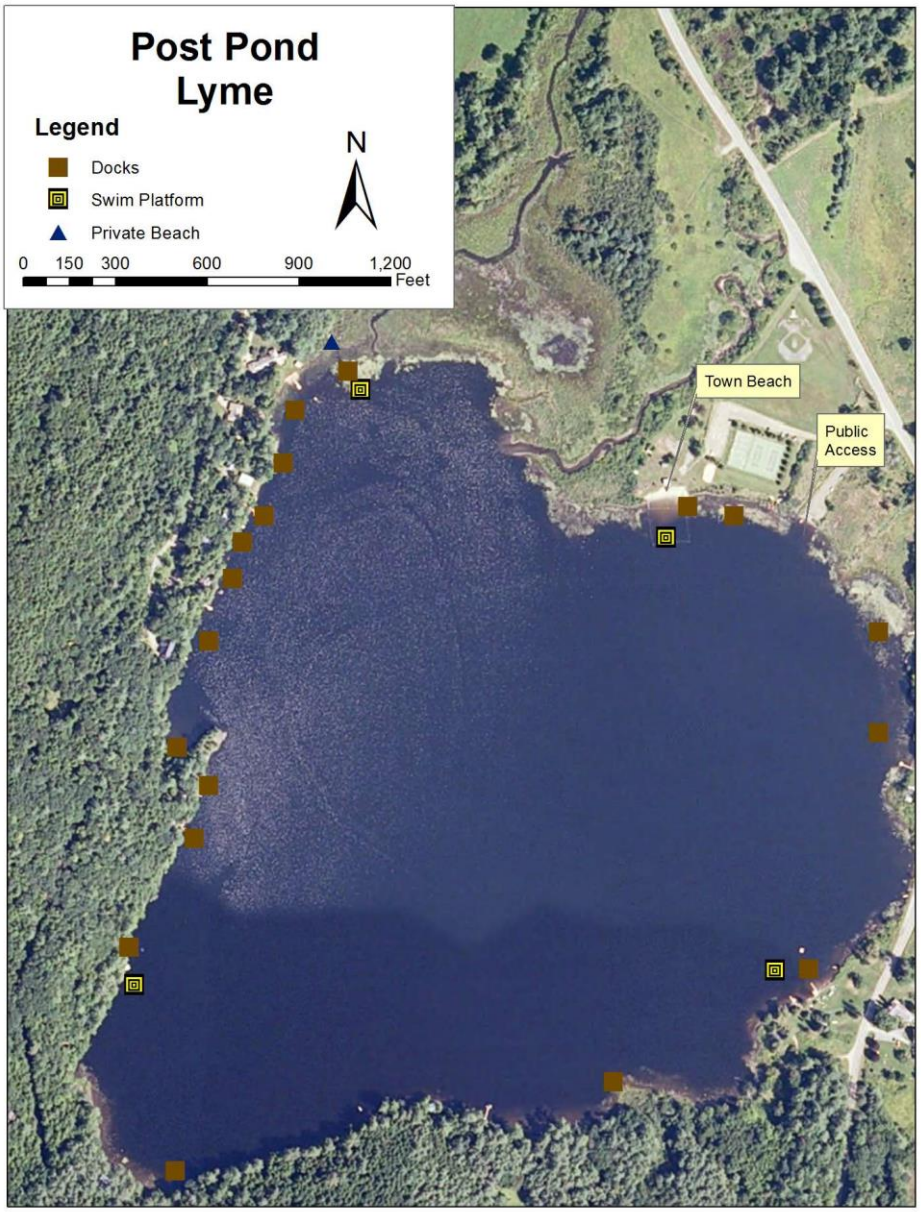
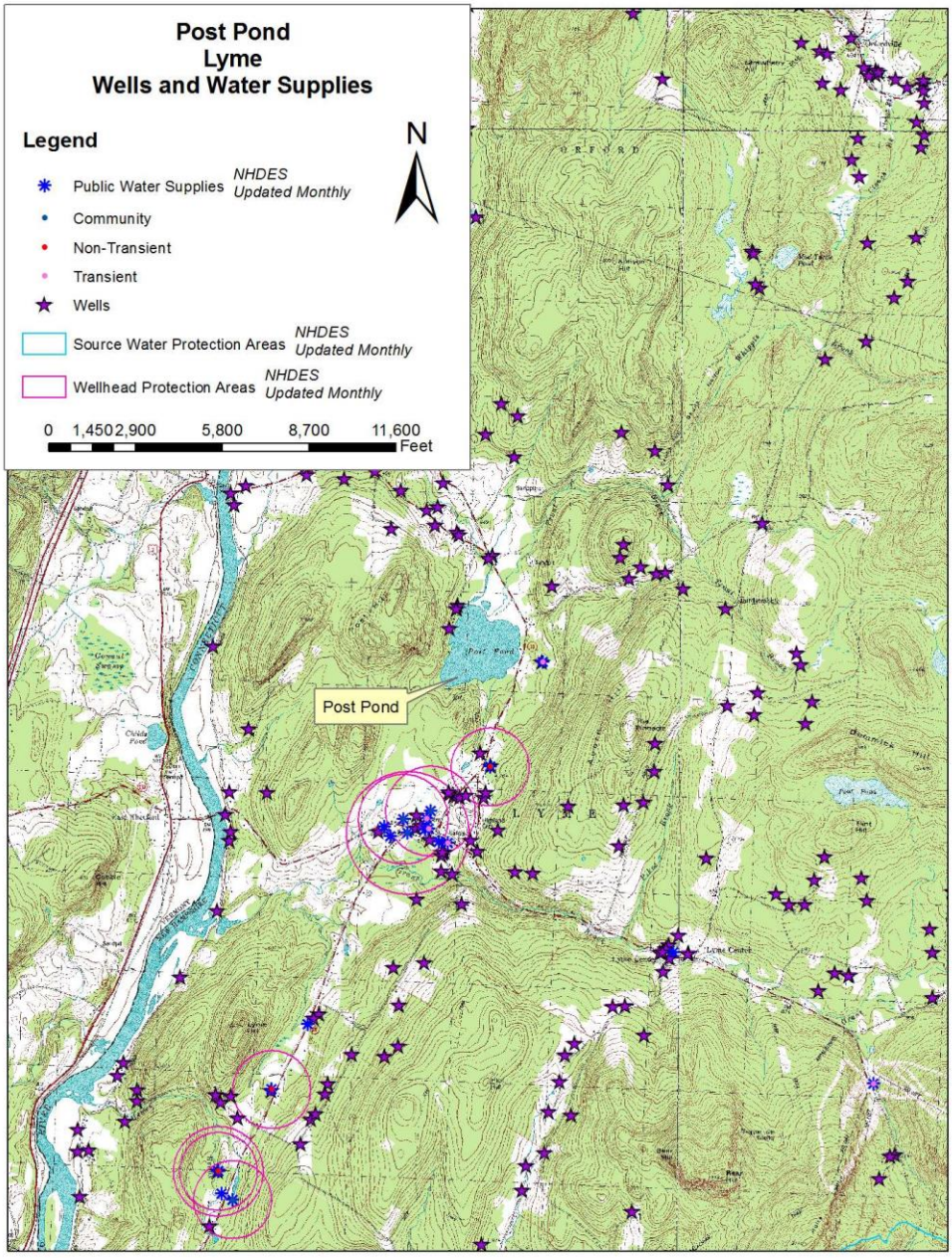


Figure 7: Wells and Water Supplies, 1:48,000 scale



Appendix A Selection of Invasive Aquatic Plant Control Techniques

Preliminary Investigations

I. Field Site Inspection

- Verify genus and species of the plant.
- Determine if the plant is a native or exotic species per RSA 487:16, II.
- Map extent of the exotic aquatic plant infestation (area, water depth, height of the plant, density of the population).
- Document any native plant abundances and community structure around and dispersed within the exotic/nuisance plant population (provide updated native plant map after review of milfoil in the Fall or after treatment)

II. Office/Laboratory Research of Waterbody Characteristics

- Contact the appropriate agencies to determine the presence of rare or endangered species in the waterbody or its prime wetlands.
- Determine the basic relevant limnological characteristics of the waterbody (size, bathymetry, flushing rate, nutrient levels, trophic status, and type and extent of adjacent wetlands).
- Determine the potential threat to downstream waterbodies from the exotic aquatic plant based on limnological characteristics (water chemistry, quantity, quality as they relate to movement or support of exotic plant growth).

Overall Control Options

For any given waterbody that has an infestation of exotic plants, one of four options will be selected, based on the status of the infestation, the available management options, and the technical knowledge of the DES Limnologists and other key resource managers who have conducted the field work and who are preparing or contributing to this plan. The options are as follows:

1) Eradication: The goal is to completely remove the exotic plant infestation over time. In some situations this may be a rapid response that results in an eradication event in a single season (such as for a new infestation), in other situations a longer-term approach may be warranted given the age and distribution of the infestation. Eradication is more feasible in smaller systems without extensive expanded growth (for example, Lake Winnipesaukee is unlikely to achieve eradication of its Eurasian water-milfoil), or without upstream sources of infestation in other connected systems that continually feed the lake.

2) Maintenance: Waterbodies where maintenance is specified as a goal are generally those with expansive infestations, that are larger systems, that have complications of extensive wetland complexes on their periphery, or that have upstream sources of the invasive plant precluding the possibility for eradication. For waterbodies where maintenance is the goal, control activities will be performed on the waterbody to keep an infestation below a desirable threshold. For maintenance projects, thresholds of percent cover or other measurable classification will be indicated, and action will occur when exotic plant growth exceeds the threshold.

3) Containment: The aim of this approach is to limit the size and extent of the existing infestation within an infested waterbody if it is localized in one portion of that waterbody (such as in a cove or embayment), or if a whole lake is infested action may be taken to prevent the downstream migration of fragments or propagules. This could be achieved through the use of fragment barriers and/or Restricted Use Areas or other such physical means of containment. Other control activities may also be used to reduce the infestation within the containment area.

4) No action. If the infestation is too large, spreading too quickly, and past management strategies have proven ineffective at controlling the target exotic aquatic plant, DES, in consultation with others, may elect to recommend 'no action' at a particular site. Feasibility of control or control options may be revisited if new information, technologies, etc., develop.

If eradication, maintenance or containment is the recommended option to pursue, the following series of control techniques may be employed. The most appropriate technique(s) based on the determinations of the preliminary investigation will be selected.

Guidelines and requirements of each control practice are suggested and detailed below each alternative, but note that site specific conditions will be factored into the evaluation and recommendation of use on each individual waterbody with an infestation.

A. Hand-Pulling and Diver-Assisted Suction Harvesting

- Hand-pulling can be used if infestation is in a small localized area (sparsely populated patch of up to 5' X 5', single stems, or dense small patch up to 2' X 2'). For larger areas Diver-Assisted Suction Harvesting (DASH) may be more appropriate.
- Can be used if plant density is low, or if target plant is scattered and not dense.
- Can be used if the plant could effectively be managed or eradicated by hand-

pulling or DASH

- Use must be in compliance with the Wetlands Bureau rules.

B. Mechanically Harvest or Hydro-Rake

- Can not be used on plants which reproduce vegetatively by fragmentation (e.g., milfoil, fanwort, etc.) unless containment can be ensured.
- Can be used only if the waterbody is accessible to machinery.
- Can be used if there is a disposal location available for harvested plant materials.
- Can be used if plant depth is conducive to harvesting capabilities (~ <7 ft. for mower, ~ <12 ft. for hydro-rake).
- If a waterbody is fully infested and no other control options are effective, mechanical harvesting can be used to open navigation channel(s) through dense plant growth.

C. Herbicide Treatment

- Can be used if application of herbicide is conducted in areas where alternative control techniques are not optimum due to depth, current, use, or density and type of plant.
- Can be used for treatment of exotic plants where fragmentation is a high concern.
- Can be used where species specific treatment is necessary due to the need to manage other plants
- Can be used if other methods used as first choices in the past have not been effective.
- A licensed applicator should be contacted to inspect the site and make recommendations about the effectiveness of herbicide treatment as compared with other treatments.

D. Restricted Use Areas (per RSA 487:17, II (d))

- Can be established in an area that effectively restricts use to a small cove, bay, or other such area where navigation, fishing, and other transient activities may cause fragmentation to occur.
- Can <u>not</u> be used when there are several “patches” of an infestation of exotic aquatic plants throughout a waterbody.
- Can be used as a temporary means of control.

E. Bottom Barrier

- Can be used in small areas, preferably less than 10,000 sq. ft.

- Can be used in an area where the current is not likely to cause the displacement of the barrier.
- Can be used early in the season before the plant reaches the surface of the water.
- Can be used in an area to compress plants to allow for clear passage of boat traffic.
- Can be used in an area to compress plants to allow for a clear swimming area.
- Use must be in compliance with the Wetlands Bureau rules.

F. Drawdown

- Can be used if the target plant(s) are susceptible to drawdown control.
- Can be used in an area where bathymetry of the waterbody would be conducive to an adequate level of drawdown to control plant growth, but where extensive deep habits exist for the maintenance of aquatic life such as fish and amphibians.
- Can be used where plants are growing exclusively in shallow waters where a drawdown would leave this area "in the dry" for a suitable period of time (over winter months) to control plant growth.
- Can be used in winter months to avoid encroachment of terrestrial plants into the aquatic system.
- Can be used if it will not significantly impact adjacent or downstream wetland habitats.
- Can be used if spring recharge is sufficient to refill the lake in the spring.
- Can be used in an area where shallow wells would not be significantly impacted.
- Reference RSA 211:11 with regards to drawdown statutes.

G. Dredge

- Can be used in conjunction with a scheduled drawdown.
- Can be used if a drawdown is not scheduled, though a hydraulic pumping dredge should be used.
- Can only be used as a last alternative due to the detrimental impacts to environmental and aesthetic values of the waterbody.

H. Biological Control

- Grass carp cannot be used as they are illegal in New Hampshire.
- Exotic controls, such as insects, cannot be introduced to control a nuisance plant

unless approved by Department of Agriculture.

- Research should be conducted on a potential biological control prior to use to determine the extent of target specificity.

Appendix B Summary of Control Practices Used in NH

Restricted Use Areas and Fragment Barrier:

Restricted Use Areas (RUAs) are a tool that can be use to quarantine a portion of a waterbody if an infestation of exotic aquatic plants is isolated to a small cove, embayment, or section of a waterbody. RUAs generally consist of a series of buoys and ropes or nets connecting the buoys to establish an enclosure (or exclosure) to protect an infested area from disturbance. RUAs can be used to prevent access to these infested areas while control practices are being done, and provide the benefit of restricting boating, fishing, and other recreational activities within these areas, so as to prevent fragmentation and spread of the plants outside of the RUA.

Hand-pulling:

Hand-pulling exotic aquatic plants is a technique used on both new and existing infestations, as circumstances allow. For this technique divers carefully hand-remove the shoots and roots of plants from infested areas and place the plant material in mesh dive bags for collect and disposal. This technique is suited to small patches or areas of low density exotic plant coverage.

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. It is often a follow-up technique that is included in most management plans.

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. Roughly 100 divers were certified through this program through the 2010 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.

Diver Assisted Suction Harvesting

Diver Assisted Suction Harvesting (DASH) is an emerging and evolving control technique in New Hampshire. The technique employs divers that perform hand removal actions as described above, however, instead of using a dive bag a mechanical suction device is used to entrain the plants and bring them topside where a tender accumulates and bags the material for disposal. Because of this variation divers are able to work in moderately dense stands of plants that cover more bottom area, with increased efficiency and accuracy.

Mechanical Harvesting

The process of mechanical harvesting is conducted by using machines which cut and collect aquatic plants. 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.

The advantages of this type of weed control are that cutting and harvesting immediately opens an area such as boat lanes, 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. 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.

Benthic Barriers:

Benthic barriers are fiberglass coated screening material that can be applied directly to the lake bottom to cover and compress aquatic plant growth. Screening is staked or weighted to the bottom to prevent it from becoming buoyant or drifting with current. The barriers also serve to block sunlight and prevent photosynthesis by the plants, thereby killing the plants with time. While a reliable method for small areas of plants (roughly 100 sq. ft. or less), larger areas are not reasonably controlled with this method due to a variety of factors (labor intensive installation, cost, and gas accumulation and bubbling beneath the barrier).

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. Each aquatic plant responds differently to different herbicides and concentrations of herbicides, but research performed by the Army Corps of Engineers has isolated target specificity of a variety of aquatic herbicides for different species.

Generally, ProcellaCOR or 2,4-D (Navigate formulation) are the herbicides that are recommended for control of variable milfoil. Based on laboratory and field trials, these are the most effective herbicides in selectively controlling variable milfoil in New Hampshire's waterbodies.

A field trial was performed during the 2008 summer using the herbicide Renovate to control Eurasian water-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 more slowly 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.

During the summer of 2010, DES worked with other researchers to perform field trials of three different formulations of 2,4-D in Lake Winnisquam, to determine which product was most target-specific to the Eurasian water-milfoil. Navigate formulation was used, as were a 2,4-D amine formulation,

and a 2,4-D amine and triclopyr formulation (MaxG). Although the final report has not been completed for this study, preliminary results suggest that all three products worked well, but that Navigate formation may be the most target specific of all three.

Another herbicide, Fluridone, is sometimes also used in New Hampshire, mainly to control growths of fanwort (*Cabomba caroliniana*). Fluridone is a systemic aquatic herbicide that inhibits the formation of carotenoids in plants. Reduced carotenoids pigment ultimately results in the breakdown of chlorophyll and subsequent loss of photosynthetic function of the plants.

Other aquatic herbicides are also used in New Hampshire when appropriate (glyphosate, copper compounds, etc). The product of choice will be recommended based on what the target species is, and other waterbody-specific characteristics that are important to consider when selecting a product.

In 2018, a new aquatic formulation of an herbicide was labeled and licensed for use. ProcellaCOR is a reduced-risk liquid formulation herbicide that is a systemic. Based on New Hampshire field data, it works well on variable milfoil, it is taken up very quickly following treatment (hours) and it degrades quickly in the water column, with typical non-detect readings within 24-48 hours post treatment.

Extended Drawdown

Extended drawdown serves to expose submersed aquatic plants to dessication and scouring from ice (if in winter), physically breaking down plant tissue. Some species can respond well to drawdown and plant density can be reduced, but for invasive species drawdown tends to yield more disturbance to bottom sediments, something to which exotic plants are most adapted. In waterbodies where drawdown is conducted exotic plants can often outcompete native plants for habitat and come to dominate the system.

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 Eurasian water-milfoil control).

Dredging

Dredging is a means of physical removal of 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.

Dredging can take place in to fashion, including drawdown followed by mechanical dredging using an excavator, or using a diver-operated suction dredge while the water level remains up.

Biological Control

There are no approved biological controls for submersed exotic aquatic plant at this time in New Hampshire.

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