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NH Department of
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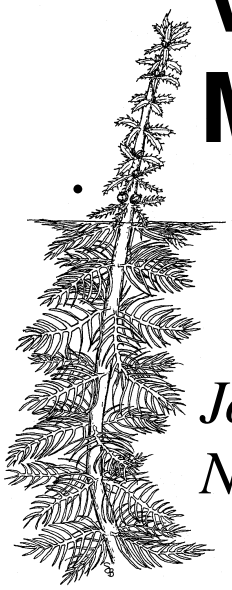
Long-Term Variable Milfoil Management Plan



Jones and Downing Ponds
New Durham, New Hampshire

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 variable 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.

Variable Milfoil Infestation in Jones and Downing Ponds

This plan covers the segment of the Merrymeeting River from the bridge crossing on Merrymeeting Road at the southern end of Marsh Pond to the Jones Pond Dam (known as Jones Pond), as well as the Downing Pond basin downstream.

Variable milfoil (*Myriophyllum heterophyllum*) was documented in Jones Pond in New Durham, New Hampshire around 2000-2002. No variable milfoil was found to be growing upstream in Marsh Pond (based on a summer 2009 survey by DES), nor in Merrymeeting Lake, further upstream, and headwater to this system. It is suspected that the milfoil was introduced by a transient boater using an unofficial boat access site at the bridge on Merrymeeting Road below Marsh Pond.

Variable milfoil was first documented in Downing Pond in 2010, based on concerns from local lake residents. It is suspected that the infestation in this pond occurred earlier than the year in which it was documented, as a result of downstream flow of fragments from Jones Pond.

Variable milfoil has been widespread and dense throughout much of Jones Pond since it was first found, and it has remained in similar areas in Downings Pond as first documented, though expansion and increased densities are documented at existing areas of growth. The plants generally top out by mid July and form a canopy across the surface of the water in depths less than eight feet. The milfoil has produced flowers annually, and the resultant seeds contribute to the proliferation of the plant in the system from year to year, in

addition to the plants regenerating from established root systems (perennial growth).

Variable milfoil in this segment of the river is a continual threat to the ecological and structural diversity in the Merrymeeting Marsh system downstream, and ultimately to the aesthetic, recreational, and ecological values of Alton Bay (Lake Winnipesaukee) below the Merrymeeting Marsh.

Figure 1 shows the growth of variable milfoil over time in Jones Pond, and Downing Pond over time. The following tables provide a summary of each area indicated in Figure 1, based on updated data from each year (as available). Area reference in the table below relates to the grid overlays on the map in Figures 1a and 1b.

Jones Pond

Area	Location/Area Description	Year	Description of Variable Milfoil Growth	Variable Milfoil % Cover
B1	Upstream most segment of river. Just below bridge crossing of river on Merrymeeting Road. Location of unimproved cartop access to river.	2008	Scattered medium patches of growth	15%
		2009	Expansive growth throughout	80%
		2010	Scattered patches and stems	10%
		2011	Single stems and small patches	5%
		2012	Large patches of growth throughout	60%
		2013	Large patches throughout, before and post treatment	50%
		2014	This portion of the river continues to support large stands of variable milfoil, both pre- and post treatment	50%
		2015	Dense patches of growth throughout this section	50%
C1, C2, D2	Eastern bend of river in upper reaches. River bounded by riparian wetlands.	2008	Areas of increasing growth, medium to large patches of growth	40%
		2009	Expansive growth throughout	80%
		2010	Moderate coverage of small to medium patches	40%
		2011	Small to medium patches along channel	40%
		2012	Large patches of milfoil growth across many areas	65%
		2013	Large patches in C1 and C2 before and after treatment	55%
		2014	This portion of the river continues to support large stands of variable milfoil, both pre- and post treatment	50%

Area	Location/Area Description	Year	Description of Variable Milfoil Growth	Variable Milfoil % Cover
		2015	Small but dense patches distributed through this reach	40%
B2, B3	Middle section. This section is a straight reach of river just above and below the bridge crossing to the Hoover residence.	2008	Large patches of growth extending across much of the channel	80%
		2009	Expansive growth throughout	80%
		2010	Moderate coverage of small to medium patches, denser growth above Hoover bridge	40-60%
		2011	Very limited growth	10%
		2012	Scattered small patches	25%
		2013	Reduced growths of milfoil, scattered patchy stems	<10%
		2014	Reduced growth of milfoil as compared to prior years	<5%
		2015	Scattered single stems or small clumps	<5%
B4	Lower section just above impoundment. This secion is below the bridge access to the Hoover residence and ends at the dam.	2008	Scattered small patches of growth	25%
		2009	Expansive growth throughout	80%
		2010	Scattered patches of growth along shore	40%
		2011	Small scattered patches of growth	15%
		2012	Scattered small patches	15%
		2013	Reduced growths of milfoil, scattered patchy stems	<10%
		2014	Reduced growths, only small scattered stems present	<1%
		2015	None observed	0%

Downing Pond

Area	Location/Area Description	Year	Description of Variable Milfoil Growth	Variable Milfoil % Cover
A3, A4	Western side of pond	2010	Scattered stems of variable milfoil	<1%
		2011	Not surveyed	
		2012	Not surveyed	
		2013	Increased scattering of stems of variable milfoil	1%
		2014	No milfoil observed late season	0%
		2015	None observed	0%
B1, B2	Northern end of pond, inflow of Merrymeeting River	2010	No variable milfoil observed	0%
		2011	Not surveyed	
		2012	Not surveyed	
		2013	Scattered stems of variable milfoil observed close to shore	1%
		2014	No milfoil observed late season	0%

Area	Location/Area Description	Year	Description of Variable Milfoil Growth	Variable Milfoil % Cover
		2015	None observed	0%
B3, B4	Southwestern basin	2010	Small patches observed in deep cove area	10%
		2011	Not surveyed	
		2012	Not surveyed	
		2013	Small patches observed in deep cove area	10%
		2014	No milfoil observed late season	0%
		2015	One small clump observed	<1%
C3	South central basin	2010	Medium sized scattered patches of growth, and patchy growth in deep cove area	30%
		2011	Not surveyed	
		2012	Not surveyed	
		2013	Medium to large sized scattered patches of growth, and patchy growth in deep cove area	40%
		2014	Scattered patches and stems observed post treatment	<15%
		2015	One small clump observed	<1%
C2, D2, D3	Eastern side of pond	2010	Dense continuous area of growth near eastern cove, milfoil taking up much water column area	40%
		2011	Not surveyed	
		2012	Not surveyed	
		2013	Dense continuous area of growth near eastern cove, milfoil taking up much water column area, expanded growth over 2010 observations	50%
		2014	None observed: low water levels late season, could not get boat into dense shallow lily bed area, may be growth mixed in	Unknown
		2015	None observed	0%

In terms of the impacts of the variable milfoil in the system, there are fourteen houses around the shoreline of Jones Pond and fewer around the shoreline of Downing Pond, with mostly seasonal cottages, though there are a few year-round dwellings. There are also some back lots with lake rights. Many of these abut areas of dense variable milfoil growth.

Milfoil Management Goals and Objectives

The goal for Jones Pond and Downing Pond is the reduction of overall biomass and distribution of variable milfoil in the system, so as to reduce the

downstream migration of fragments into the Merrymeeting River system, with the eventual eradication (if feasible) using an Integrated Pest Management Approach.

Local Support

Town or Municipality Support

The town of New Durham appreciates the importance of keeping the Merrymeeting River impoundments in town (Jones Pond and Downing Pond) usable by controlling the variable milfoil. The town has also allocated town funds to implement control activities. The town has also sent local divers to obtain the Weed Control Diver Certification so that divers are on call as needed to control small areas of growth that are best controlled by hand-removal. At this time the milfoil is too widespread to be effectively controlled by divers, but if the biomass is reduced divers will be available to further reduce milfoil growth by hand removal.

New Durham Milfoil Committee Support

A New Durham Milfoil Committee was formed to coordinate town-wide activities related to milfoil control. This group worked to survey all ponds in town to verify the presence of any exotic aquatic plants (none were found other than in the Merrymeeting River system impoundments (Jones Pond and Downing Pond). The New Durham Milfoil Committee meets on a monthly basis to coordinate activities related to milfoil control in the Merrymeeting River. They often have contractors, state agency personnel, and representatives from other groups dealing with milfoil problems come in as guest speakers and participants in their meetings. The group also works to earmark local funds for control efforts, and makes application to DES for state funds that may be available.

Waterbody Characteristics

The following tables summarize basic physical and biological characteristics of Jones and Downing Ponds, including the milfoil infestation. Note that a current review of the Natural Heritage Bureau (NHB) database was requested and the results from that search are pending.

Jones Pond

Parameter/Measure	Value/Description
Lake area (acres)	112
Watershed area (acres)	10,667.2
Shoreline Uses	Forested, wetland, waterfowl habitat area, low density residential
Max Depth (ft)	16.5
Mean Depth (ft)	~5
Trophic Status	Mesotrophic
Color in Epilimnion	17.5
Clarity (ft)	11.2
Flushing Rate (yr-1)	60.5
Waterbody Type	Artificial (dammed)
Invasive Plants	Variable milfoil *(Myriophyllumheterophyllum)*
Infested Area (acres)	See Figures
Distribution (ringing lake, patchy growth, etc)	See Figures
Sediment type in infested area (sand/silt/organic/rock)	Silty/organic upstream in northern portion, rocky/cobble in lower basin
Rare, Threatened, or Endangered Species in Waterbody (according to historic NH Natural Heritage Bureau (NHB) Inventory review)	Species Listed in 2016 Review Flatstem Pondweed (*Potamogeton zosteriformis*) Hollow joe-pye weed (*Eutrochium fisulosum*) Ebony boghaunter (*Williamsonia fletcheri*) Bald Eagle (*Haliaeetus leucocephalus*) Species Listed in Historic Reviews Blandings turtle (*Emydoidea blandingii)* Spotted turtle *(Clemmys guttata)*

Downing Pond

Parameter/Measure	Value/Description
Lake area (acres)	52.8
Watershed area (acres)	11,338.8
Shoreline Uses (residential, forested, agriculture)	Forested, some residential
Max Depth (ft)	11.6
Mean Depth (ft)	2.9
Trophic Status	Eutrophic
Color (CPU) in Epilimnion	12
Clarity (ft)	9.9
Flushing Rate (yr-1)	104
Natural waterbody/Raised by Damming/Other	Artificial, raised by damming
Invasive Plants	Variable milfoil *(Myriophyllum heterophyllum)*
Infested Area (acres)	See Figures
Distribution (ringing lake, patchy growth, etc)	See Figures
Sediment type in infested area (sand/silt/organic/rock)	Silty/organic upstream in northern portion, rocky/cobble in lower basin
Rare, Threatened, or Endangered Species in Waterbody (according to historic NH Natural Heritage Bureau (NHB) Inventory review)	2016 NHB Review Medium level fen system Blandings turtle (*Emydoidea blandingii)* Spotted turtle *(Clemmys guttata)* Historic NHB Review Blandings turtle (*Emydoidea blandingii)* Spotted turtle *(Clemmys guttata)* Wood turtle (*Glyptemys insculpta)*

Native aquatic vegetation maps and keys from the DES Biology Section are shown in Figure 3. Bathymetric maps are 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
Bass, pickerel, and hornpout are common fish found in the river. Upstream of both ponds, the Powder Mill Fish Hatchery encompasses approximately 100 acres of conservation land. It is located at the head of Marsh Pond, and receiving water from the outflow of Merrymeeting Lake. Occasionally, trout which are reared at the hatchery, escape and are found downstream.

Wildlife Information
Information from the Fish and Game Department shows that there are wildlife management areas both upstream and downstream of this segment of the Merrymeeting River. The Marks Wildlife Management Area is located west of the Marsh Pond shoreline which is upstream of Jones Pond. From below the Jones Pond Dam south is located the Merrymeeting Marsh Wildlife Management Area. Fish and Game official have indicated that this area is important for waterfowl habitat.

The Merrymeeting Marsh WMA abuts this waterbody and encompasses more than 725 acres of conservation land. This WMA consists primarily of wetlands (including bogs, forested wetland, scrub, etc.) and some upland. This area is home to: white-tailed deer (occasionally feed on aquatic species of plants in summer), moose (1/4-25 mile range, feed on aquatic plants in summer), black bear, snowshoe hare, beaver, muskrat, great blue herons, marsh wrens (glean insects from just below water) and eastern kingbirds (sometimes take insects from surface of water, like to live near water). Spring and fall migratory waterfowl species found in this WMA include ring-necked

ducks, common goldeneyes, blue-winged and green-winged teal, scaup and scoters. The area's nesting species include black ducks, mallards, wood ducks, hooded mergansers and Canada geese. The marsh also has warmwater fish species, such as largemouth bass, chain pickerel, and yellow perch.

An historical NHB review (2013) showed the presence of the ebony boghaunter (Williamsonia fletcheri), documented at the Powder Mill Fish Hatchery in 2011. No impacts are expected to this dragonfly species as the result of management practices.

An historical NHB review (2013) of the area showed a record for the bald eagle (*Haliaeetus leucocephalus*). The records show that in 2011 there was a nesting eagle pair that had two fledged eaglets, and in 2010 a nesting eagle pair had one fledged eaglet. DES biologists observed one adult eagle perched on a pine tree at the southern end of Jones Pond (adjacent to the dam) in July 2012.

Historical NHB records also indicate that the Merrymeeting Marsh is a common location to find wintering eagles. As the herbicide of choice does not show a history of bioaccumulating in fish (a primary food of the eagle) it is unlikely that the eagles will be affected by control activities in this system.

The Fish and Game Department does request that airboats not be used within 100 meters of nesting sites of the bald eagle.

Current and historic NHB reviews also showed the presence of the Blandings turtle (*Emydoidea blandingii)* in the area. The record is from the discovery of a deceased turtle in 2007. Blanding's turtle (*Emydoidea blandingii*) is listed as endangered in New Hampshire because it is critically imperiled due to rarity or vulnerability. Globally the species is apparently secure but with cause for concern. Blanding's turtles are mostly aquatic and are found in the shallows of lakes and ponds, in marshes, bogs, and small streams. The turtles nest on land, but feed underwater on insects, tadpoles, crayfish, and snails, among other small aquatic organisms. It is not expected that habitat or food sources for the turtle will be affected by the recommended milfoil control practices. The Fish and Game Department has asked that contractors avoid overspray of any herbicides into emergent scrub-shrub habitats so as to avoid any impacts to blanding's turtle habitat.

An historic NHB record for the spotted turtle also exists for the Merrymeeting River, from 2008. This turtle is listed as threatened in New Hampshire, due to rarity or vulnerability. It is not expected that habitat or food sources for the turtle will be affected by the recommended milfoil control practices.

An historic NHB record also showed the presence of the wood turtle in the area, but closer to Club Pond in town than to Jones or Downing Pond. The wood turtle is listed as a species of concern in NH.

Recreational Uses and Access Points

Jones Pond is a small shallow impoundment of the Merrymeeting River, with extensive wetland complexes in the upper portion of the pond. The river is used by shoreline residents as well as by transient boaters (for both non-motorized craft as well as craft with short shaft low horsepower engines).

Two unofficial public access sites are used by transient boaters (one on the lower basin and one at the bridge crossing between Marsh Pond and Jones Pond, and the other which was on the lower basin has been closed off). There is an official launch site farther upstream into Marsh Pond.

There are no designated beaches on Jones Pond, however there are a few (4) small private swim beaches located on private properties around the pond. There are 10 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 Jones 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 Jones Pond is characterized by a mix of native and non-native (variable milfoil) plant growth (Figure 3). Native species include a mix of floating plants (white and yellow water-lilies, duckweed, watershield), emergent plants (swamp loosestrife, cattail, bur-reed, arrowhead, pickerelweed, arrow arum, tape grass, three-way sedge, bulrush, spike rush, iris, sweet gale), and submergent plants (bladderwort, coontail, pondweed, water naiad). Native plant communities are mixed around the entire lake, and are characterized as ‘common/abundant’ by the DES.

Filamentous green algae were observed throughout much of the system, and the Cyanobacterium *Nostoc* was observed in very low density along the eastern shoreline along the wetland edge. Another Cyanobacterium, *Oscillatoria*, is occasionally present in the lower basin of the pond above the dam.

An NHB review indicated two records of plant species of concern in this system. Flatstem Pondweed (*Potamogeton zosteriformis*) was identified upstream in Marsh Pond with a record dating back to 1972. A survey of the river system was conducted by DES in spring 2011 and again in 2012, but this pondweed species was not found as part of the survey. Because pondweeds are monocots it is expected that they will not be targeted by the recommended control actions prescribed later in this plan.

The other plant species is Hollow joe-pye weed (*Eutrochium fisulosum*). This plant was documented in a roadside ditch in 2011, and not in the main stem or periphery of the river itself, and thus should not be impacted by proposed control activities.

A medium level fen system was identified downstream of Downing Pond, throughout the Merrymeeting River system.

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 AREA (ac) OR DIVER/DASH GALLONS	APPLICATOR/ENTITY
25-Jun-03	2,4-D	11	LYCOTT
FALL 2007	DRAWDOWN	N/A	NEW DURHAM
22-Sep-08	2,4-D (G)	10	ACT
21-Jul-10	2,4-D	23.5 ACRES ABOVE HOOVER BRIDGE	ACT
17-Sep-10	2,4-D	13 ACRES ABOVE HOOVER BRIDGE	ACT
14-Jul-11	2,4-D (G)	12 acres	ACT
18-Jul-12	2,4D (G)	15 ACRES	ACT
9/13/2012	DIVER HAND REMOVAL	2.5 HOURS, 80 GALLONS	DES
7/15/2013	2,4-D & TRICLOPYR (G)	20 ACRES	ACT
6/24/2014	HAND PULLING IN DOWNING POND AND JONES POND	20 GALLONS	MARK SPAULDING (NEW ENGLAND MILFOIL)
7/1/2014	DIQUAT	18.8 ACRES IN JONES POND AND 12 ACRES IN DOWNING POND	ACT
6/29/2015	DIQUAT	18.8 ACRES	ACT
9/11/2015	2,4-D BEE (G)	18.8 ACRES	ACT
AUGUST 2015	DIVING/DASH	VARIED	DASH CONTRACTOR

There have been no control activities in Downing Pond to date. The town of New Durham was prioritizing upstream infestations (Jones Pond) before moving on to Downing Pond, but noting expansion of growth in Downing Pond in recent years, they have decided to reduce infestations in this pond before they continue to expand.

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.htm. Additional information can be obtained from a document prepared for the State of Massachusetts called the Generic Environmental Impact Report for Lakes and Ponds, available at http://www.mass.gov/dcr/watersupply/lakepond/geir.htm.
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 Jones and Downing Ponds
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 variable 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.
Hand-pulling	Recommended as a primary means of control for milfoil growth areas that are single points outside of designated treatment areas. After treatment is performed, those areas should be surveyed to see if additional dive work may be needed as a follow-up.
Mechanical	Not recommended due to the risk of fragmentation

Control Method	Use on Jones and Downing Ponds
Harvesting/Removal	and drift, and subsequent further spread of the invasive plant.
Benthic Barriers	Recommended for small patches that are 20' x 20' in size or less, and where practical, outside of the main stem of the river.
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. Historic and proposed future treatments are presented in Figure 2.
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 variable milfoil.
No Control	The variable milfoil in this system is easily mobile due to flow, and a no-control option only continues to put downstream habitats at risk for infestation.

Recommended Actions, Timeframes and Responsible Parties

An evaluation of the size, location, and type of variable 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 variable milfoil control in the system:

Year	Action	Responsible Party	Schedule
2012	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through September
	Survey and planning for summer/fall milfoil control actions	DES	May/June

Year	Action	Responsible Party	Schedule
	Diver/DASH work as needed and recommended (areas to be determined based on updated spring survey)	Contract Diver	June-September as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on updated spring survey)	Aquatic Control Technology, Inc.	June or September
	Survey waterbody and planning for next season's control actions	DES	September
2013	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through September
	Survey and planning for summer/fall milfoil control actions	DES	May/June
	Diver/DASH work as needed and recommended (areas to be determined based on need)	Contract Diver	June-September as needed
	Herbicide treatment, if needed, based on diver progress as monitored by DES (areas to be determined based on need)	Aquatic Control Technology	July
	Survey and planning for next season's control actions	DES	September
2014	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through September
	Survey and planning for summer/fall milfoil control actions	DES	May/June
	Diver/DASH work as needed and recommended (areas to be determined based on need)	Contract Diver	June-September as needed
	Herbicide Treatment (Figure 2 for 2014)	Aquatic Control Technology, LLC	July

Year	Action	Responsible Party	Schedule
	Survey and planning for next season's control actions	DES	September
2015	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through September
	Survey and planning for summer/fall milfoil control actions	DES	May/June
	Diver/DASH work as needed and recommended on both ponds (areas to be determined based on survey)	Contract Diver	June-September as needed
	Herbicide treatment in Jones Pond (Figure 2 for 2015 proposed treatment)	Aquatic Control Technology, LLC	Late June and/or September
	Survey and planning for next season's control actions	DES	September
2016	Weed Watching and marking/reporting of milfoil growth	Local Weed Watchers	Once a month from May through September
	Survey and planning for summer/fall milfoil control actions	DES	May/June
	Diver/DASH work as needed and recommended (areas to be determined based on need and updated survey)	Contract Diver	June-September as needed
	Herbicide treatment in Jones Pond (Figure 2 for 2016 proposed treatment)	SŌLitude Lake Management, LLC	Late June and/or September
	Survey and planning for next season's control actions	DES	September
2017	Update and revise Long-Term Variable Milfoil Control Plan	DES and Interested Parties	Fall/ Winter

Notes

Target Specificity

It is important to realize that 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.*

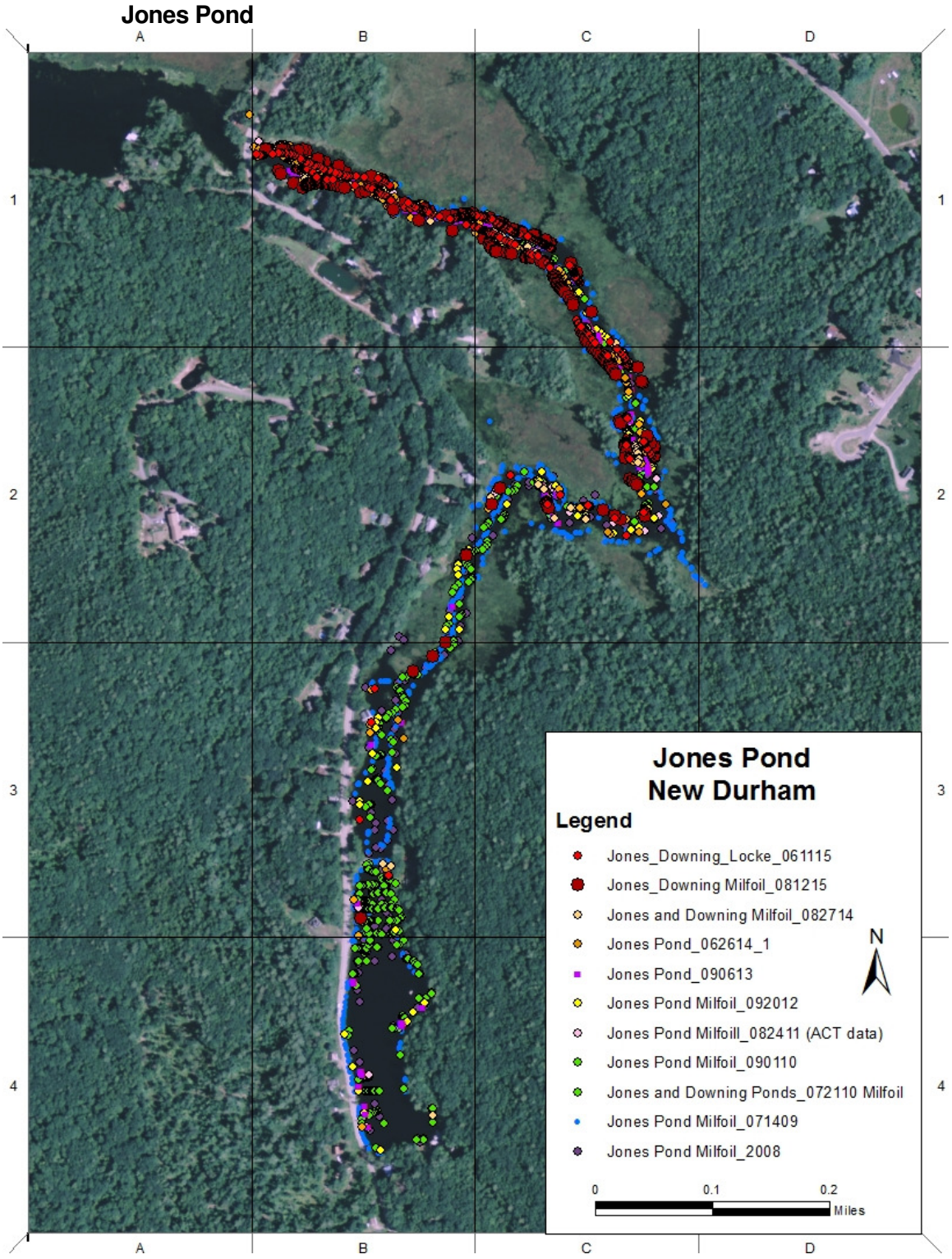
Adaptive Management

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).

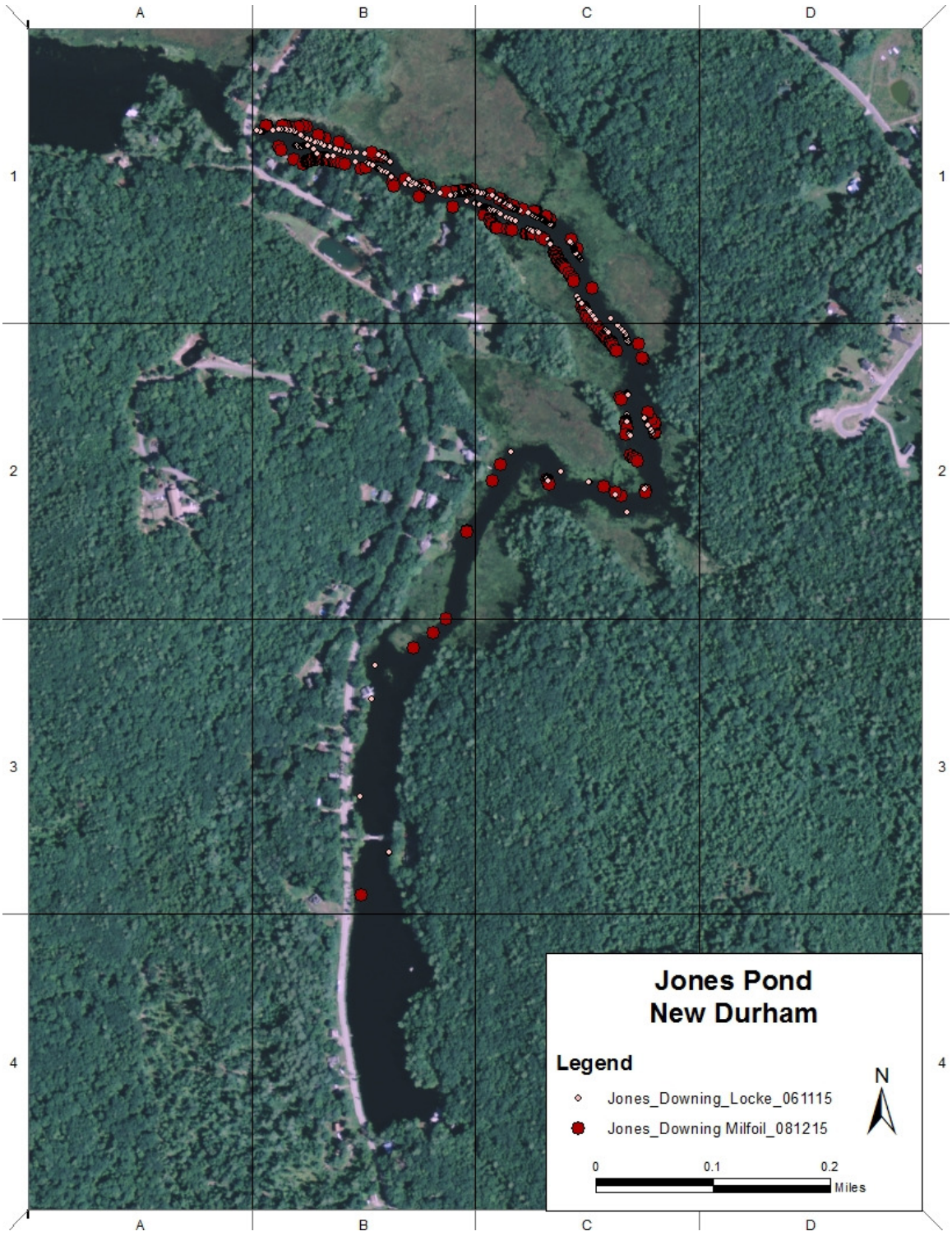
This long-term plan is therefore based on the concept of adaptive management, where current field data (from field survey work using DES established field survey standard operating procedures) drive decision making, which may result in modifications to the recommended control actions and timeframes for 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 variable milfoil management in the subject waterbody.

Figure 1: Map of Variable Milfoil Infestations Over Time



Jones Pond 2015 Milfoil



Downing Pond

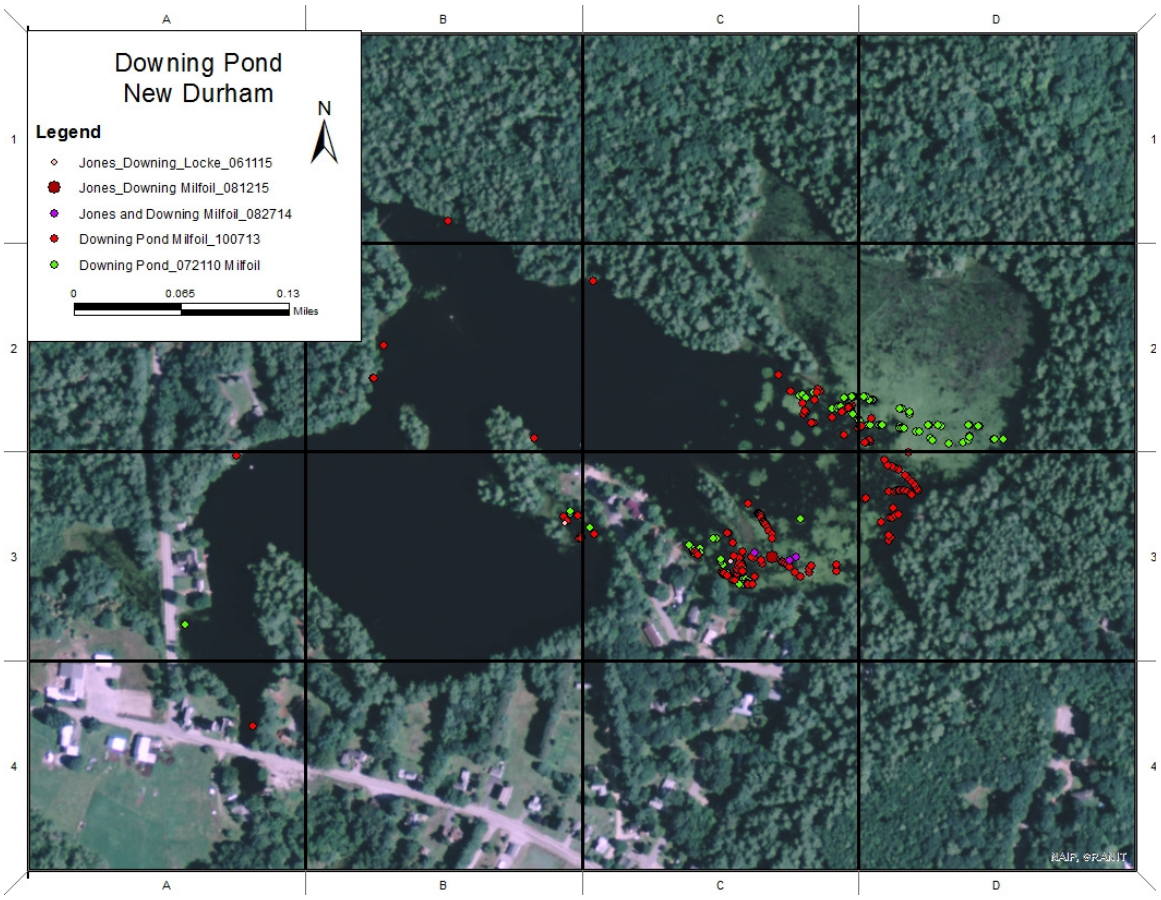
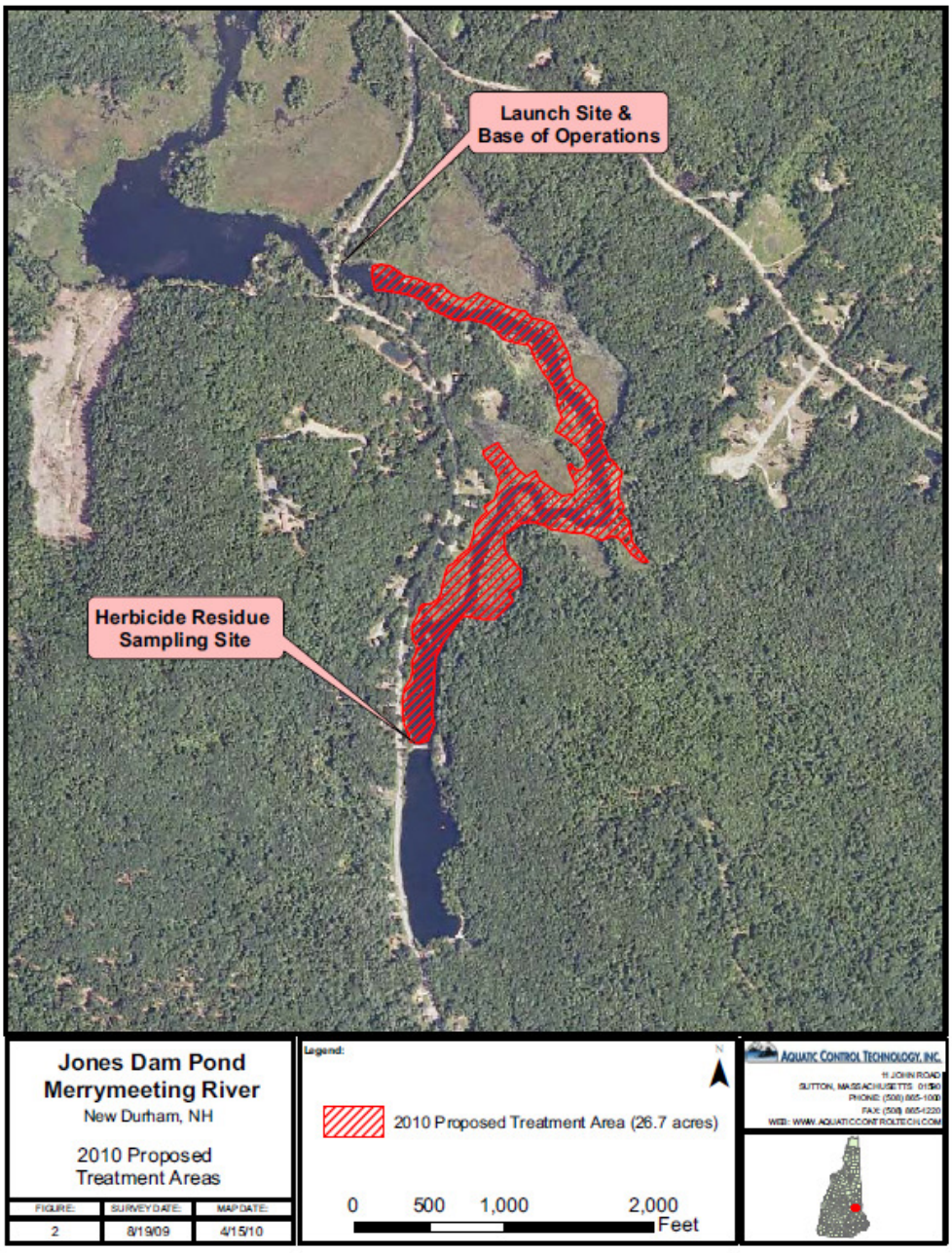
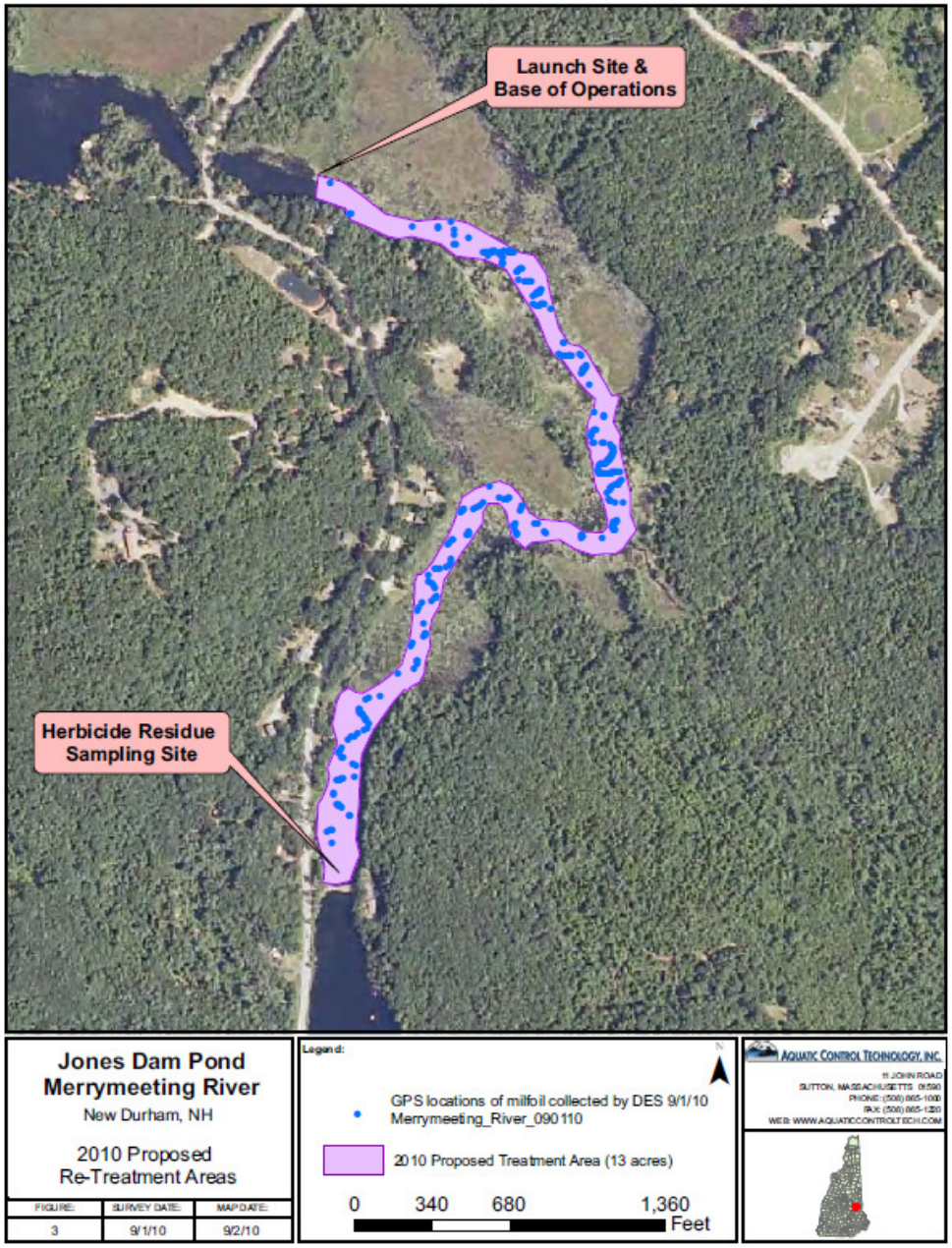


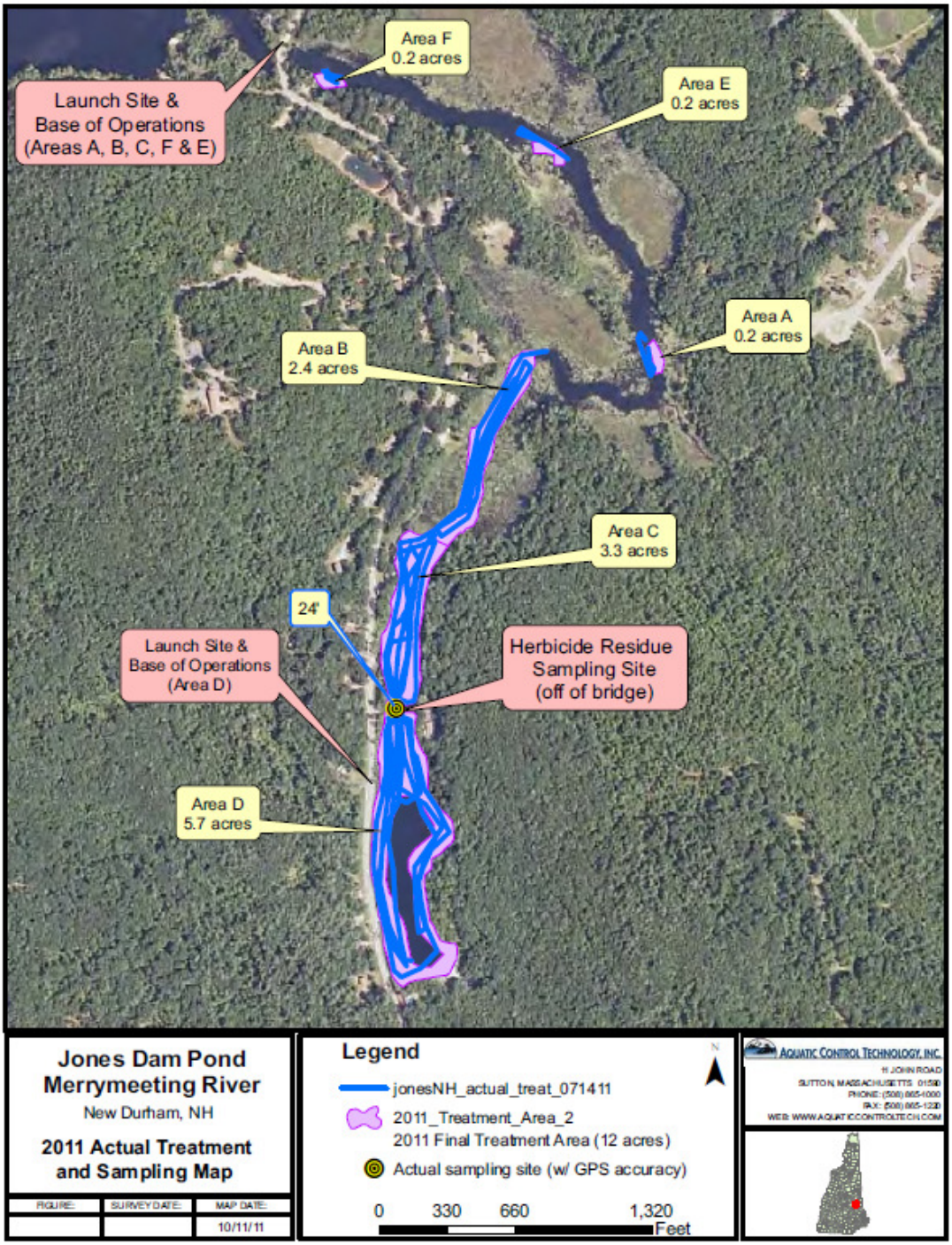
Figure 2: Map of Control Actions Over Time

2010 (map provided by Aquatic Control Technology)

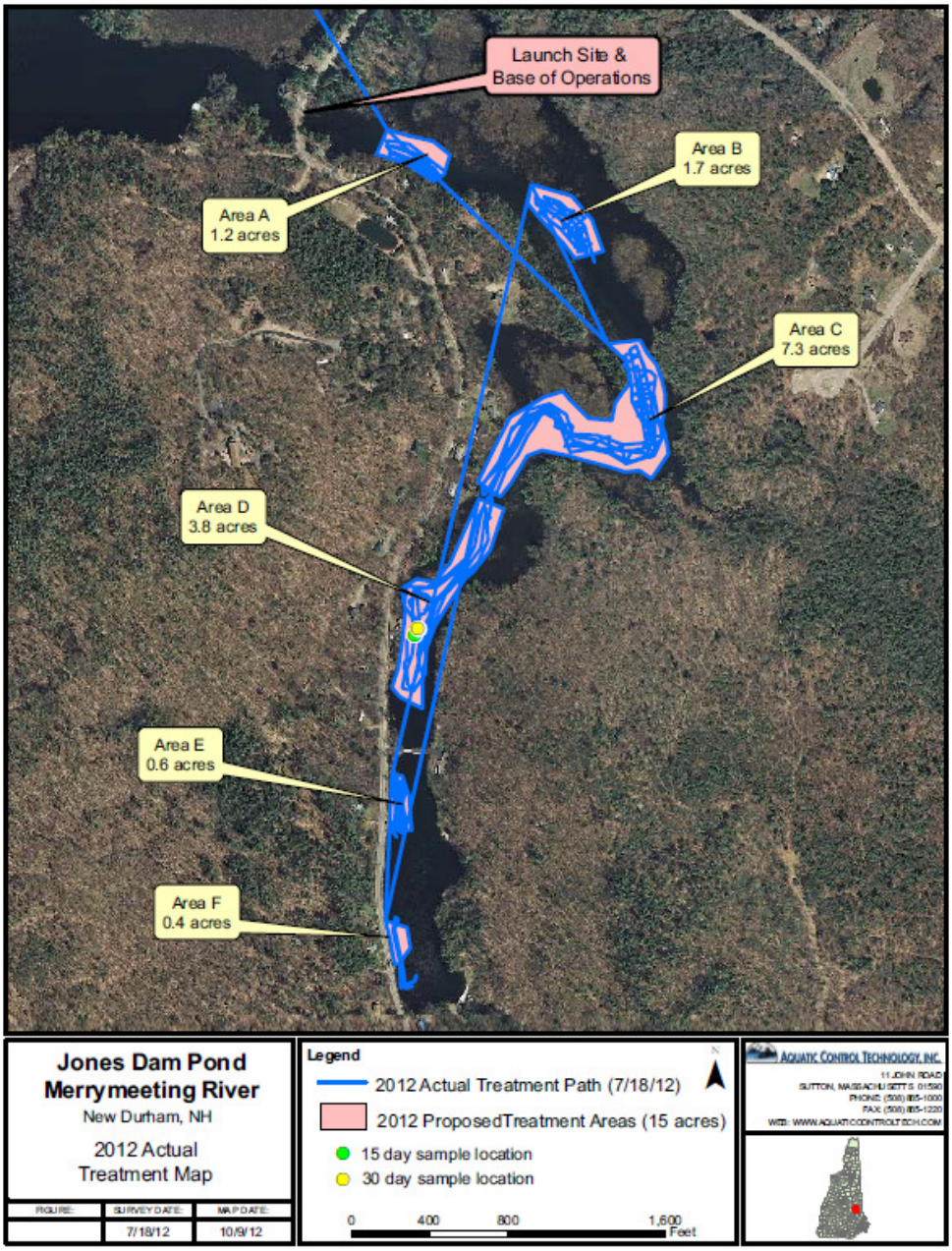



Launch Site &
Base of Operations
Herbicide Residue
Sampling Site
Jones Dam Pond
Merrymeeting River
New Durham, NH
2010 Proposed
Re-Treatment Areas
FIGURE: 3
SURVEY DATE: 9/1/10
MAP DATE: 9/2/10
Legend:
GPS locations of milfoil collected by DES 9/1/10
Merrymeeting_River_090110
2010 Proposed Treatment Area (13 acres)
0 340 680 1,360
Feet
AQUATIC CONTROL TECHNOLOGY, INC.

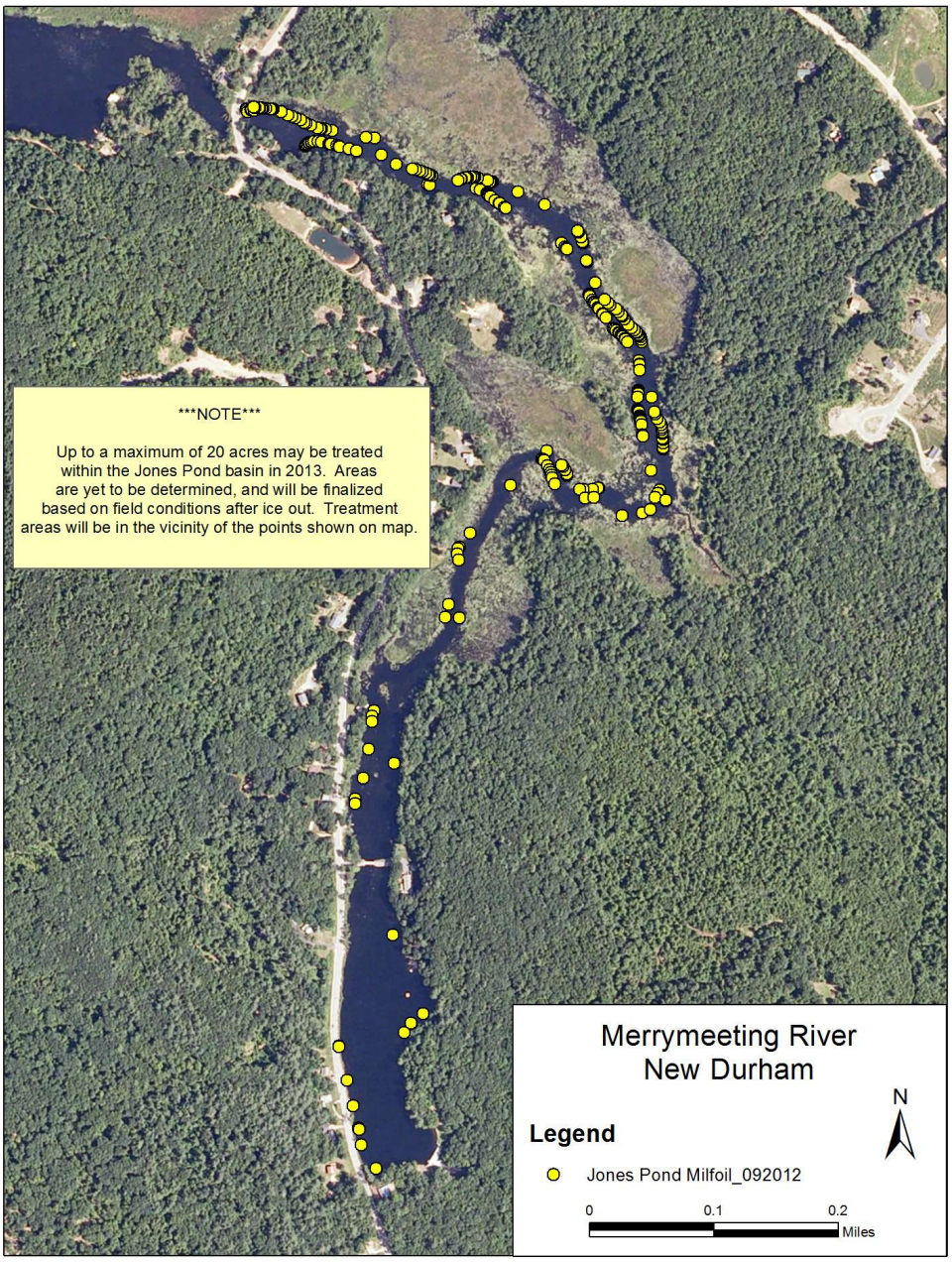
2011 (map provided by Aquatic Control Technology)



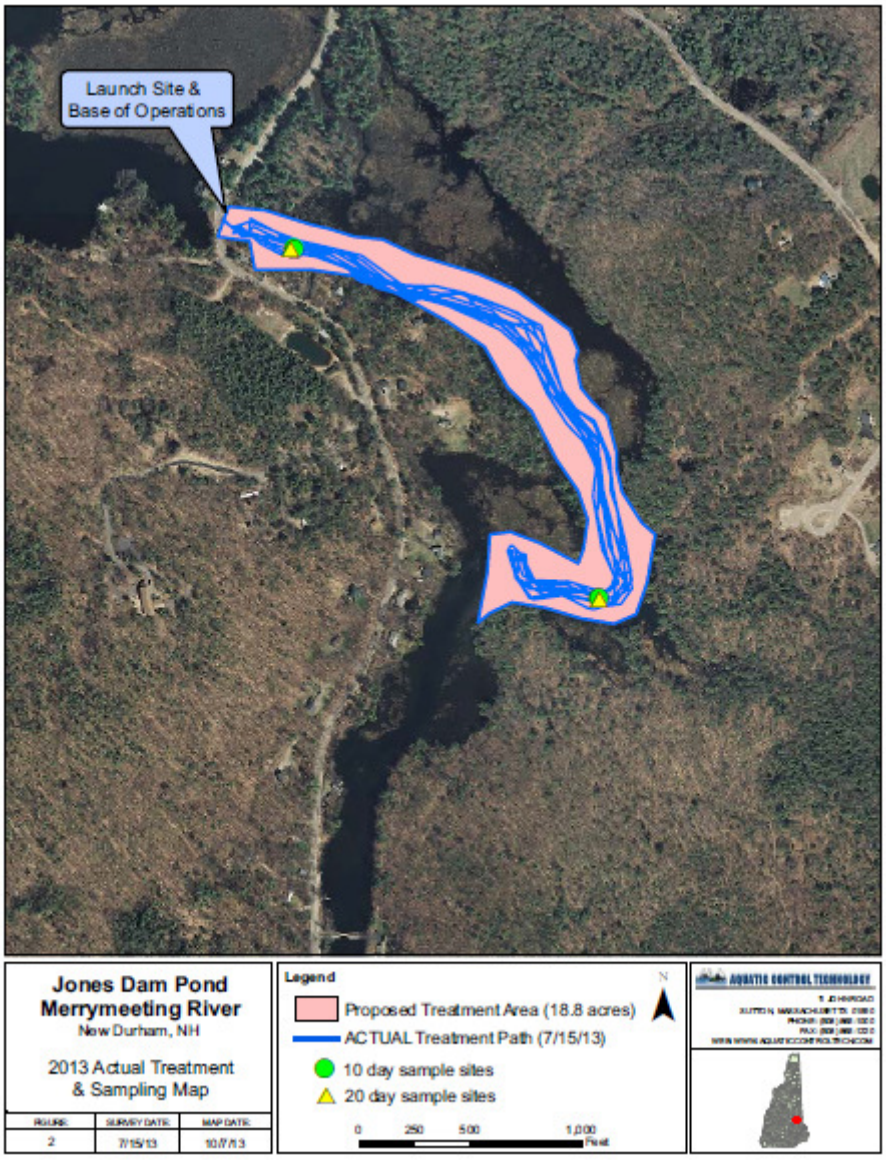
2012 (map provided by Aquatic Control Technology)



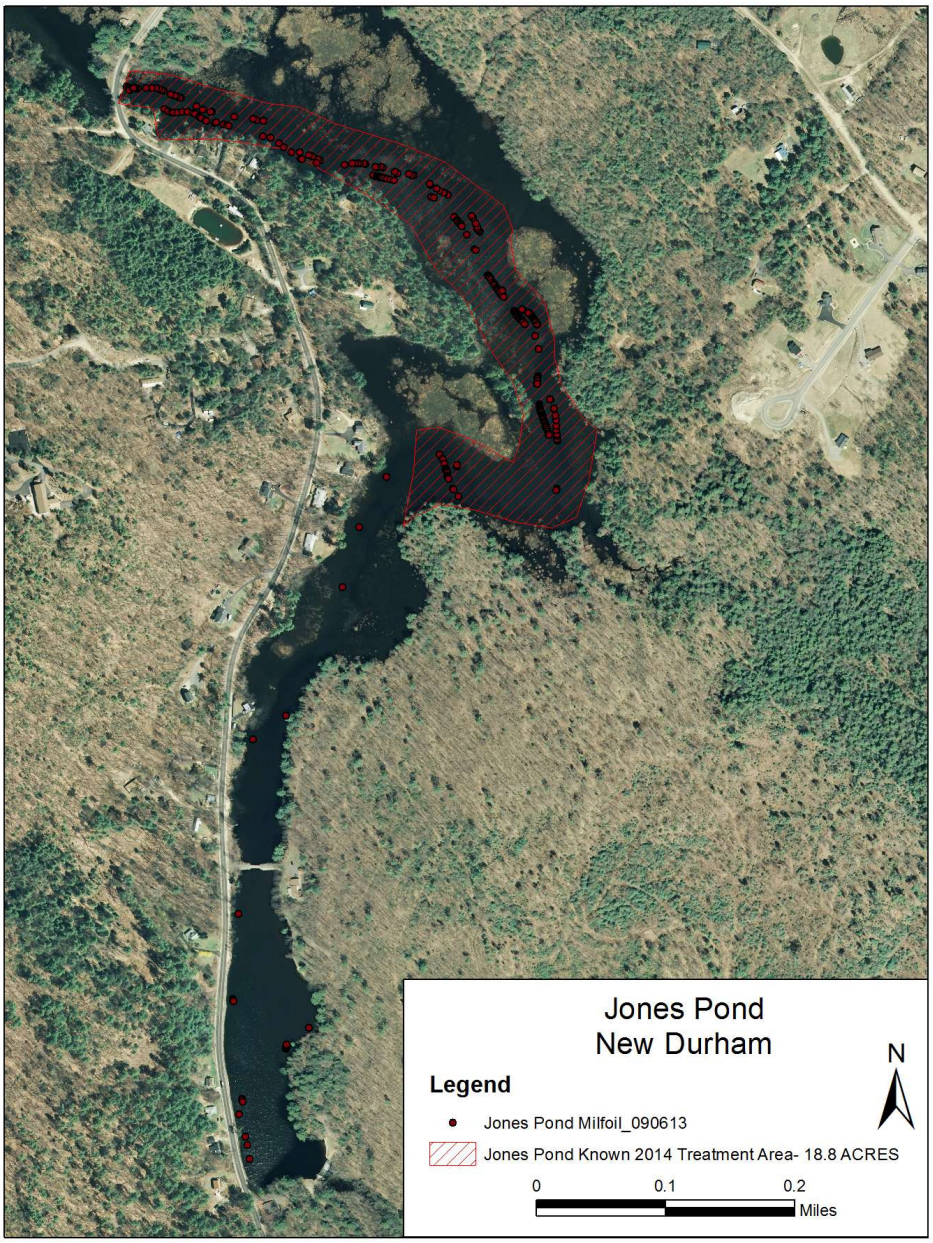
2013 (proposed)

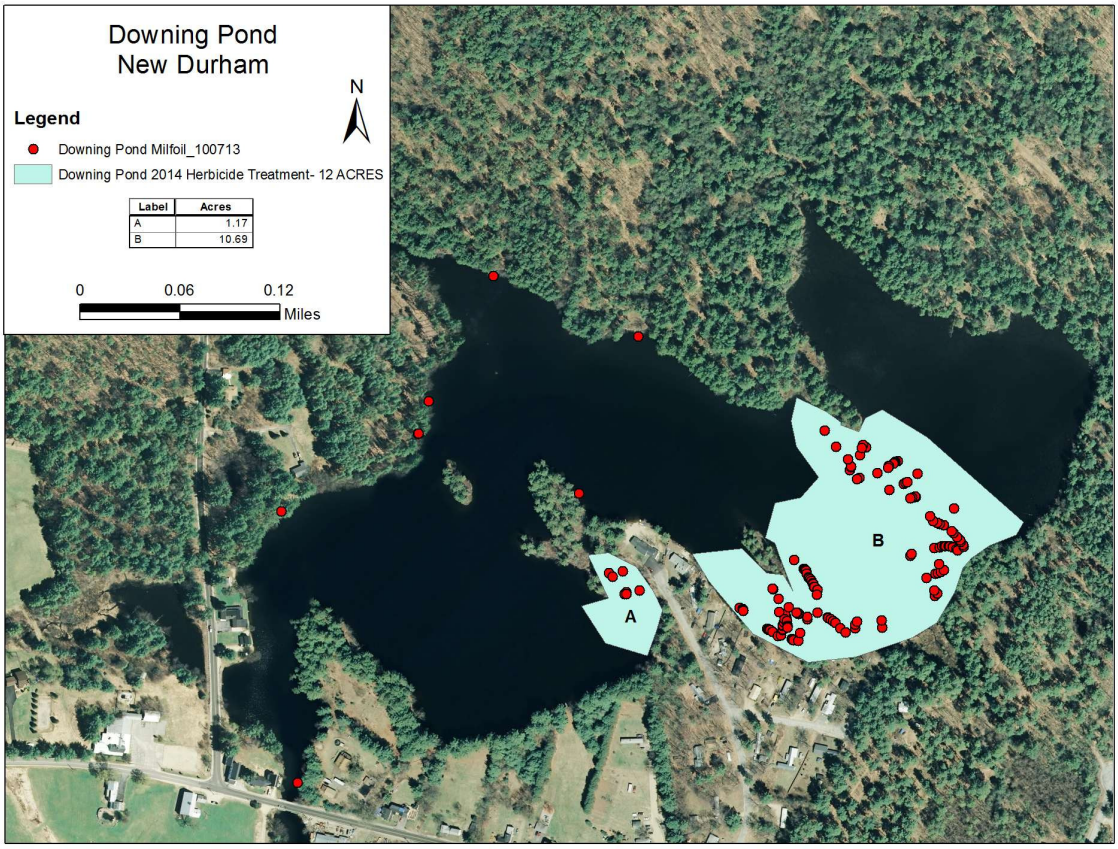


2013 (actual)

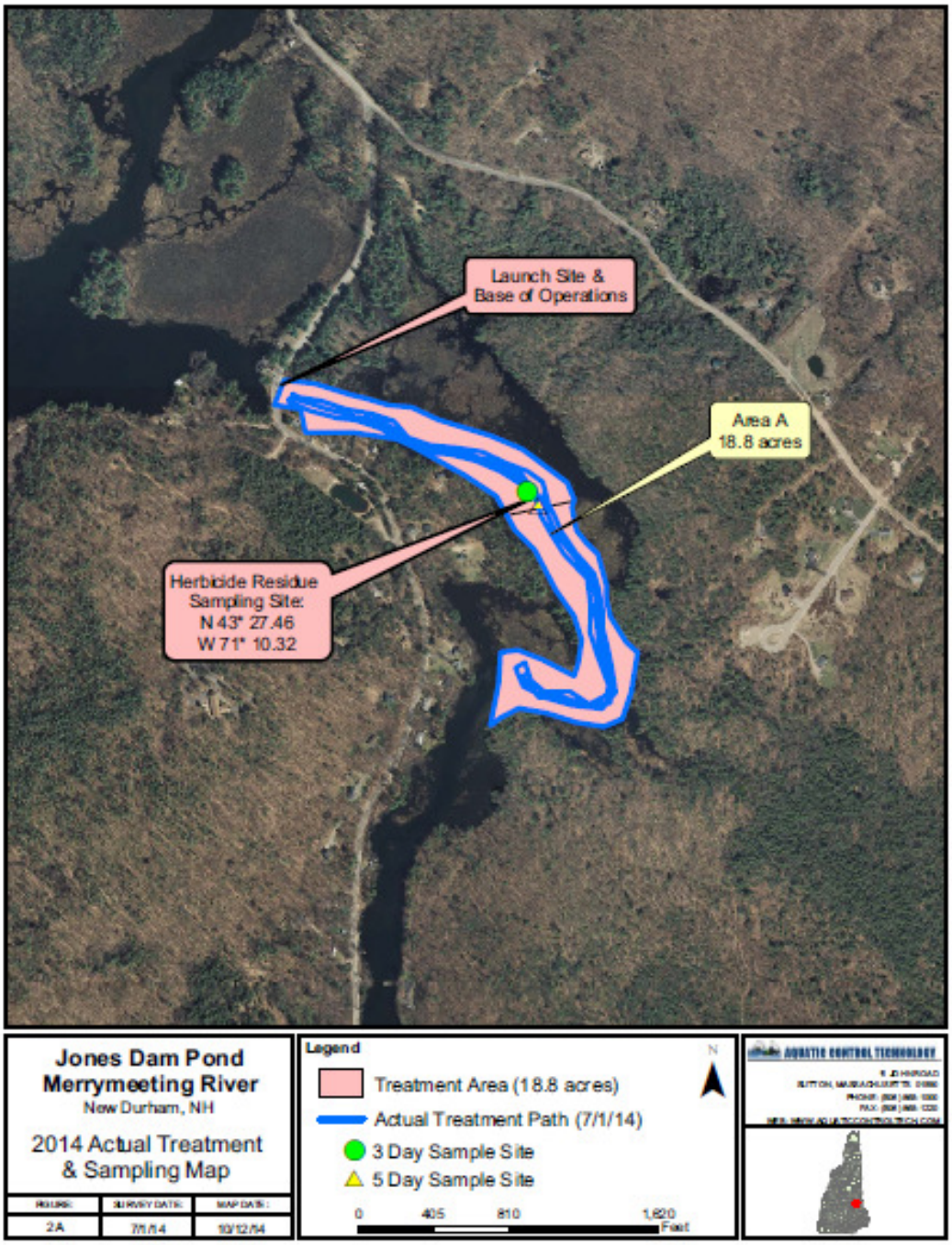

Launch Site &
Base of Operations
Jones Dam Pond
Merrymeeting River
New Durham, NH
2013 Actual Treatment
& Sampling Map
FIGURE
SURVEY DATE
MAP DATE
2
7/15/13
10/7/13
Legend
Proposed Treatment Area (18.8 acres)
ACTUAL Treatment Path (7/15/13)
10 day sample sites
20 day sample sites
0
250
500
1,000
Feet
N
AQUATIC CONTROL TECHNOLOGY

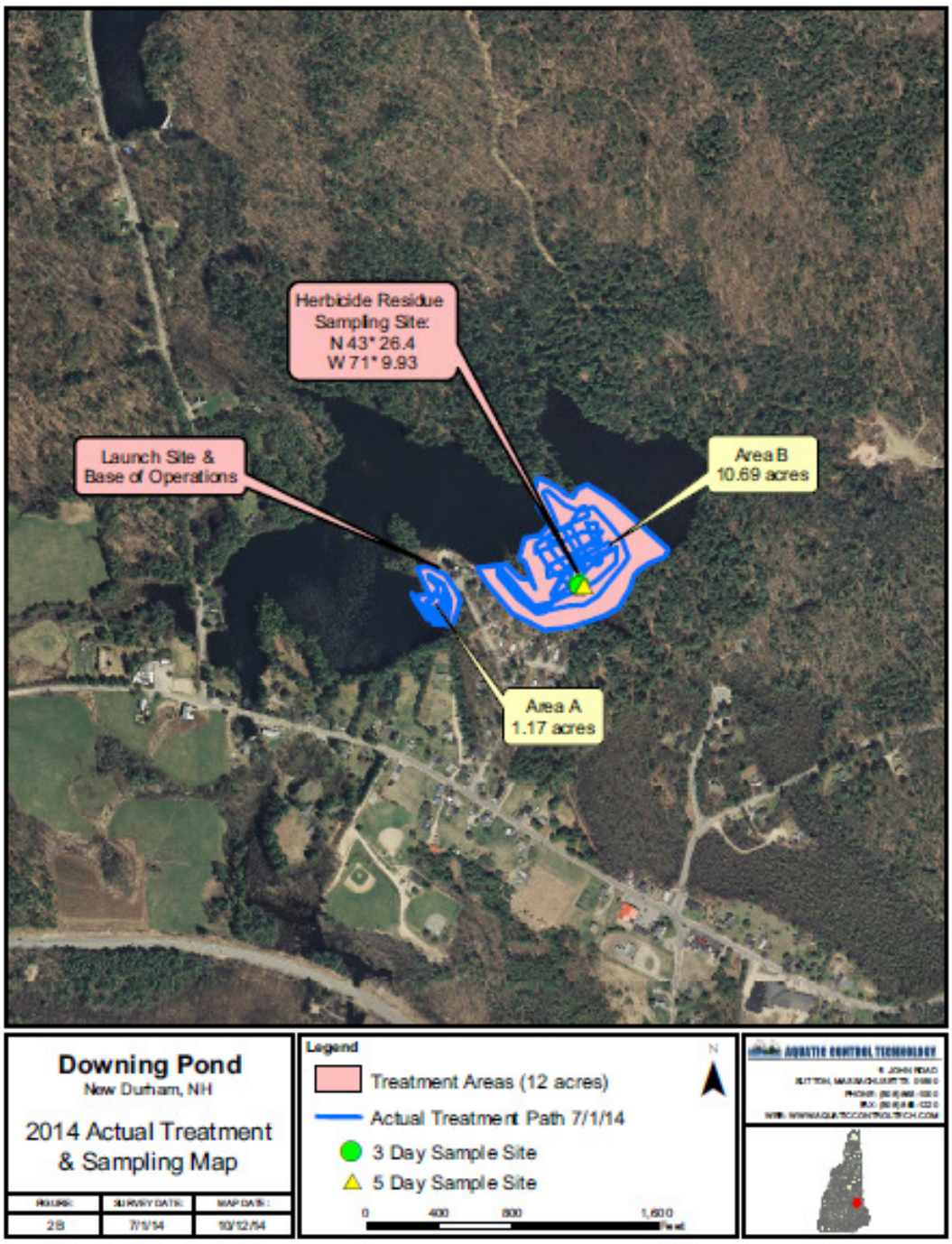
2014 (proposed)



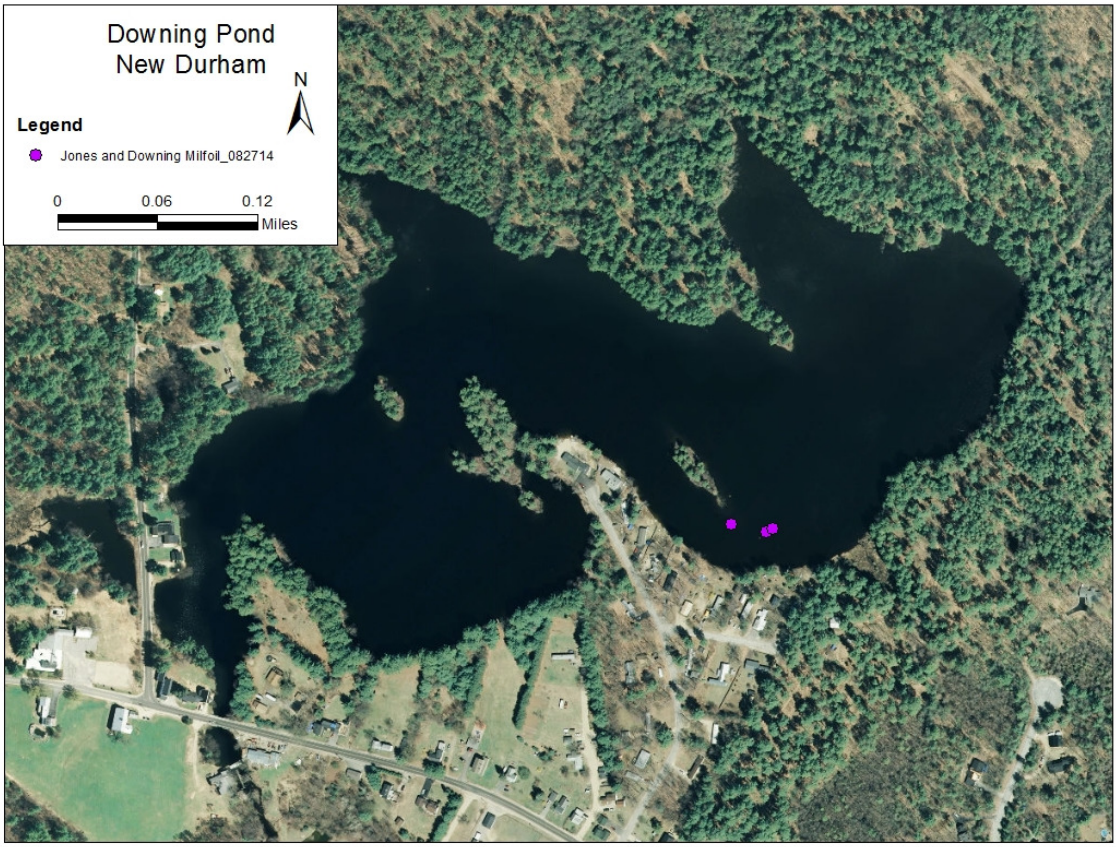

Downing Pond
New Durham
N
Legend
Downing Pond Milfoil_100713
Downing Pond 2014 Herbicide Treatment- 12 ACRES
Label
Acres
A
1.17
B
10.69
0
0.06
0.12
Miles
A
B

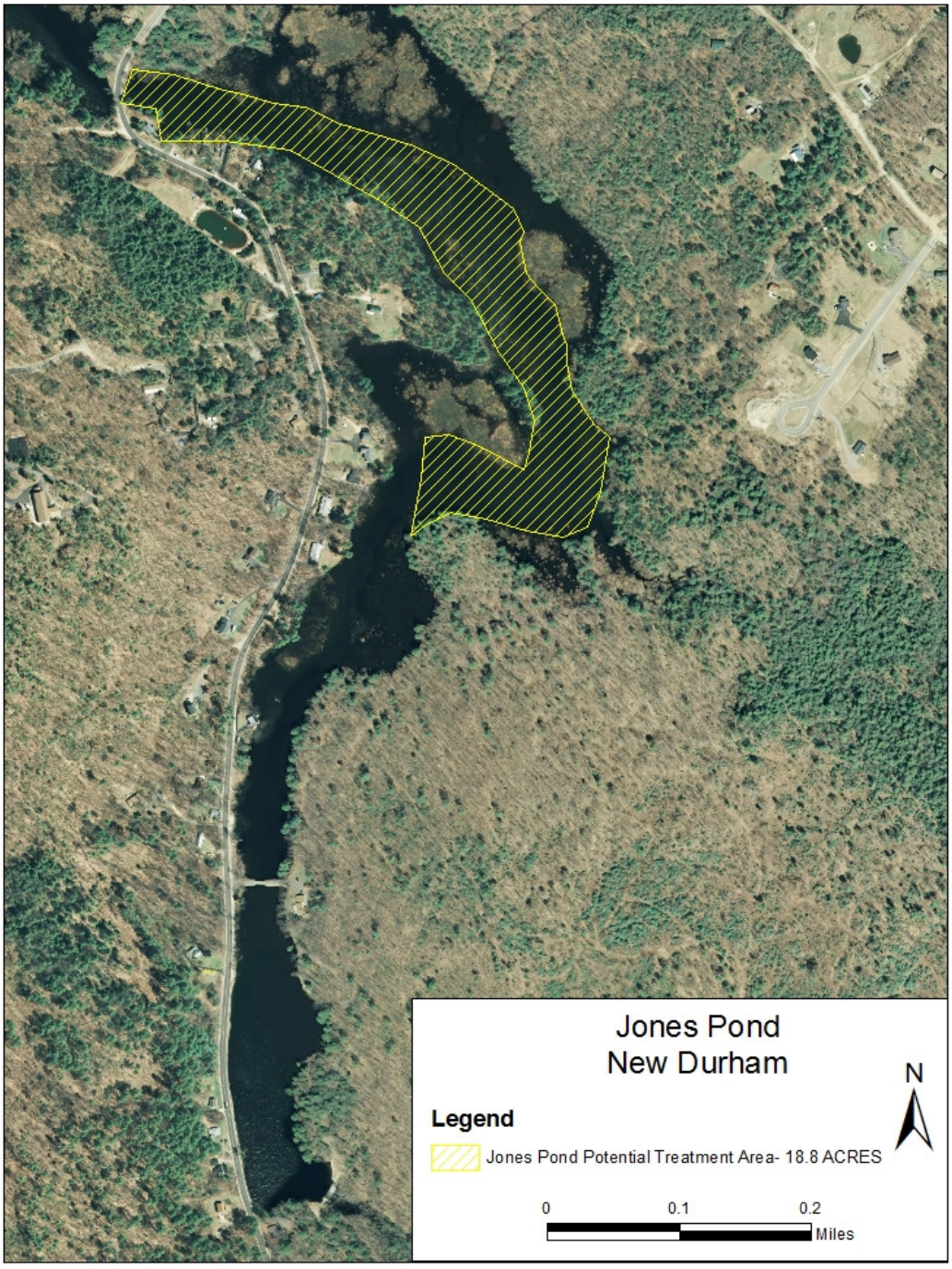
2014 (actual)


Launch Site &
Base of Operations
Area A
18.8 acres
Herbicide Residue
Sampling Site:
N 43° 27.46
W 71° 10.32
Jones Dam Pond
Merrymeeting River
New Durham, NH
2014 Actual Treatment
& Sampling Map
2A
7/1/14
10/12/54
Legend
N
Treatment Area (18.8 acres)
Actual Treatment Path (7/1/14)
3 Day Sample Site
5 Day Sample Site
0
405
810
1,620
Feet

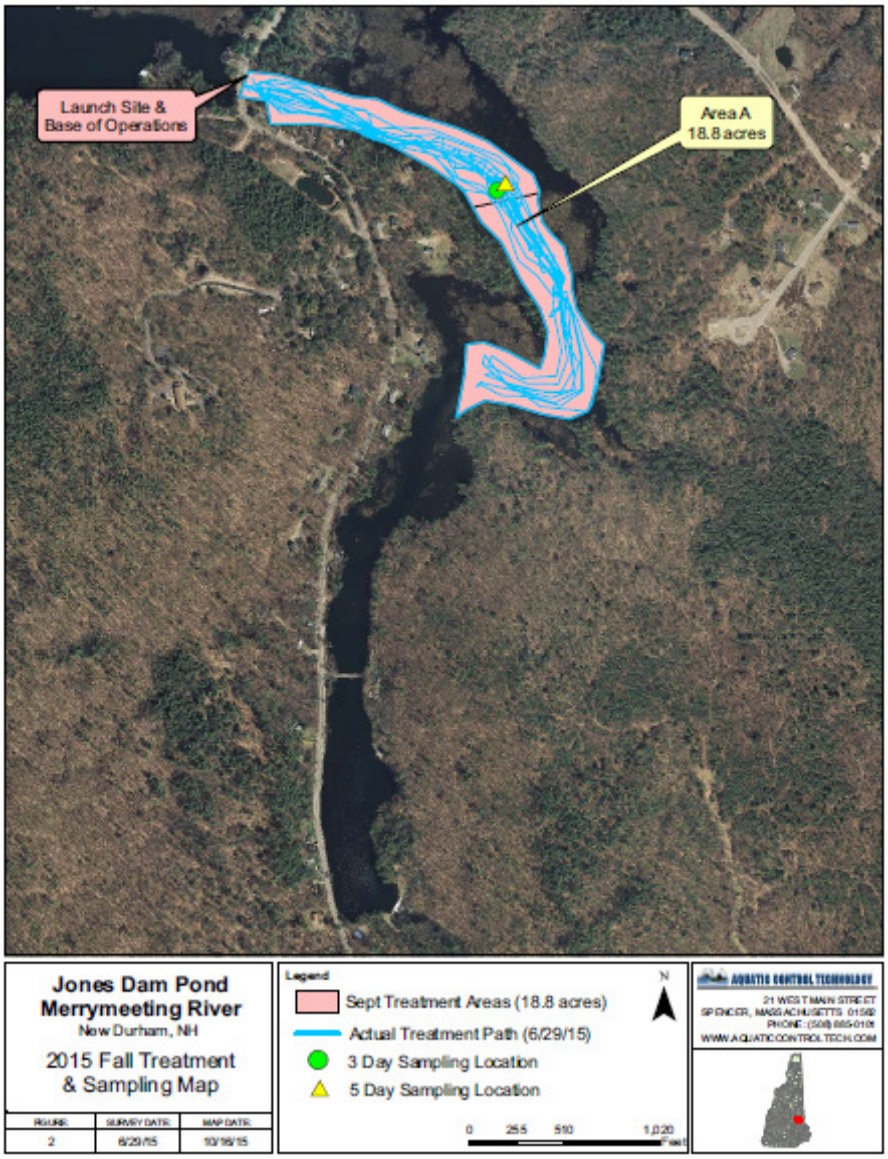

Herbicide Residue
Sampling Site:
N 43° 26.4
W 71° 9.93
Launch Site &
Base of Operations
Area B
10.69 acres
Area A
1.17 acres
Downing Pond
New Durham, NH
2014 Actual Treatment
& Sampling Map
FIGURE:
2B
SURVEY DATE:
7/1/14
MAP DATE:
10/12/14
Legend
Treatment Areas (12 acres)
Actual Treatment Path 7/1/14
3 Day Sample Site
5 Day Sample Site
N
0
400
800
1,600
Feet
AQUATIC CONTROL TECHNOLOGY

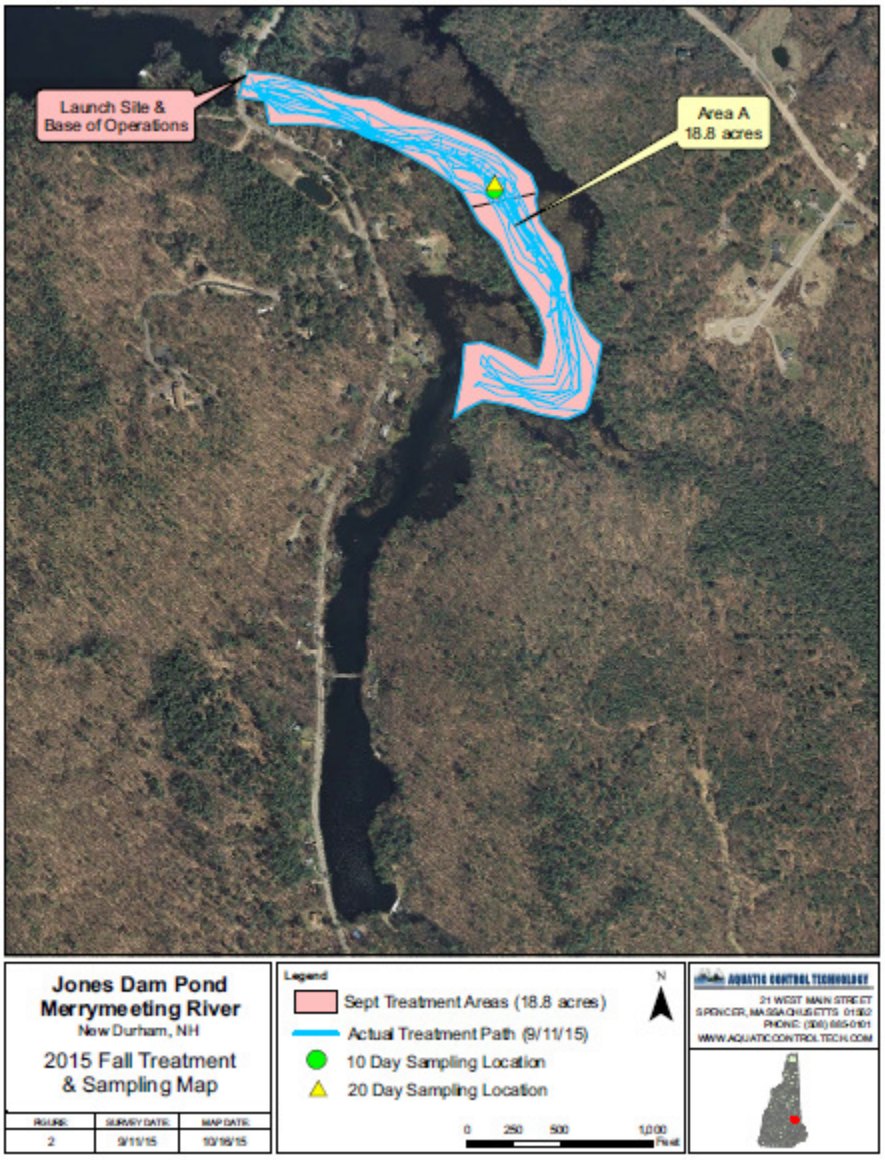
2015 (proposed)




Jones Pond
New Durham
N
Legend
Jones Pond Potential Treatment Area- 18.8 ACRES
0
0.1
0.2
Miles

2015 (actual)


Launch Site &
Base of Operations
Area A
18.8 acres
Jones Dam Pond
Merrymeeting River
New Durham, NH
2015 Fall Treatment
& Sampling Map
FIGURE
SURVEY DATE
MAP DATE
2
6/29/15
10/19/15
Legend
Sept Treatment Areas (18.8 acres)
Actual Treatment Path (6/29/15)
3 Day Sampling Location
5 Day Sampling Location
N
0
255
510
1,020
AQUATIC CONTROL TECHNOLOGY
21 WEST MAIN STREET
SPENCER, MASSACHUSETTS 01562
PHONE: (508) 885-0101
WWW.AQUATICCONTROLTECH.COM


Launch Site &
Base of Operations
Area A
18.8 acres
Jones Dam Pond
Merrymeeting River
New Durham, NH
2015 Fall Treatment
& Sampling Map
FIGURE
2
SURVEY DATE
9/11/15
MAP DATE
10/16/15
Legend
Sept Treatment Areas (18.8 acres)
Actual Treatment Path (9/11/15)
10 Day Sampling Location
20 Day Sampling Location
N
0
250
500
1,000
Feet
AQUATIC CONTROL TECHNOLOGY
21 WEST MAIN STREET
SPENCER, MASSACHUSETTS 01562
PHONE: (508) 885-0101
WWW.AQUATICCONTROLTECH.COM

2016 (proposed)

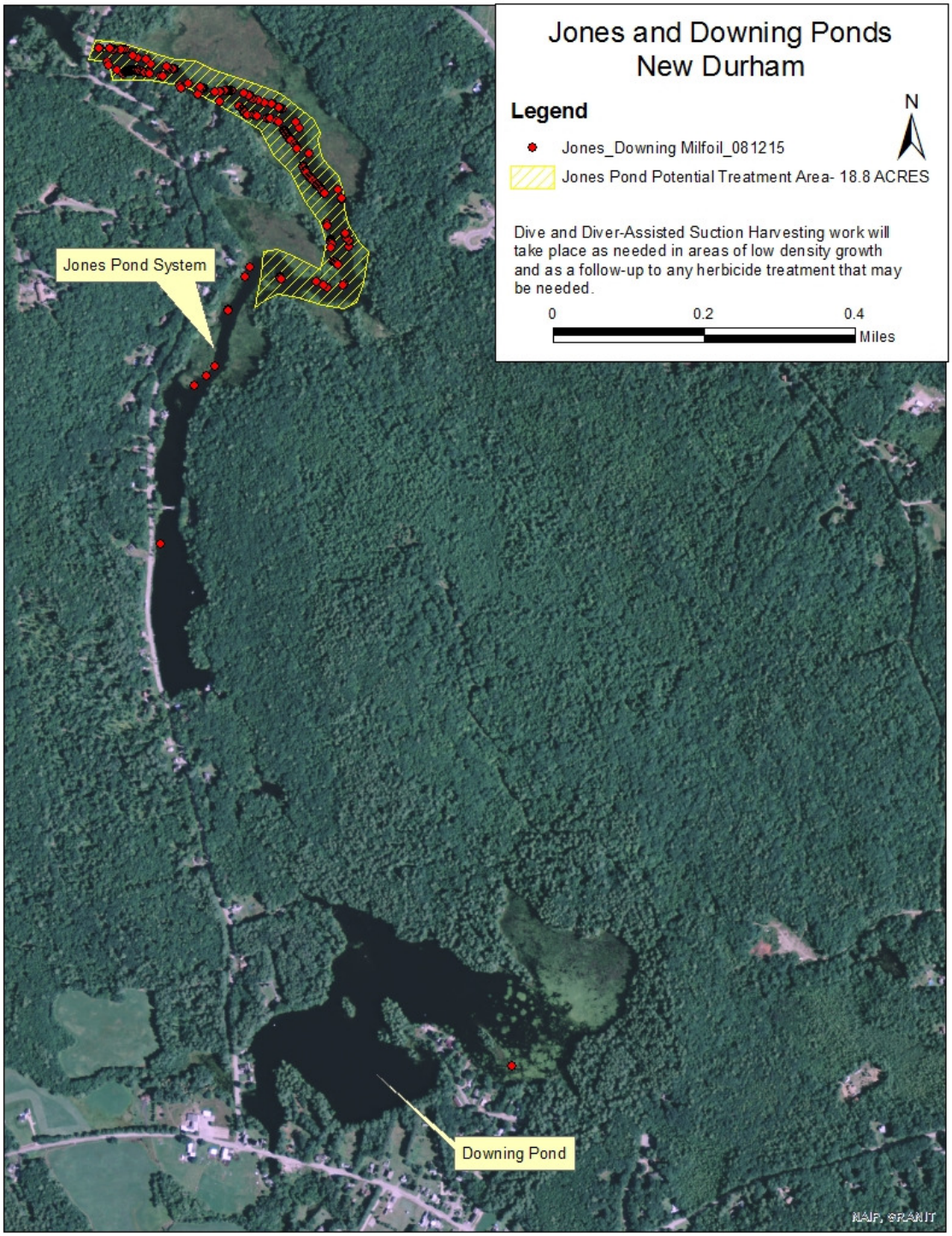
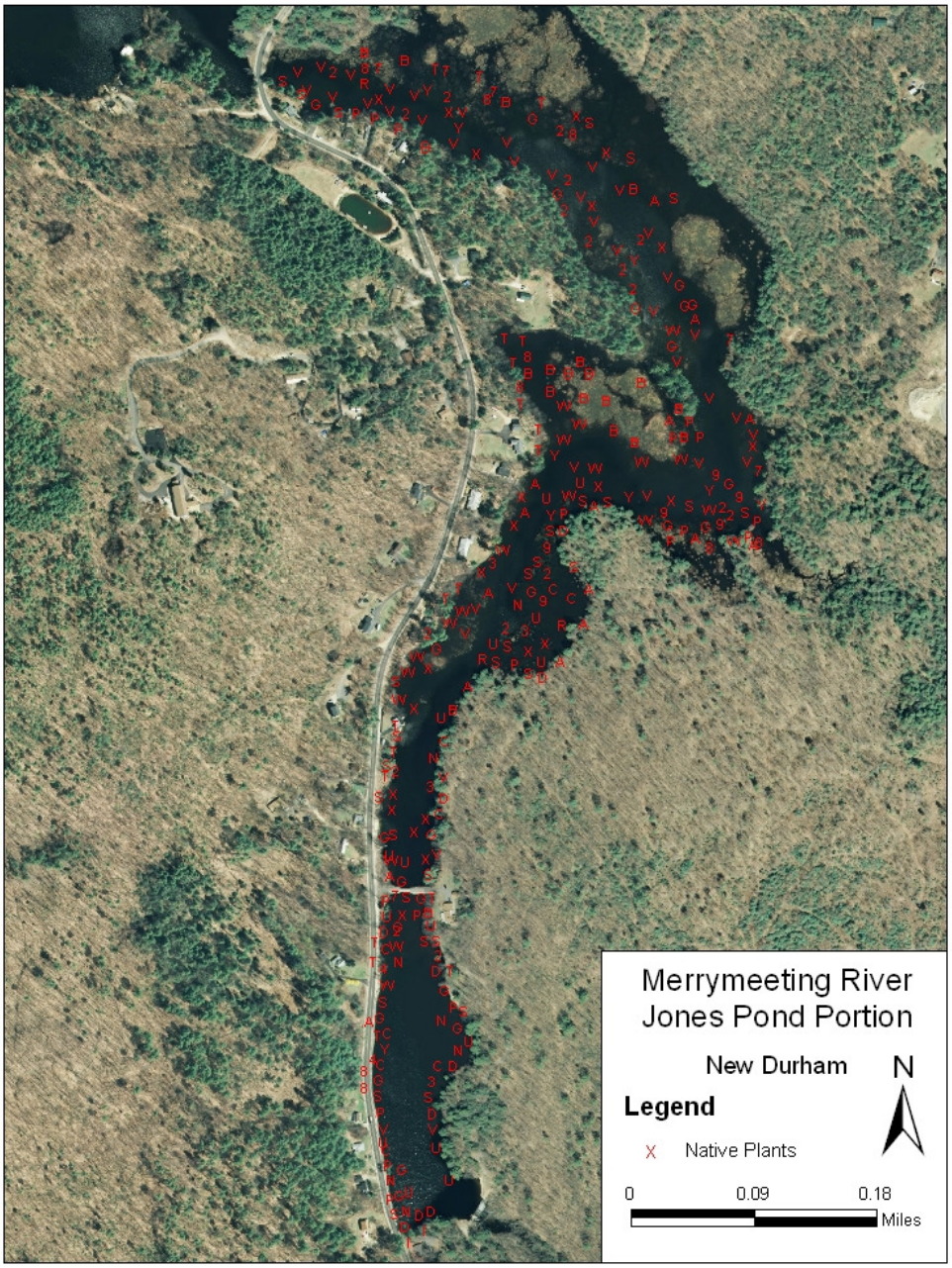


Figure 3: Map of Native Aquatic Macrophytes

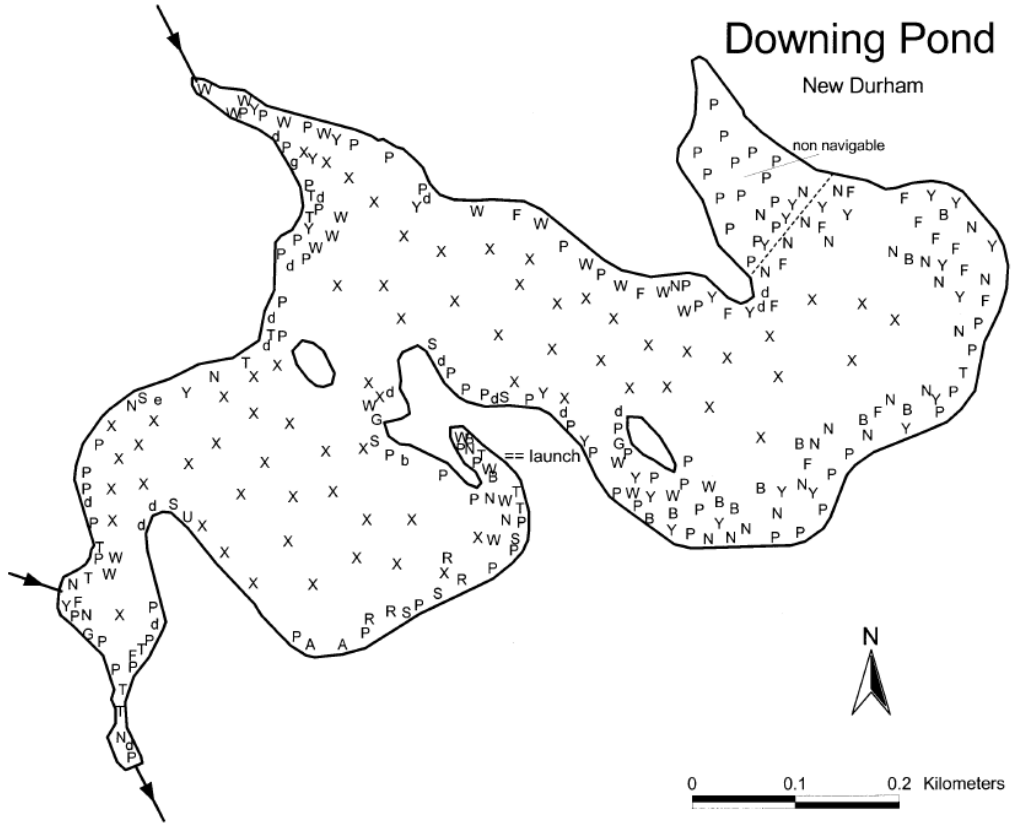
Jones Pond



Jones Pond Key to Macrophyte Map

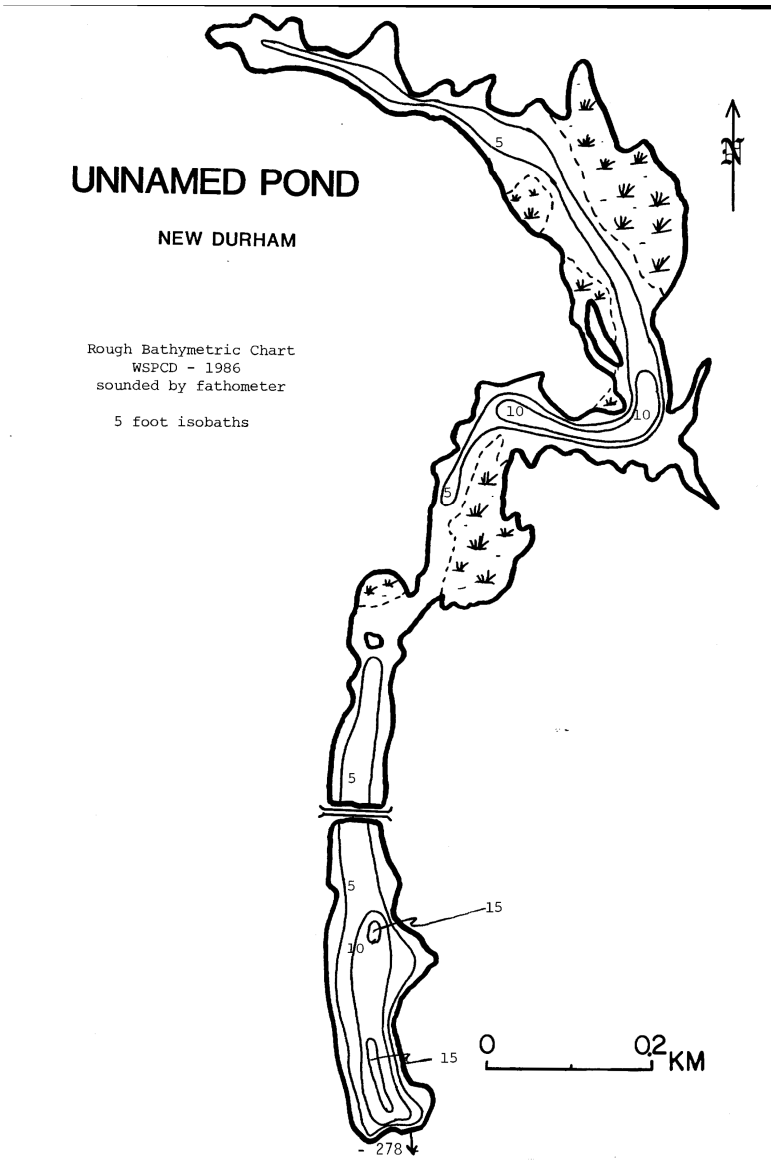
Symbol	Common Name	Latin Name
4	Swamp loosestrife	*Decodon verticillatus*
W	White water-lily	*Nymphaea*
Y	Yellow water-lily	*Nuphar*
T	Cattail	*Typha*
2	Tape-like bur-reed	*Sparganium*
U	Bladderwort	*Utricularia*
S	Bur-reed (erect)	*Sparganium*
D	Duckweed	*Lemna*
G	Grassy arrowhead	*Sagittaria sp*
C	Coontail	*Ceratophyllum*
P	Pickerelweed	*Pontedaria cordata*
X	Filamentous green algae	
A	Arrow arum	*Peltandra virginica*
V	Tapegrass	*Vallisneria americana*
3	Pondweed species	*Potamogeton*
R	Robbins pondweed	*Potamogeton robbinsii*
7	Three-way sedge	*Dulichium arundinaceum*
B	Bulrush	*Scirpus*
8	Spike rush	*Eleocharis*
9	Watershield	*Brasenia schreberi*
I	Iris	*Iris*

Downing Pond



AQUATIC PLANT SURVEY			
LAKE: DOWNING POND	**TOWN:** NEW DURHAM		**DATE:** 7/15/03
KEY	**PLANT NAME**		**ABUNDANCE**
	GENERIC	**COMMON**	
W	Potamogeton	Pondweed	Common
N	Nymphaea	White water lily	Common
P	Pontederia cordata	Pickerelweed	Common
B	Brasenia schreberi	Water shield	Common
X		Sterile thread-like leaf	Very Abundant
Y	Nuphar	Yellow water lily	Common
R	Potamogeton robbinsii	Robbins pondweed	Sparse
d	Dulichium arundinaceum	Three-way sedge	Sparse
T	Typha	Cattail	Sparse
F	Nymphoides cordatum	Floating heart	Sparse
G	Gramineae	Grass family	Sparse
S	Sparganium	Bur reed	Common
b	Scirpus	Bulrush	Sparse
e	Eleocharis	Spike rush	Sparse
A	Sagittaria	Arrowhead	Sparse
U	Utricularia	Bladderwort	Sparse
g	Phragmites australis	Common reed	Sparse

Figure 4: Bathymetric Maps



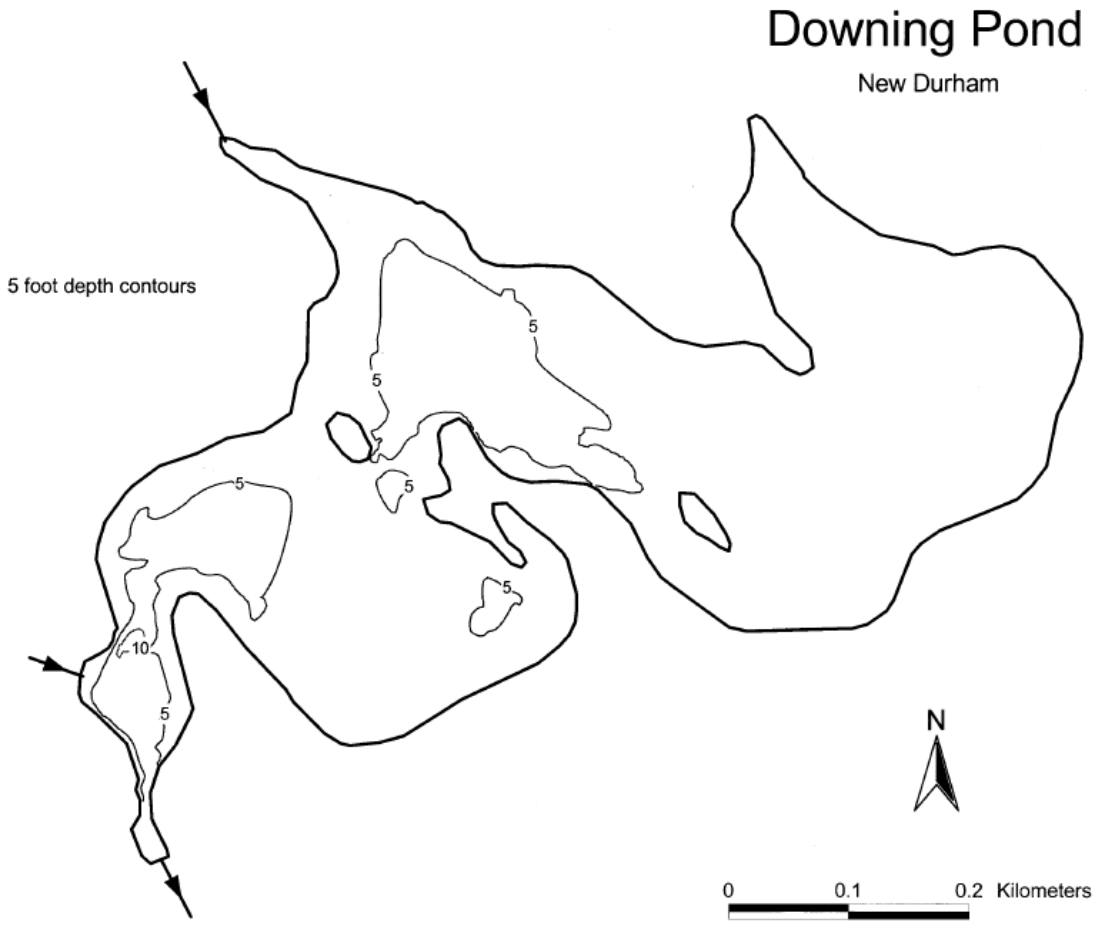
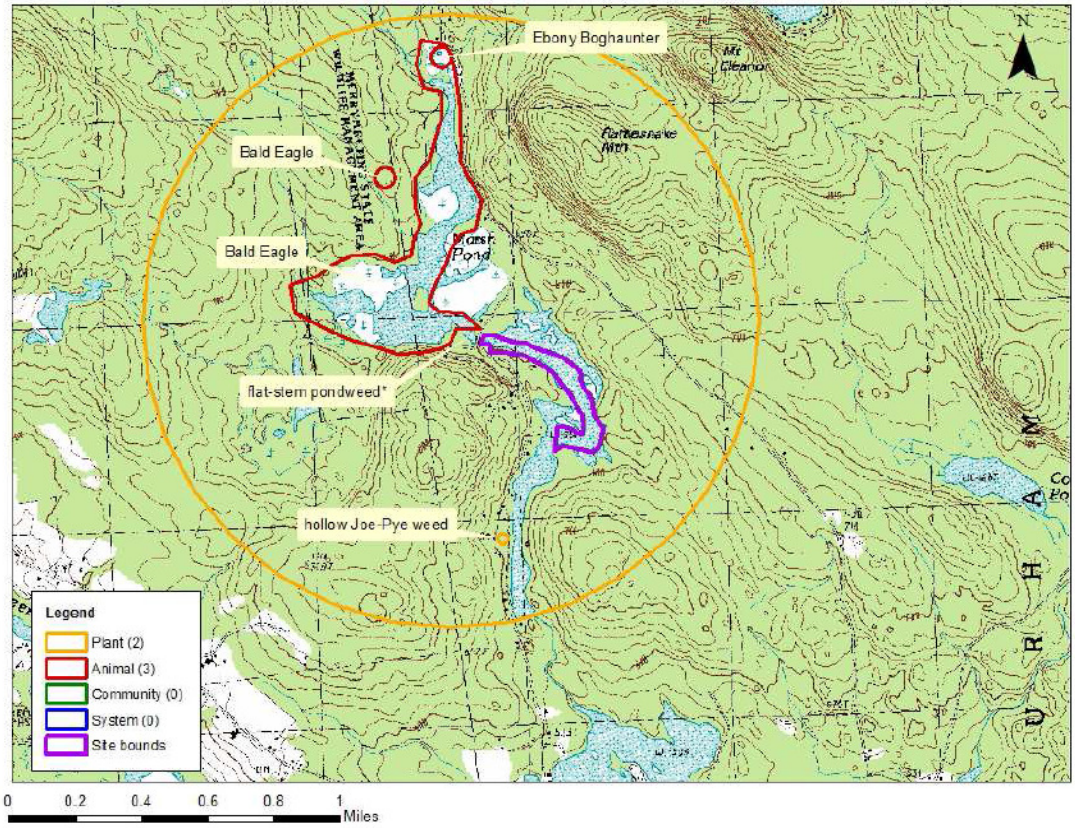
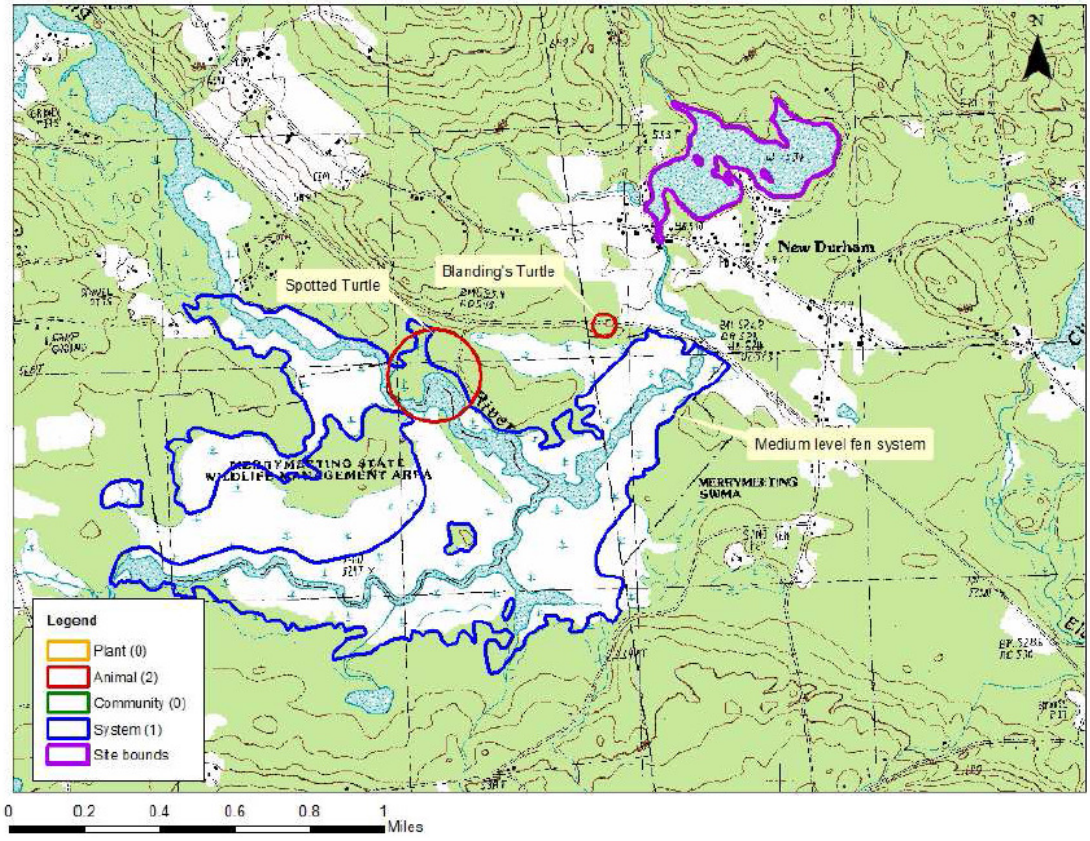

Downing Pond
New Durham
5 foot depth contours
5
5
5
5
5
10
5
N
0
0.1
0.2 Kilometers

Figure 5: Critical Habitats or Conservation Areas (Historical)

NHB15-3982



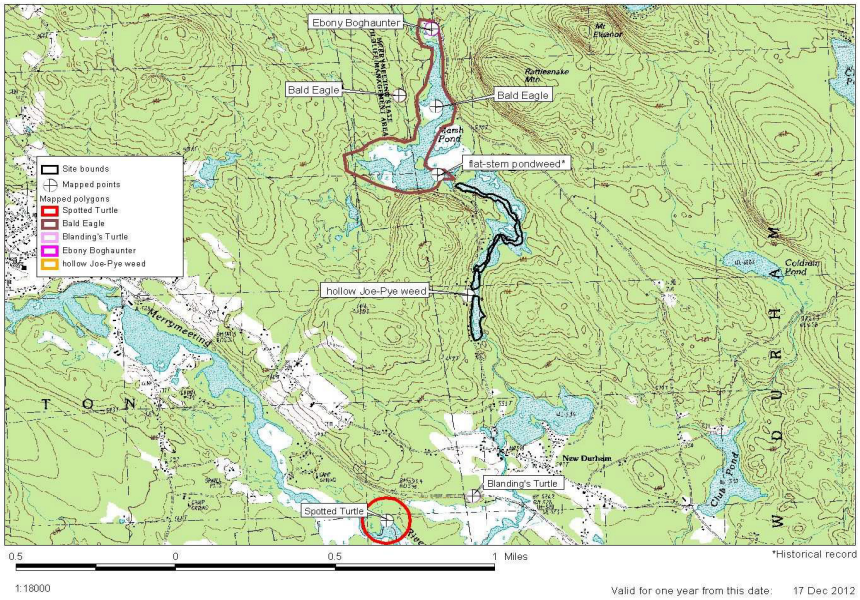
NHB15-3978



NH Natural Heritage Bureau

Known locations of rare species and exemplary natural communities

Note: Mapped locations are not always exact. Occurrences that are not in the vicinity of the project are not shown.



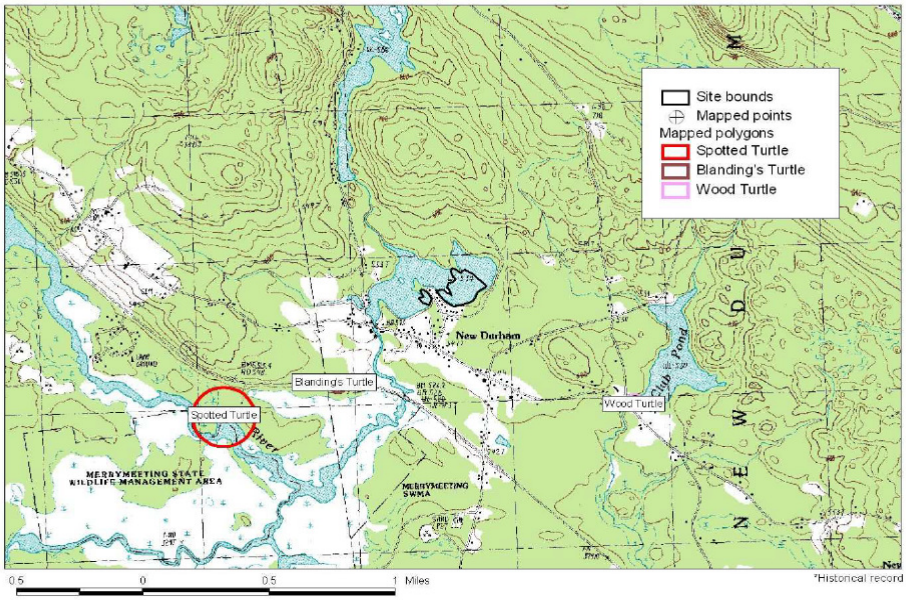
1:18000

Valid for one year from this date: 17 Dec 2012

NH Natural Heritage Bureau

Known locations of rare species and exemplary natural communities

Note: Mapped locations are not always exact. Occurrences that are not in the vicinity of the project are not shown.



Valid for one year from this date: 06 Feb 2014

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

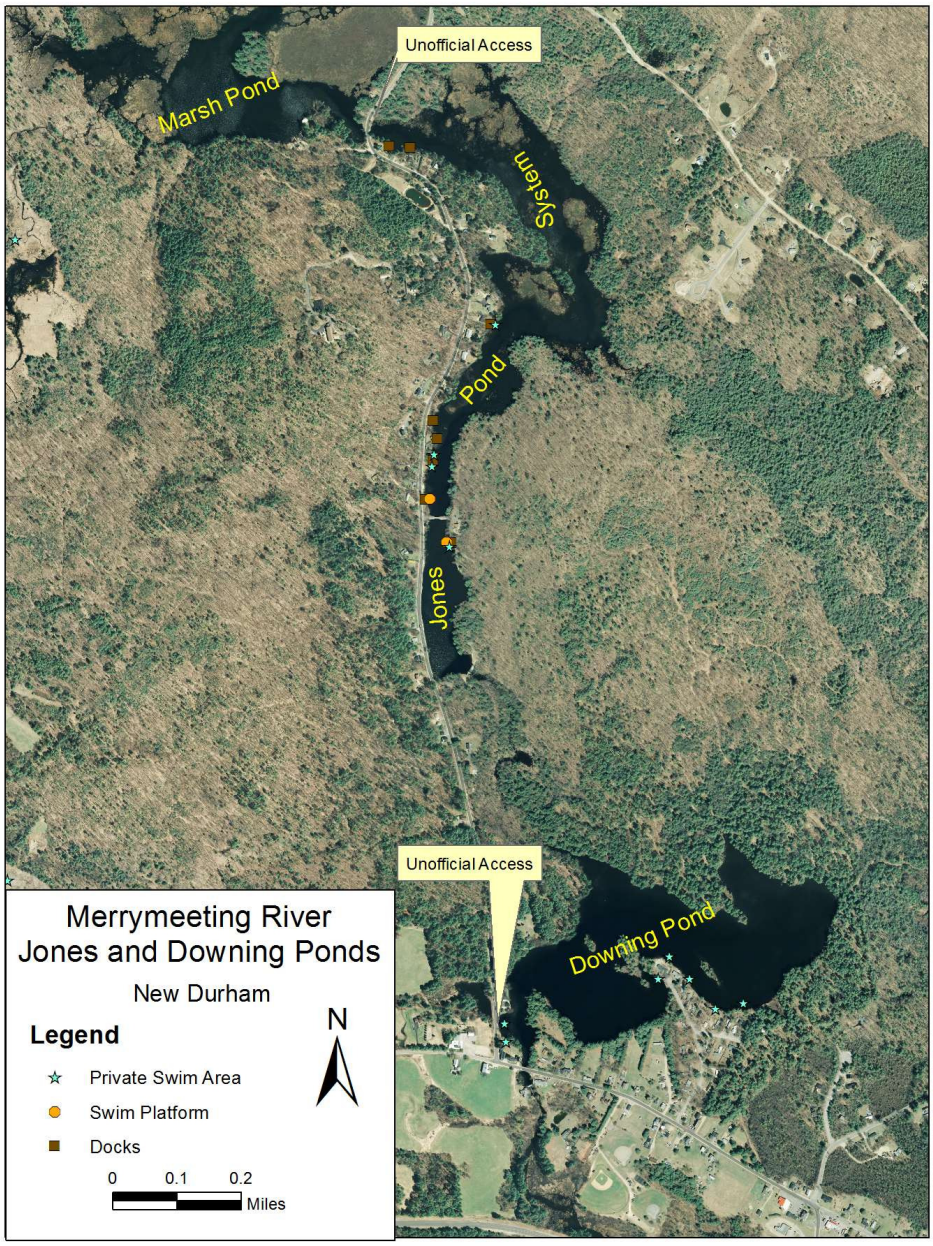
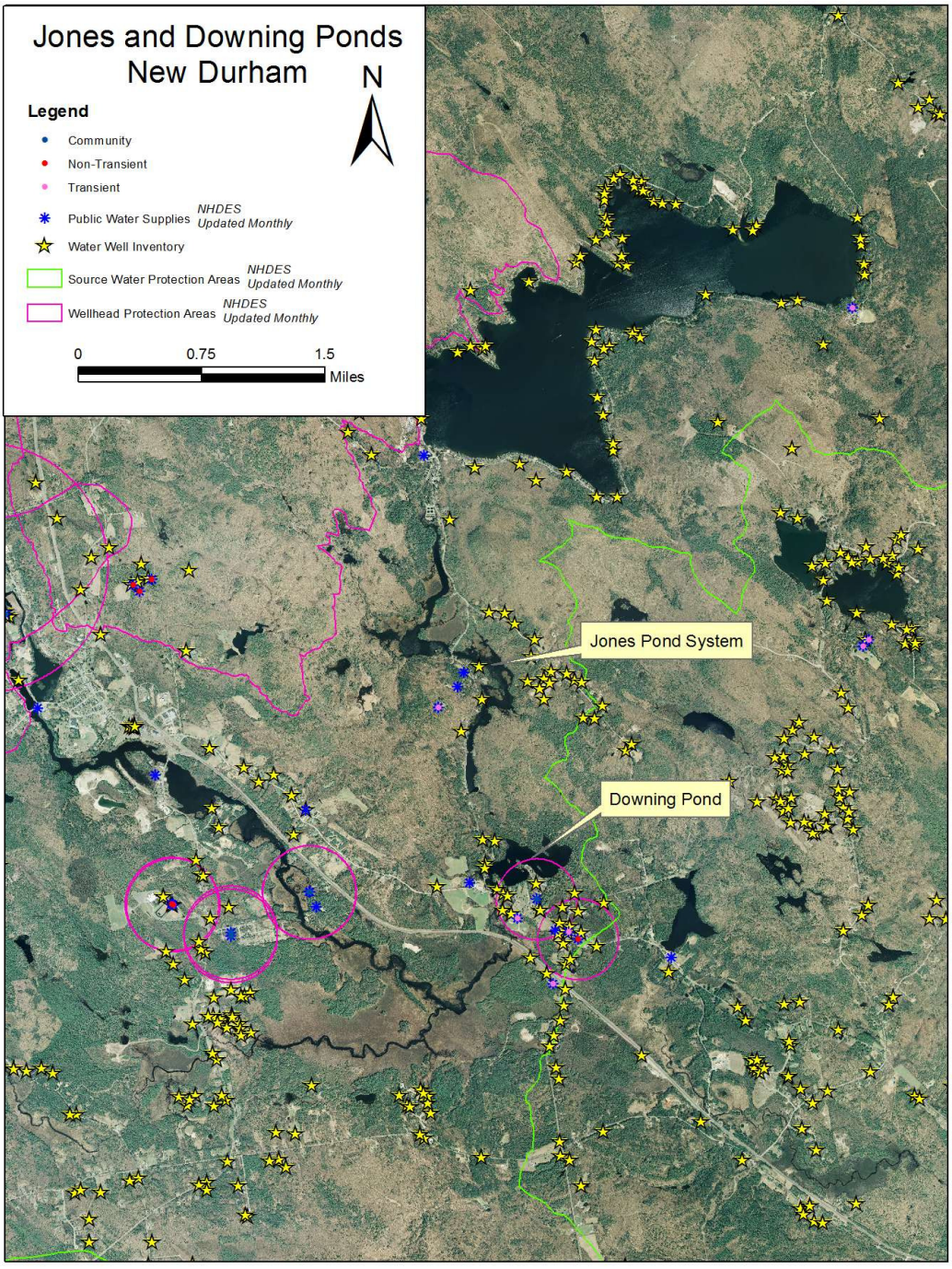


Figure 7: Wells and Water Supplies, 1:48,000 scale



Appendix A 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 variable 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

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, 2,4-D (Navigate formulation) is the herbicide that is recommended for control of variable milfoil. Based on laboratory data this is the most effective herbicide 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 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 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 variable milfoil. Navigate formulation was used, as were a 2,4-D amine formulation, and a 2,4-D amine and triclopyr formulation (MaxG). All three products were effective in controlling variable milfoil.

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.

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 variable 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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