2010 Whitman's Pond Pre-Treatment Survey Results and Management Plan

May 2010

Prepared for:

The Town of Weymouth
c/o Department of Public Works
120 Winter Street
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Prepared by:

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INTRODUCTION:

In May of 2010 Aquatic Control Technology, Inc. (ACT) was contracted by the Town of Weymouth to implement a non-native vegetative management program at Whitman's Pond targeting control of Fanwort (*Cabomba caroliniana),* variable milfoil (*Myriophyllum heterophyllum*). A component of the management program was to survey aquatic vegetation to determine the presence/absence of the target invasive species and all other aquatic plant species throughout the pond. The vegetation survey utilized a point-intercept survey methodology (Madsen 1999) to facilitate the collection of a large data set over the pond's littoral zone. This mapping approach, when replicated in future years, will provide a more quantitative assessment of the annual changes in the submersed plant community as opposed to more simplified vegetation assemblage maps. Focusing on presence/absence data also removes some of the subjectivity from the data collection process.

2010 PRE-TREATMENT SURVEY MEHTODS:

Two Aquatic Control biologists, Keith Gazaille and Erika Haug, and the Conservation Administrator for the Town of Weymouth, Mary Ellen Schloss, completed the pre-treatment point intercept survey of Whitman's Pond on May 5th 2010. Prior to the survey randomly generated data points were created for the Whitman's Pond littoral zone using ArcView 9x software. The data point locations were based on an approximately 210 foot grid to create 79 data points throughout the littoral zone (figure 1). Data point locations were navigated to using GPS.

During the surveys the following information was recorded at each data point:

- Water depth (using Lowrance depth finder)
- Overall areal plant cover
- Dominant aquatic plant species
- Aquatic plant species present

The presence/absence of aquatic plant species at each data point was assessed from two throw-rake tosses, and observations directly below the boat from the surface and using an underwater camera system when necessary. The day of the survey was sunny with minimal wind, allowing for optimal visualization of the plants. Overall areal plant cover was recorded using a simple density index (1 = 1-25% cover; 2 = 26-50% cover; 3 = 51-76% cover; & 4 = 76-100% cover) in order to track possible variations in plant cover pre and post-treatment and from year to year.

Senior Biologist Keith Gazaille examines the plant species present on the throw-rake at Whitman's Pond

2010 SPRING SURVEY RESULTS:

A table displaying all of the data collected at each data point is attached (Attachment A). Whitman's Pond contains a reasonably diverse assemblage of native and non-native plant species throughout its littoral zone. Eight native species were observed during the May survey with varying degrees of abundance. The average overall cover in the pond was quite low at the time of the inspection (average 1.2 on density index). A species list of all observed species is presented below and a map showing the dominant species at each point in attached (see figure 2).

Table 1: Whitman's Pond Observed Species

Scientific Name	Common Name	Frequency of Occurrence
Myriophyllum heterophyllum	Variable milfoil	40
Cabomba caroliniana	Fanwort	30
Potamogeton crispus	Curlyleaf Pondweed	17
Potamogeton amplifolius	Largeleaf Pondweed	1
Elodea sp.	waterweed	4
Ceratophyllum sp.	Coontail	12
Utricularia sp.	Bladderwort	17
Nuphar Variegatum	Yellow waterlily	1
Nymphaea odorata	White waterlily	10
Fontinalis sp.	Aquatic moss	4
Nitella sp.	Stonewort	5
Sp.	Filamentous algae	21

In the shallows of Whitman's Pond along the northern edge, dense milfoil reaches the surface and dense fanwort grows in the understory this time of year.

As the above table shows non-native invasive plant species are the most prevalent species in Whitman's Pond. In total, milfoil was encountered at 40 of the 79 surveyed points (figure 3) and fanwort was encountered at 30 of the 79 survey points (figure 4). As a result of the early timing of the survey, much of the fanwort growth was still rather immature (4-6 inches on average), as it typically initiates vegetative growth a bit later in the season than other non-native species like variable milfoil. The variable milfoil at the time of the survey was quite a bit more mature (1-2 feet tall on average) than the fanwort, which made throw rake collection of fanwort more difficult in areas where the two species coexisted. This discrepancy in the target plant maturity may result in the pre-treatment fanwort growth being slightly under-represented from actual mid-season conditions. In some areas the dense understory of fanwort was observable and likely more indicative of the true pre-treatment fanwort conditions.

In the deeper waters of Whitman's Pond dense fanwort has already reached heights of 1 to 2 feet

Water depth measurements were collected at each survey point location (figure 6). Fanwort was observed growing in depths of up to 13.2 feet; however 5 feet was the average water depth at which the plant was observed. The average water depth that milfoil was observed growing in was approximately 4 feet with a maximum observed depth of 7.6 feet. Based on our observations and this water depth data it appears as though the fanwort dominates in the deeper water areas of the littoral zone, while the variable milfoil is more dominant in the shallower areas.

During the course of the pre-treatment survey a third non-native and invasive species was documented in Whitman's Pond. Abundant growth of curlyleaf pondweed was observed throughout the Northwest cove area of the pond (figure 5). To our knowledge this is the first documented occurrence of curlyleaf pondweed in Whitman's Pond. Curlyleaf pondweed is not uncommon in the region and was likely introduced into the pond via boat traffic and/or waterfowl. The long-term management plan of Whitman's Pond will have to take the unique life cycle of curlyleaf pondweed into consideration in order to successfully maintain a diverse native plant assemblage.

During the survey Secchi disk clarity readings and a temperature and dissolved oxygen profile were generated for Whitman's Pond. The results of these measurements are presented below.

Table 2: Temperature Dissolved Oxygen and Clarity Data.

Depth (in meters below the surface)	**Temperature**	**Dissolved Oxygen**
Surface Reading	20.5	11.6
1	19.2	11.5
2	18	11.3
3	15.7	11.0
4	13.3	11.0
5	12.4	10.5
6	12.0	9.9
7	11.7	9.4
Secchi Disk Reading	5 ft 1 in	

The temperature and dissolved oxygen data is representative of a water column relatively uniform in temperature and well oxygenated, which is typical of normal early spring conditions. These readings do not show significant thermal stratification or the formation of a thermocline. A drop in dissolved oxygen near the pond bottom is observable and likely indicative of normal Biological Oxygen Demand (BOD) resulting from the breakdown of organic matter by microbial action.

MANAGEMENT PROGRAM:

Problem Statement/ Objective:

The objective of the following Aquatic Plant Management Program is to selectively control fanwort (*Cabomba caroliniana*) and variable milfoil (*Myriophyllum heterophyllum*) in Whitman's Pond through with the application of Sonar (Fluridone) herbicide, in order to preserve/restore a diverse native plant community for fish and wildlife habitat.

Treatment Areas:

Based on the general morphological characteristics and observed distribution of target plants during the pre-treatment survey, the pond littoral zone was divided into six different treatment sectors. Using GIS and the water depth information collected during the initial survey, the approximate water volume was calculated for each treatment sector in order to accurately calculate the desired Sonar dose for each herbicide application (figure 7).

Treatment Program Schedule:

The successful control of fanwort in particular, requires early application of Sonar herbicide. An initial Sonar application early in the development of the plant (late May-early June) is critical, as treatment early in the growth cycle slows further plant maturation; in essence keeping them in a more constant state of vegetative growth, which is essential to proper herbicide uptake. Whitman's Pond serves as a spawning ground for anadromous herring; therefore, both the Conservation Commission and the Division of Marine Fisheries (DMF) have expressed concerns over the timing of the initial treatment and subsequent impacts to water quality and fish egg incubation. In light of these potential impacts DMF typically requires that no treatments be performed prior to June 16th. Based on our experience and the target plant conditions observed during the pre-treatment survey, we feel that waiting until after June 16th to perform the initial Sonar treatment would significantly jeopardize the success of the vegetation control program. Therefore, with input from DMF and the Conservation Commission, we have developed the following treatment approach, with additional water quality monitoring, that will minimize the risk to the herring spawn and facilitate an initial Sonar treatment on June 1st.

We expect that the best approach under these circumstances will be to perform the initial treatment on June 1st using the pellet formulation Sonar One. The Sonar pellets will be applied at a rate of 40 ppb over the mapped target plant beds. Because the pellet formulations release the fluridone active ingredient slowly over a period of time (weeks), the actual fluridone concentration in the pond water during the three weeks (until June 16th) that herring spawn, should still be well below 20 ppb. This concentration (20 ppb) is far below the No Observable Effect Concentrations (NOEC) for egg hatchability and fish fry survival recorded in EPA studies (1.71 mg a.i./L) for Chinook Salmon due to the absence of both significant mortality and sub-lethal effects. In fact, this 1.71 mg a.i./L is greater than 11 times the maximum label usage rate of 150 ppb.

From the time of the initial treatment, the fanwort and milfoil need to be exposed to the fluridone for at least 45-60 days, before any significant decomposition of the plant is visible; therefore, the likelihood of significant degradation of water quality post-treatment with Sonar is low. Additional water quality monitoring, discussed in more detail below, will be performed during the June 1-June 16 period in order to assess any relevant changes in water quality.

This earlier application and subsequent herbicide absorption by the fanwort plants will be crucial to slowing the rapid maturation of the plant, which is necessary to achieve a lethal level of herbicide uptake over the course of the treatment program. All subsequent booster applications would be performed after June 16th. A total pond -wide (135 acres) fluridone dose of approximately 40 ppb (approximately 80 ppb over the target plant beds) will be split over 3-4 low dose applications. Booster applications are expected to be scheduled and performed once the in-lake concentration decline to below about 10 ppb. Routine monitoring of fluridone concentration in Whitman's Pond and visual evidence of fluridone uptake (chlorosis – bleaching or whitening) will guide the timing and dose of subsequent booster applications.

Treatment Procedure:

All chemical applications will be performed by Gerald Smith, ACT President, or Keith Gazaille, ACT Senior Biologist. Gerry and Keith have over 35 years and 14 years of professional experience, respectively. Both hold the Supervisory-level Commercial Certification for Aquatic Applications in

Massachusetts. All personnel that will assist on the treatments have also been trained and are licensed.

The chemical will be applied from one of our Classic (Panther) Airboats that can operate in just "inches" of water. The liquid Sonar herbicide will first be diluted with lake water at a ratio of >50-100 to 1 (water to Sonar) in a tank on-board the spray boat. This diluted herbicide solution will then be injected subsurface from weighted hoses that trail the Airboat to avoid any aerial drift of the herbicide. Pellet formulations will be applied using a "Cyclone" rotary spreader/seeder. The Sonar herbicide will be evenly applied throughout the treatment zones (figure 6). A Differential GPS unit will be used on-board the spray boat to assist with navigation and guidance during the application.

Proposed Monitoring Program:

Herring Spawning Additional Monitoring: Dissolved oxygen and secchi disk readings – In order to ensure that there will be no significant impact on the spawning population of Herring in Whitman's Pond, an additional monitoring program has been designed with input from the DMF and Weymouth Conservation Commission. The proposed program consists of monitoring pH, dissolved oxygen, temperature and clarity during the day and evening hours between the critical dates of June 1st and June 16th. This monitoring will be performed by association volunteers with equipment and guidance to be provided by Aquatic Control Technology Inc.

***Day Time Monitoring*:**

- ***Data Collection Frequency*:** Every other day from June 1st through June 16th for a total of 7 daytime monitoring events.
- ***Parameters to be Monitored per data collection*:**
  - A pH reading will be taken.
  - A temperature and dissolved oxygen profile will be measured.
  - A secchi disk reading will be taken to measure water clarity

Evening Monitoring:

- ***Data Collection Frequency*:** Every other day from June 1st through June 16th for a total of 7 evening monitoring events.
- ***Parameters to be Monitored per data collection:***
  - A temperature and dissolved oxygen profile will be measured.

FasTEST Fluridone Concentration Monitoring - Aquatic Control will coordinate and perform an in-pond fluridone monitoring program utilizing SePRO's FasTEST (immunoassay analysis) procedure. The sampling procedure will be as follows:

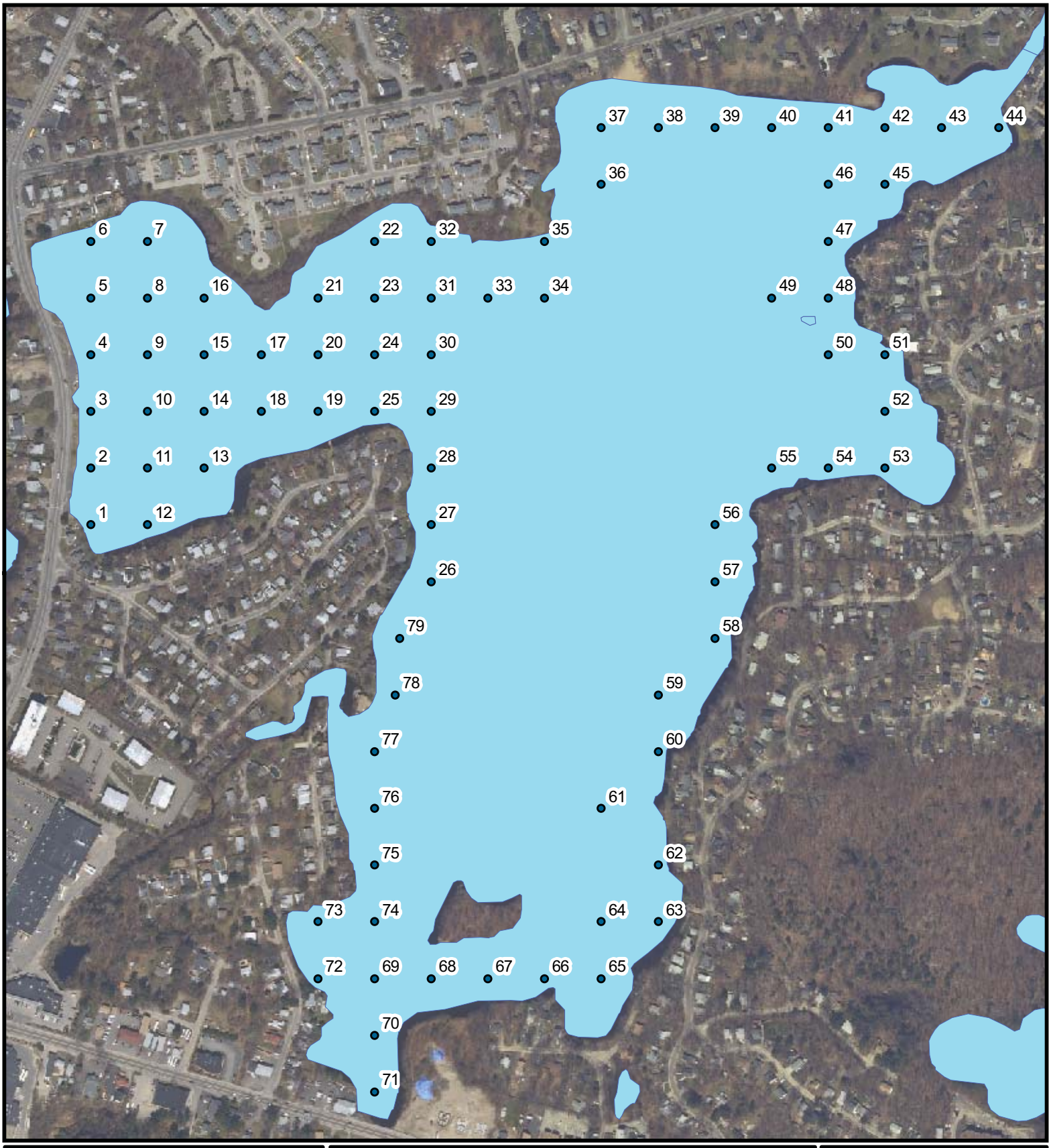
- Monitor fluridone concentrations at 3 in-pond locations
- Sample approximately 14 days after initial treatment and then about every three weeks thereafter
- Assume 5 sampling rounds; 15 total samples
- Samples will be collected in bottles provided by SePRO and will be shipped to SePRO's laboratory in Whittakers, NC via overnight delivery on the day of collection with a completed Chain of Custody.
- FasTEST results will be used to guide booster applications

Post-Treatment Surveys - Comprehensive post-treatment vegetation surveys will be conducted in late August or early September 2010 and again in August 2011 and August 2012 to assess the

effectiveness of the fluridone treatment on the targeted invasive species, namely fanwort, as well as impacts on non-target plants. Aquatic Control will replicate the survey protocol and data points that were established for the pre-treatment survey.

ATTACHMENT A

Figures



Whitmans Pond

Weymouth, MA

Point Intercept Survey
Labeled Data Point Locations

FIGURE:	SURVEY DATE:	MAP DATE:
1	5/5/10	5/10/10

Legend:

N

0 125 250 500 750 1,000 Feet

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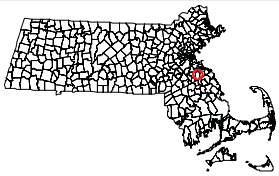

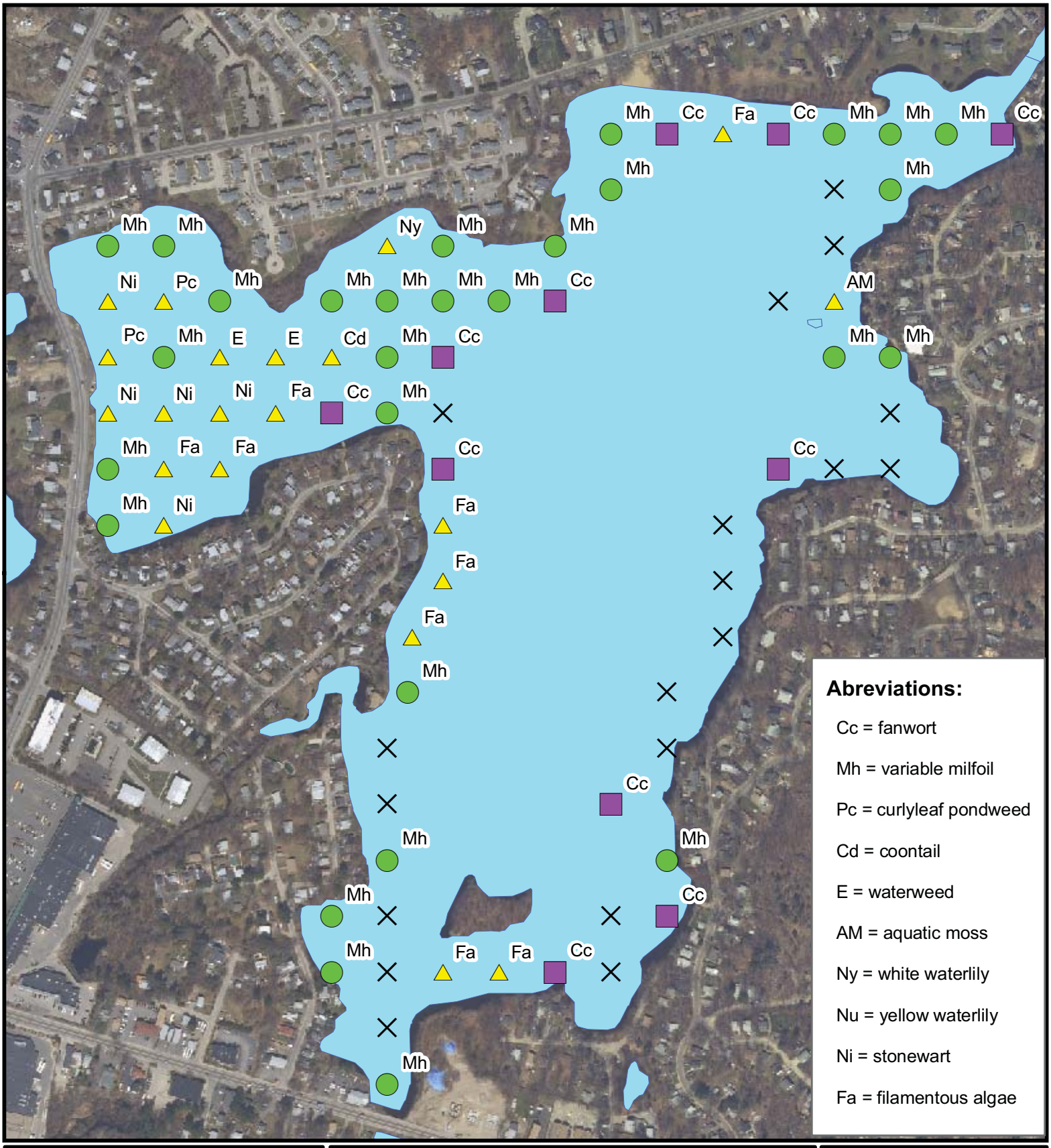

Whitmans Pond

Weymouth, MA

Point Intercept Survey
Dominant Plant Species

FIGURE:	SURVEY DATE:	MAP DATE:
2	5/5/10	5/11/10

Legend

- No vegetation Present
- Native Plant Dominant
- Fanwort Dominant
- Vaiable Milfoil Dominant

0 250 500 1,000 Feet

N

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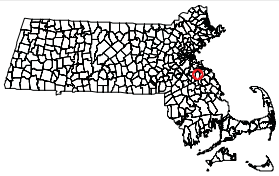

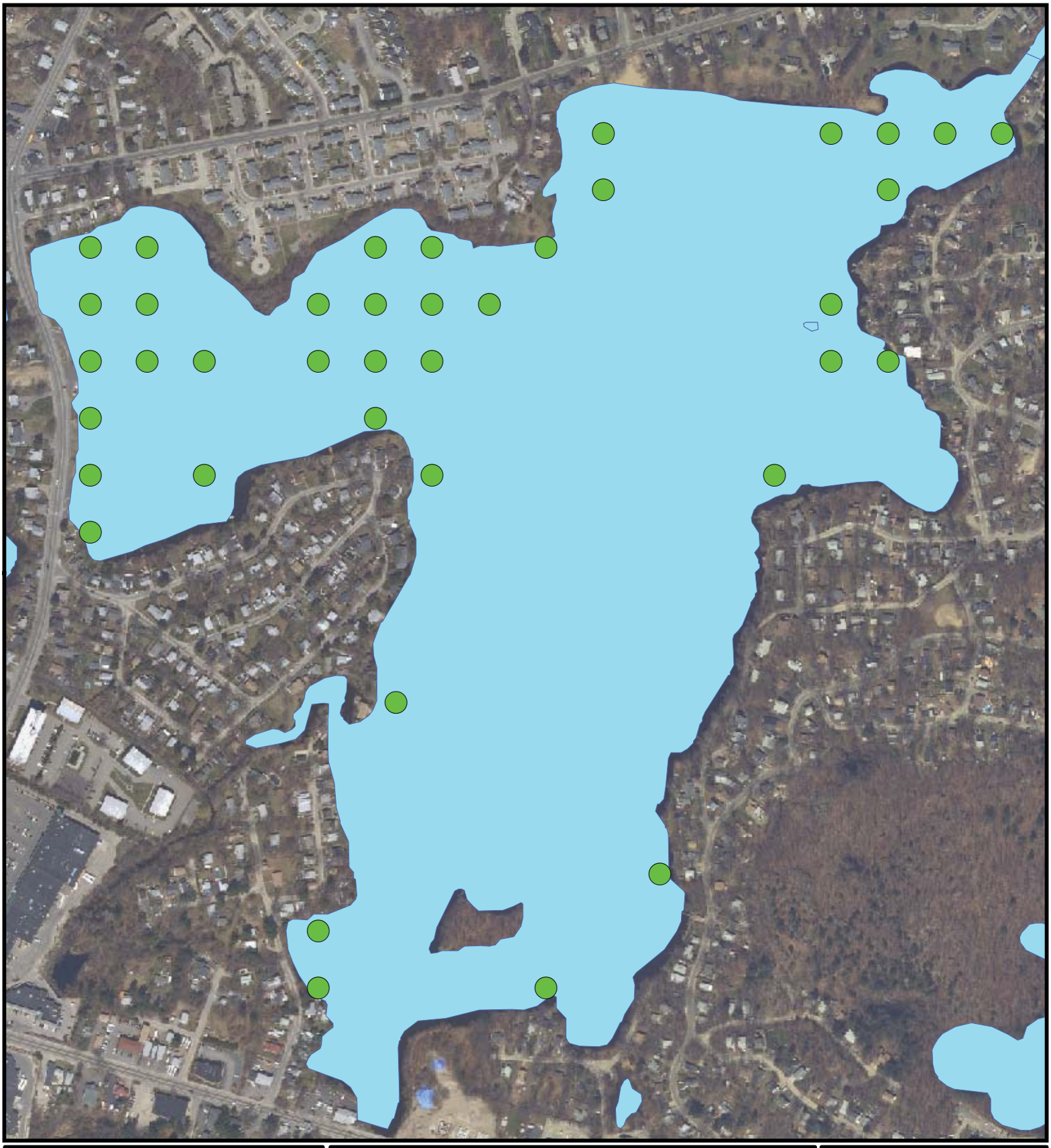

Whitmans Pond

Weymouth, MA

Point Intercept Survey
Variable Milfoil Locations

FIGURE:	SURVEY DATE:	MAP DATE:
3	5/5/10	5/10/10

Legend

N

Data points where variable milfoil (Myriophyllum heterophyllum) was observed

0 250 500 1,000 Feet

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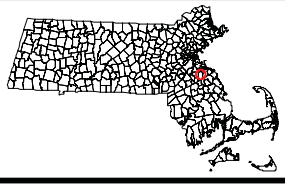

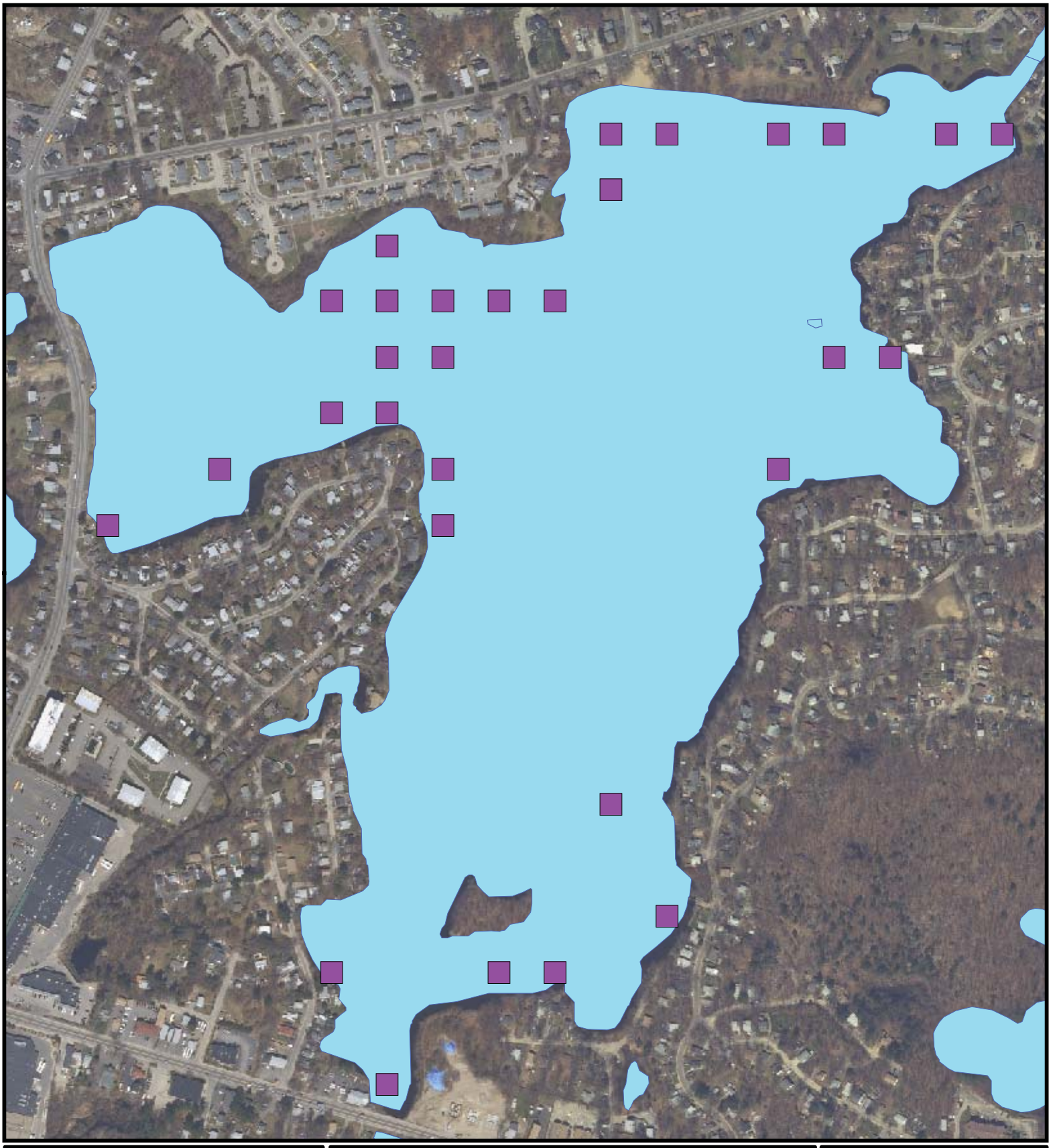

Whitmans Pond

Weymouth, MA

Point Intercept Survey
Fanwort Locations

FIGURE:	SURVEY DATE:	MAP DATE:
4	5/5/10	5/10/10

Legend:

Data points where fanwort (Cabomba caroliniana) was observed

N

0 250 500 1,000 Feet

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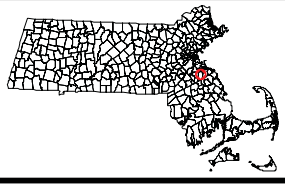

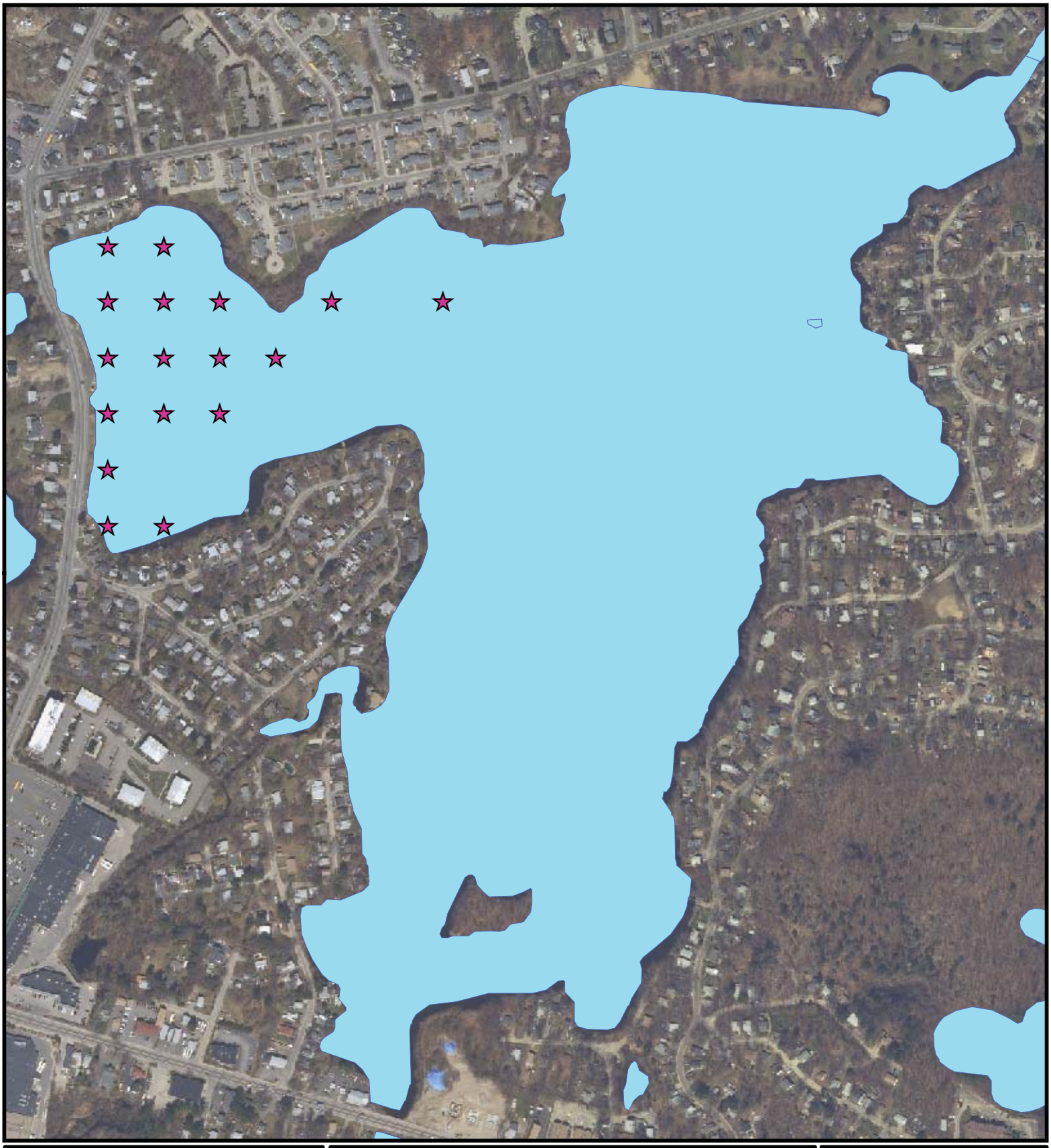

Whitmans Pond

Weymouth, MA

Point Intercept Survey
Curlyleaf Pondweed Locations

FIGURE:	SURVEY DATE:	MAP DATE:
5	5/5/10	5/10/10

Legend:

★ Data points where curlyleaf pondweed (Potamogeton crispus) was observed

N

0 250 500 1,000 Feet

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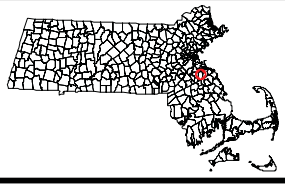

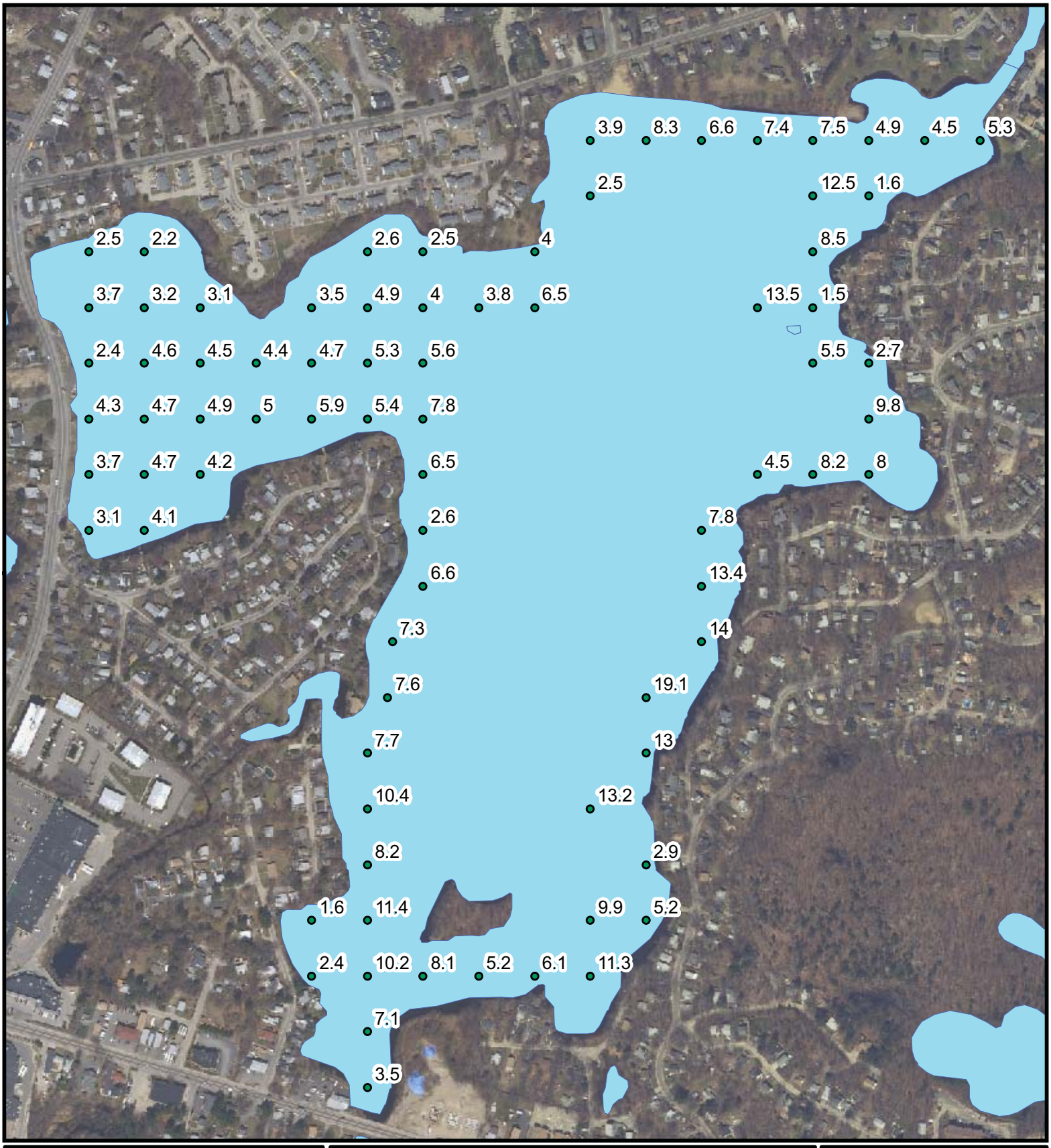

Whitmans Pond

Weymouth, MA

Point Intercept Survey
Water Depth Measurements (feet)

FIGURE:	SURVEY DATE:	MAP DATE:
6	5/5/10	5/10/10

Legend:

N

0 250 500 1,000 Feet

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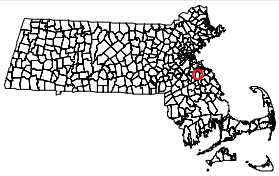

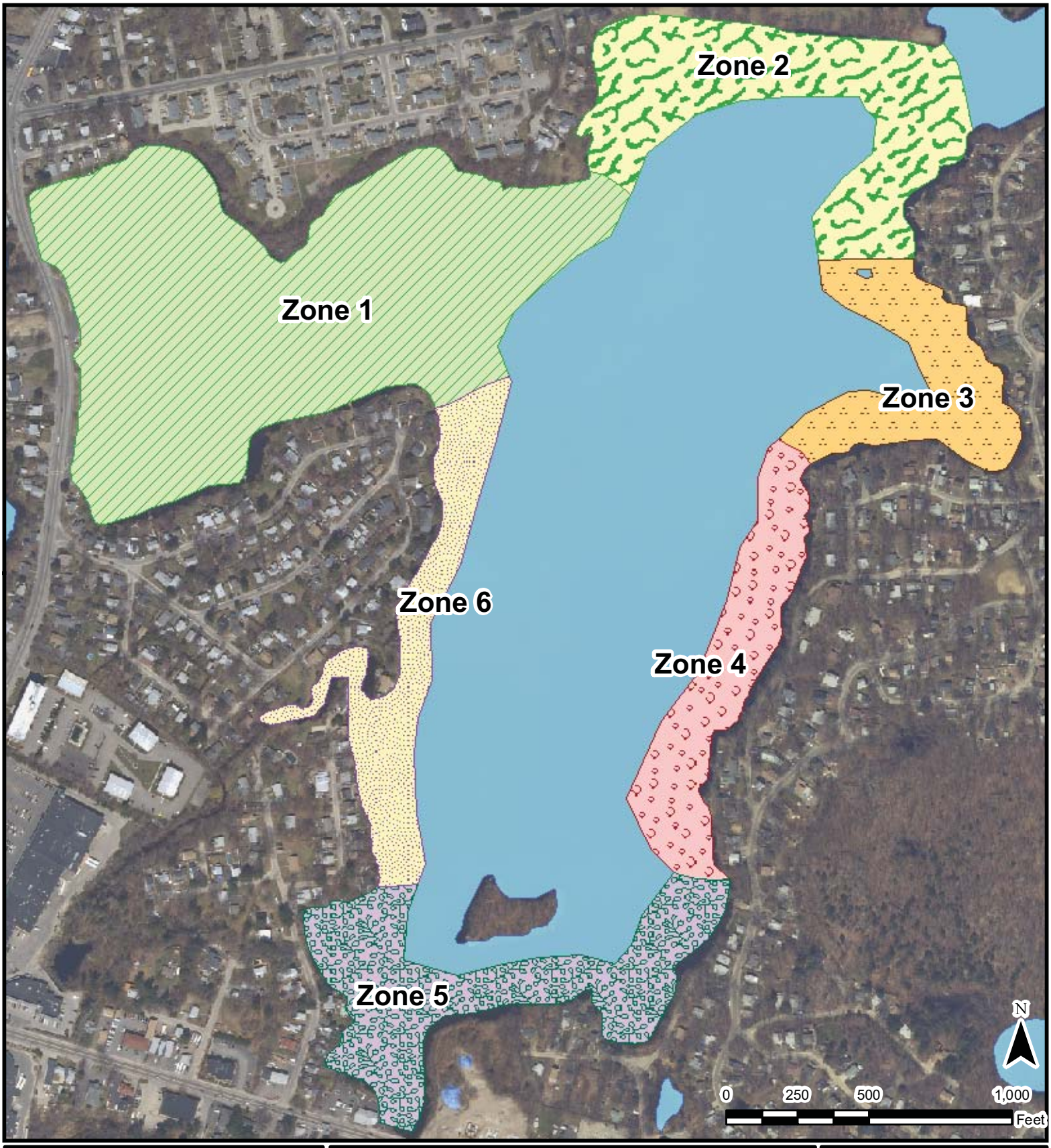

Whitmans Pond

Weymouth, MA

Point Intercept Survey
Labeled Point Locations

FIGURE:	SURVEY DATE:	MAP DATE:
7	5/5/10	5/10/10

Legend

- Zone 1 Volume = 147.98 ac-ft
- Zone 2 Volume = 85.15 ac-ft
- Zone 3 Volume = 43.86 ac-ft
- Zone 4 Volume = 89.33 ac-ft
- Zone 5 Volume = 72.40 ac-ft
- Zone 6 Volume = 53.33 ac-ft

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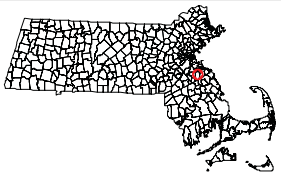

ATTACHMENT B

Survey Data

Point Number	Water Depth	Overall Cover	Aquatic Plant Species Present
1	3.1	1	Mh, Pc, Cd, U, Cc
2	3.7	1	Mh, U, E, Pc
3	4.3	1	Ni, Pc, U, Mh
4	2.4	1	Pc, Ni, U, Mh
5	3.7	1	Ni, Mh, Pc, Cd, U, Nu
6	2.5	3	Mh, Am, Pc, Pa
7	2.2	2	Mh, Cd, Pc, U
8	3.2	1	Pc, Cd, Mh
9	4.6	1	Mh, U, Pc, Cd
10	4.7	1	Ni, Pc, U
11	4.7	4	Fa
12	4.1	2	Ni, Pc, Ny, Cd
13	4.2	1	Fa, Mh, U, Cc
14	4.9	2	Ni, Pc, U
15	4.5	2	E, U, Mh, Pc
16	3.1	2	Mh, U, Cd, Pc, Ny, Ni
17	4.4	2	E, Cd, Pc
18	5	4	Fa, E
19	5.9	1	Cc, Ni
20	4.7	3	Cd, Mh
21	3.5	3	Mh, Cc, Cd, U, Ny, Pc
22	2.6	3	Ny, AM, Mh, Cc
23	4.9	2	Mh, Cc, No
24	5.3	2	Mh, Cc, Cd
25	5.4	2	Mh, Cc, Fa, U
26	6.6	1	Fa
27	2.6	2	Fa, Cc
28	6.5	2	Cc, Mh, Fa
29	7.8	0	
30	5.6	2	Cc, Mh
31	4	2	Mh, Cc, Ny, Pc
32	2.5	1	Mh
33	3.8	2	Mh, Cc, Fa
34	6.5	1	Cc, Fa
35	4	1	Mh, Fa
36	2.5	1	Mh, Cc, Fa

Point Number	Water Depth	Overall Cover	Aquatic Plant Species Present
37	3.9	1	Mh, Cc, U, Fa
38	8.3	1	Cc, Fa
39	6.6	1	Fa
40	7.4	1	Cc, Fa
41	7.5	1	Mh, Fa, Cc
42	4.9	2	Mh, Fa
43	4.5	1	Mh, Cc
44	5.3	2	Cc, Mh
45	1.6	1	Mh, AM, Cd
46	12.5	0	
47	8.5	0	
48	1.5	1	AM, Mh
49	13.5	0	
50	5.5	1	Mh, Cc, Fa
51	2.7	3	Mh, Cc
52	9.8	0	
53	8	0	
54	8.2	0	
55	4.5	1	Cc, Mh, Fa
56	7.8	0	
57	13.4	0	
58	14	0	
59	19.1	0	
60	13	0	
61	13.2	1	Cc
62	2.9	1	Mh, Ny
63	5.2	1	Cc, Ny
64	9.9	0	
65	11.3	0	
66	6.1	1	Cc, Mh
67	5.2	1	Fa, Cc
68	8.1	3	Fa
69	10.2	0	
70	7.1	0	
71	3.5	1	Mh, Cc, U, Fa
72	2.4	2	Mh, Cc, Ny

Point Number	Water Depth	Overall Cover	Aquatic Plant Species Present
73	1.6	1	Mh, Ny, U
74	11.4	0	
75	8.2	1	Mh
76	10.4	0	
77	7.7	0	
78	7.6	2	Mh
79	7.3	1	Fa

Scientific Name	Common Name	Symbol
Myriophyllum heterophyllum	Variable milfoil	Mh
Cabomba caroliniana	Fanwort	Cc
Potamogeton crispus	Curlyleaf Pondweed	Pc
Potamogeton amplifolius	Largeleaf Pondweed	Pa
Elodea sp.	waterweed	E
Ceratophyllum sp.	coontail	Cd
Utricularia sp.	Bladderwort	U
Nuphar Variegatum	Yellow waterlily	Nu
Nymphaea odorata	White waterlily	Ny
Fontinalis sp.	Aquatic moss	AM
Nitella sp.	Stonewort	Ni
Sp.	Filamentous algae	Fa