



# Glen Echo Lake Weed Biomass Study

Charlton, Massachusetts

**PREPARED FOR:**

Glen Echo Improvement Association  
PO Box 578  
Charlton, MA 01508

**PREPARED BY:**

ESS Group, Inc.  
100 Fifth Avenue, 5th Floor  
Waltham, Massachusetts 02451

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## 1.0 INTRODUCTION

Glen Echo Lake is currently drawn down approximately four feet in the winter to help manage aquatic nuisance plants. ESS Group, Inc. prepared this study to provide additional information on the lake's flora and fauna to determine the consequences of increased winter drawdown beyond four feet.

## 2.0 AQUATIC VEGETATION

ESS conducted an aquatic vegetation survey of Glen Echo Lake on September 27, 2017. ESS used a sub-meter accurate GPS receiver to navigate to 100 sampling locations and assessed the depth and aquatic vegetation present at each point. Individual species biomass, overall plant cover (Figure 1), and overall plant biomass (Figure 2) were assessed at every sampling point. For the purpose of this study, ESS defines biomass as the amount of water column filled by the aquatic plant species (not the weight of the plants, although the two would be linked).



Plant rake with common bladderwort and invasive fanwort.

The aquatic plant community was dominated by waterwort (*Elatine* sp.), spikerush (*Eleocharis* sp.), golden hedge-hyssop (*Gratiola aurea*), low milfoil (*Myriophyllum humile*), stonewort (*Nitella* sp.), brittle naiad (*Najas minor*), thinleaf pondweed (*Potamogeton pusillus*), common bladderwort (*Utricularia macrorhiza*), water celery (*Vallisneria Americana*), and arrowhead (*Sagittaria* sp.). Biomass maps for each dominant species are found in Figures 3 through 12. Brittle naiad and fanwort (*Cabomba caroliniana*) were the only aquatic invasive species found in the lake during the survey. All species found during the survey are listed in Table A.

**Table A. Species Detected During Aquatic Vegetation Survey on September 27, 2017**

Scientific Name	Common Name	Dominant Growth Type	Native or Exotic	Drawdown Response*
<i>Brasenia schreberi</i>	Watershield	Floating	Native	<b>D</b>
<i>Cabomba caroliniana</i>	Fanwort	Submerged	Exotic	<b>D</b>
<i>Callitriche</i> sp.	Water Starwort	Submerged	Native	
<i>Ceratophyllum demersum</i>	Coontail	Submerged	Native	<b>D</b>
<i>Elatine</i> spp.	Waterwort	Submerged	Native	
<i>Eleocharis</i> sp.	Spikerush	Submerged	Native	<b>V</b>
<i>Filamentous Algae</i>		Submerged	Native	
<i>Fontinalis</i> sp.	Aquatic Moss	Submerged	Native	<b>V</b>
<i>Gratiola aurea</i>	Golden Hedge-hyssop	Submerged	Native	
<i>Isoetes</i> sp.	Qillwort	Submerged	Native	
<i>Lemna</i> sp.	Duckweed	Floating	Native	<b>NC</b>
<i>Ludwigia palustris</i>	Marsh Seedbox	Submerged	Native	
<i>Myriophyllum humile</i>	Low Milfoil	Submerged	Native	<b>D</b>
<i>Myriophyllum</i> sp.		Submerged	Native	<b>D</b>
<i>Najas flexilis</i>	Bushy Naiad	Submerged	Native	<b>I</b>

Scientific Name	Common Name	Dominant Growth Type	Native or Exotic	Drawdown Response*
<i>Najas minor</i>	Brittle Naiad	Submerged	Exotic	I
<i>Nitella sp.</i>	Stonewort	Submerged	Native	V
<i>Nuphar lutea variegata</i>	Yellow Water Lily	Floating	Native	D
<i>Nymphoides cordata</i>	White Floating Heart	Floating	Native	D
<i>Pontederia cordata</i>	Pickrelweed	Emergent	Native	
<i>Potamogeton epihydrus</i>	Floating-leaf Pondweed	Floating	Native	I
<i>Potamogeton nodosus</i>	Longleaf pondweed	Floating	Native	I
<i>Potamogeton perfoliatus</i>	Clasping-leaf Pondweed	Submerged	Native	I
<i>Potamogeton pusillus</i>	Thinleaf Pondweed	Submerged	Native	I
<i>Potamogeton robbinsii</i>	Robbins' pondweed	Submerged	Native	D
<i>Sagittaria sp.</i>	Arrowhead	Submerged	Native	I
<i>Sparganium</i>	Bur-reed	Emergent	Native	
<i>Typha sp.</i>	Cattail	Emergent	Native	I
<i>Utricularia macrorhiza</i>	Common Bladderwort	Submerged	Native	
<i>Vallisneria americana</i>	Water Celery	Submerged	Native	V

\* The symbols "I" represents an increase, "D" represents a decrease, "V" represents varies, and "NC" indicates no change based on ESS experience with winter drawdowns and a review of literature available including the Massachusetts Generic Environmental Impact Report for Lake Management and other sources pertaining to winter drawdown.

### 3.0 FISH AND WILDLIFE ASSESSMENT

ESS also conducted a very limited fish and wildlife assessment on September 27, 2017 to help assess the potential for increased impacts from additional drawdown. Table B lists all species observed during the fish and wildlife assessment.

**Table B. Species Observed During the Fish and Wildlife Assessment on September 27, 2017**

Scientific Name	Common Name	Native or Exotic
<b>Birds</b>		
<i>Anas platyrhynchos</i>	Mallard Duck	Native
<i>Ardea herodias</i>	Great Blue Heron	Native
<b>Fish</b>		
<i>Lepomis macrochirus</i>	Bluegill	Exotic
<i>Micropterus dolomieu</i>	Smallmouth Bass	Exotic
<i>Micropterus salmoides</i>	Largemouth Bass	Exotic
<i>Perca flavescens</i>	Yellow Perch	Native
<b>Reptiles</b>		
<i>Chrysemys picta</i>	Painted Turtle	Native

Scientific Name	Common Name	Native or Exotic
<b>Invertebrates</b>		
<i>Elliptio</i> sp.	Elliptio	Native
	Bryozoa	Native
<i>Viviparus georgianus</i>	Banded Mystery Snail	Exotic

### 3.1 Birds

The only birds observed during the survey were mallard ducks (*Anas platyrhynchos*) and great blue heron (*Ardea herodias*). Both are common and native to New England lakes. These species depend on the lake habitat for foraging. Ducks rely directly on aquatic plants and their seeds for food, whereas herons would rely principally on fish and aquatic invertebrates. Under a winter drawdown, it is anticipated that seed forming aquatic plants would generally increase and thus this would seem to support the conclusion that a drawdown would be of benefit to foraging ducks. As long as the drawdown is conducted in a manner consistent with the state's guidance on winter drawdowns, there should not be a negative impact to the avian community supported by the lake.

### 3.2 Fish

Bluegill (*Lepomis macrochirus*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*M. salmoides*), and yellow perch (*Perca flavescens*) were observed during the wildlife survey. Bluegill were particularly abundant and observed throughout the lake. In addition, roughly half a dozen potential bluegill spawning beds observed in northern end of lake. Abundant young of the year smallmouth bass were observed in the shallow littoral zone in the northern end of the lake. Larger largemouth bass and yellow perch were observed in the southern and central portions of the lake. Sunfish, bass, and perch represent a typical New England warmwater fish community. This community relies on shallow sand and gravelly areas for spawning during the spring to complete its life cycle within the lake. Winter drawdowns performed in a manner that allow for the water levels to be restored in time for the spring spawning season would not be expected to impact the fish community within the lake. In fact, the lowering of water levels can actually enhance this fish community's ability to spawn as it would be expected that the drawdown would help to move finer sediments out of the shallow water and toward the central portion of the lake.

### 3.3 Reptiles and Amphibians

The only reptile observed during the survey were painted turtles (*Chrysemys picta*). Painted turtles were observed lounging on rocks and logs in the northern end of the lake.

Amphibians were not observed or heard during the wildlife survey. However, common amphibians likely present in the area would be those typical of central Massachusetts and are probably include spring peepers (*Pseudacris crucifer*), green frogs (*Lithobates clamitans*), and bullfrogs (*L. catesbeianus*).



*Elliptio* mussels were found throughout the southern and central portions of the lake.



### 3.4 Invertebrates

Elliptio mussels (*Elliptio* sp.) and banded mystery snails (*Viviparus georgianus*) were observed in the southern and central portions of the lake. One Bryozoan colony was observed on the base of a cattail bed in the northern portion of the lake. Elliptio were observed at depths up to roughly 10 feet and at densities less than one per square foot (Figure 13). Elliptio are native to New England, but banded mystery snails are not. Banded mystery snails are native to the southeastern United States and may compete with native snails for food and habitat. These snails may have been introduced by boats and equipment or released from home aquariums. Three banded mystery snails were found during the wildlife survey and are not thought to be abundant in the lake. Drawdowns can have an impact on mollusks, particularly the less motile species such as mussels. If the drawdown is conducted in a manner in which the water levels are lowered slowly, even the slow-moving mussel can effectively relocate with the receding waters in all but the most flatly sloped shoreline areas.



Three exotic banded mystery snails were found in the southern and central portions of the lake.

### 3.5 Wetland Habitat

ESS also assessed the wetland areas adjacent to the lake to assess available habitat. Wetland areas adjacent to the lake were exclusively located on the undeveloped, northern end of the lake. The wetland habitat was dominated by native cattail (*Typha* sp.). Tussock sedge (*Carex stricta*), goldenrod (*Solidago* sp.), and pickerelweed (*Pontederia cordata*) were also present along the shoreline. No exotic common reed (*Phragmites australis*) or purple loosestrife (*Lythrum salicaria*) were observed. Land adjacent to the wetland area at the northern tip of the lake was dominated by red maple (*Acer rubrum*). Table C lists dominant wetland vegetation present adjacent to Glen Echo lake. The wetlands associated with the lake appear to be healthy and dominated by native species despite the previous drawdown activities at the lake. This would support a conclusion that these wetlands supported hydrologically by groundwater and surface flows moving towards the lake through the wetlands or the soils within the wetlands rather than relying solely upon the water level within the lake to support their existence. Winter drawdowns during the period when these plants are dormant would not be expected to impact the wetland community.



Wetland areas were confined to the undeveloped in northern end of the lake and dominated by native cattail.

**Table C. Dominant Wetland Vegetation**

Scientific Name	Common Name	Native or Exotic
<i>Typha sp.</i>	Cattail	Native
<i>Solidago sp.</i>	Goldenrod	Native
<i>Carex stricta</i>	Tussock Sedge	Native
<i>Pontederia cordata</i>	Pickeralweed	Native
<i>Acer rubrum</i>	Red Maple	Native

#### **4.0 MANAGEMENT RECOMMENDATIONS**

The results of this survey indicate that the lake has not experienced significant impacts from prior winter water level drawdowns. This conclusion is supported by the presence of a relatively diverse plant community, healthy perimeter wetlands, the presence of a reproducing warmwater fish community, and an abundance of native mussels.

The mapping that ESS has conducted as part of this study illustrate where each of the dominant plant species within the lake occur and should help regulators see where certain plant species would be likely to proliferate with increased winter drawdown levels. Similarly, it is also evident where other species may be reduced from the increased drawdown levels. Most species of plants that are desirable for fish cover and duck foraging, such as the various *Potamogeton* species, would be expected to increase in abundance due to increased winter drawdown depths. In contrast, species such milfoil and the exotic species fanwort which spread principally through vegetative fragmentation, would be likely to decrease. As with any drawdown, the management action is not specific and cannot be expected to target only undesirable species. In fact, the exotic species, including brittle naiad, may actually increase within the lake in response to winter drawdown.

Although ESS does not anticipate any negative impacts to the overall flora and fauna associated with the lake in response to an increased drawdown, it is our recommendation that the effects of the drawdown be monitored annually. Annual mapping of the aquatic plants in a manner similar to what was conducted to support this baseline study would enable scientists to document any unexpected proliferation in exotic species or other observed negative impacts to the ecosystem so that they could be addressed proactively before the system becomes unbalanced or shifts beyond what can easily be corrected by simply reducing the degree of drawdown going forward.

## Figures

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**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

**Legend**

- \*Detail Contour (2' Interval)
- \*Index Contour (10' Interval)
- Shoreline

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

**% Plant Cover at Sample Location**

- 0%
- 1% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

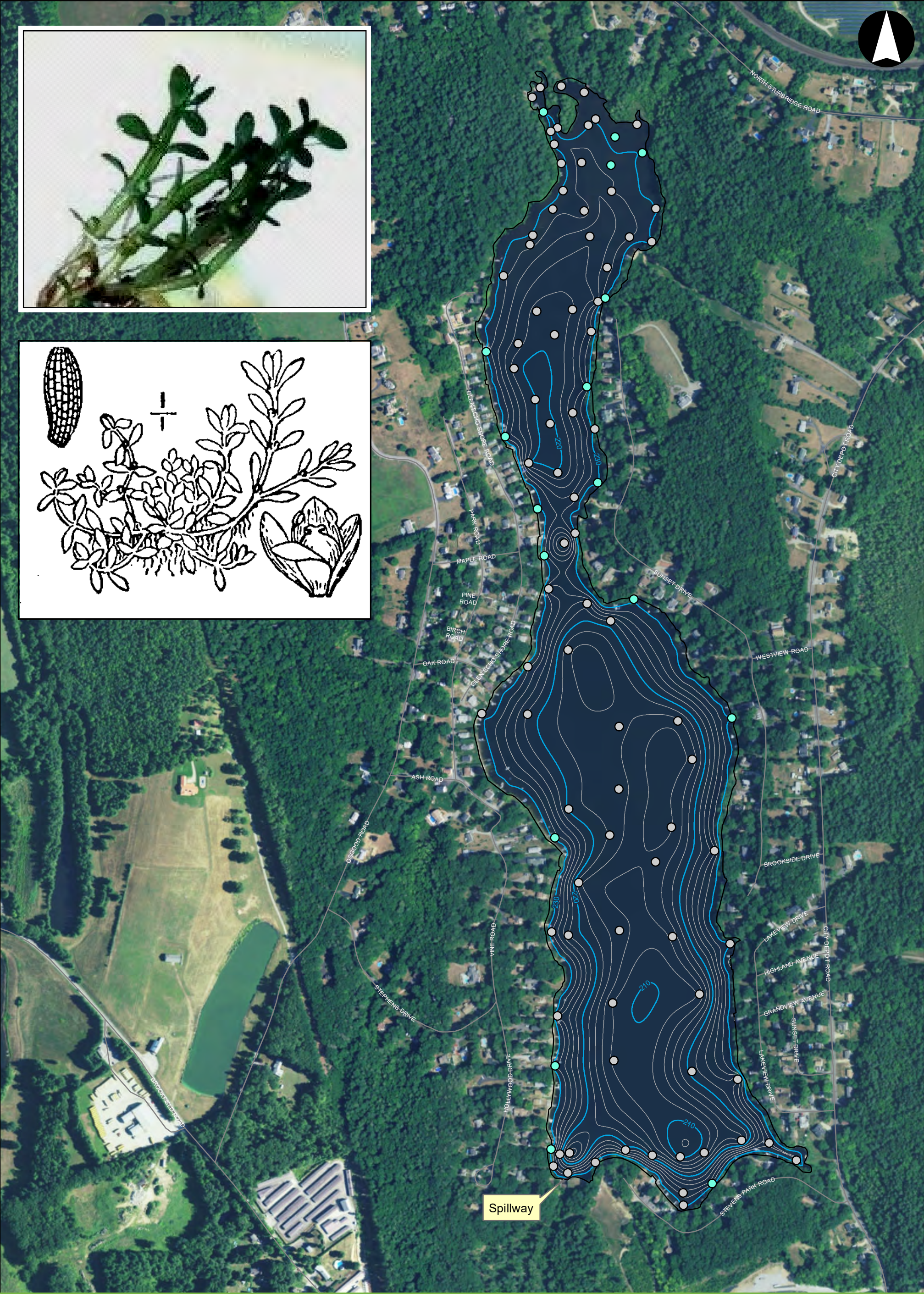
**Aquatic Vegetation Cover**

Figure 1









**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

- Legend**
- \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline

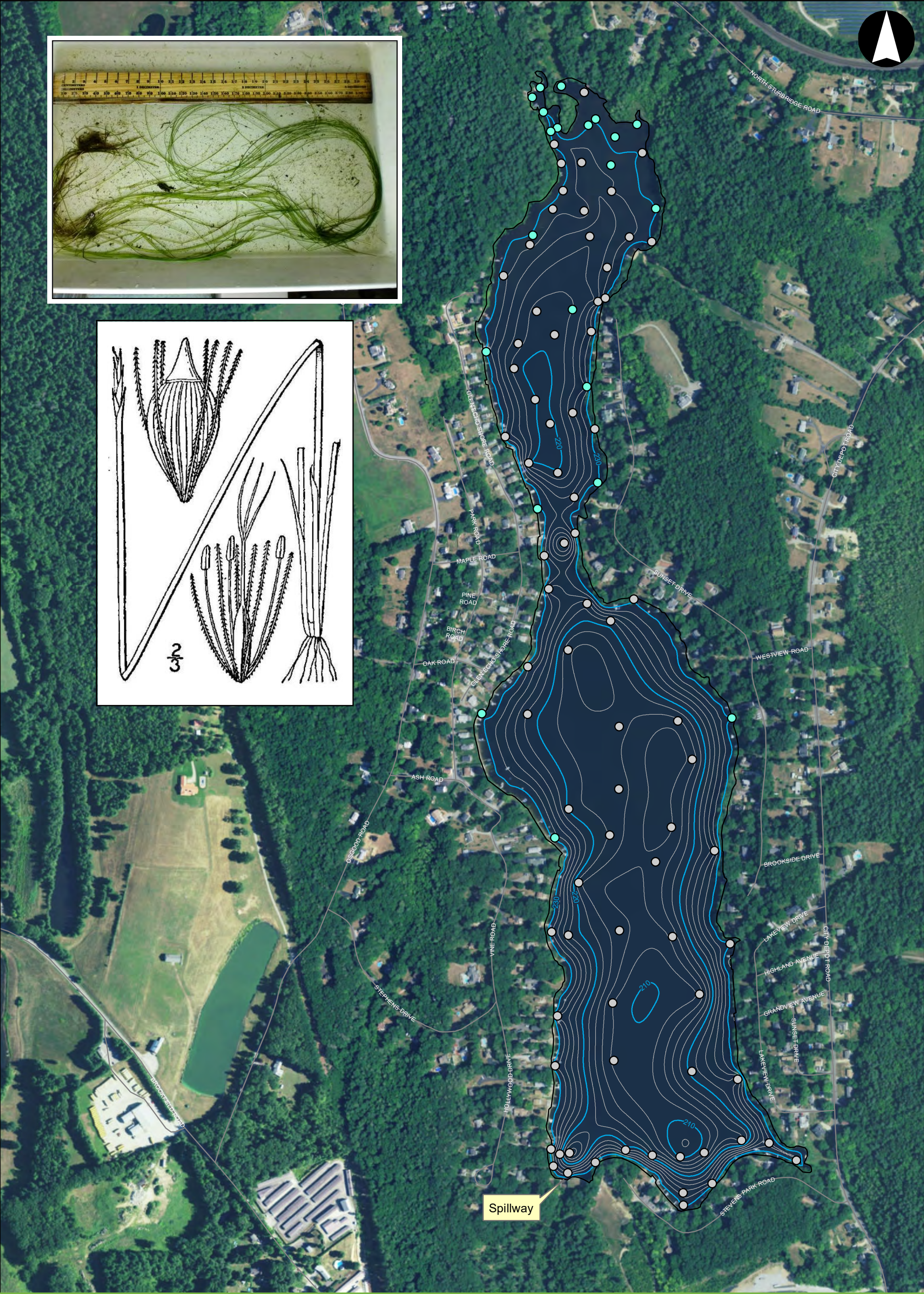
- Elatine* % Plant Biomass at Sample Location**
- 0%
  - 1% - 25%

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

**Biomass of Waterwort (*Elatine* sp.)**

Figure 3





**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

- Legend**

  - \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline
- Eleocharis* % Plant Biomass at Sample Location**

  - 0%
  - 1% - 25%

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

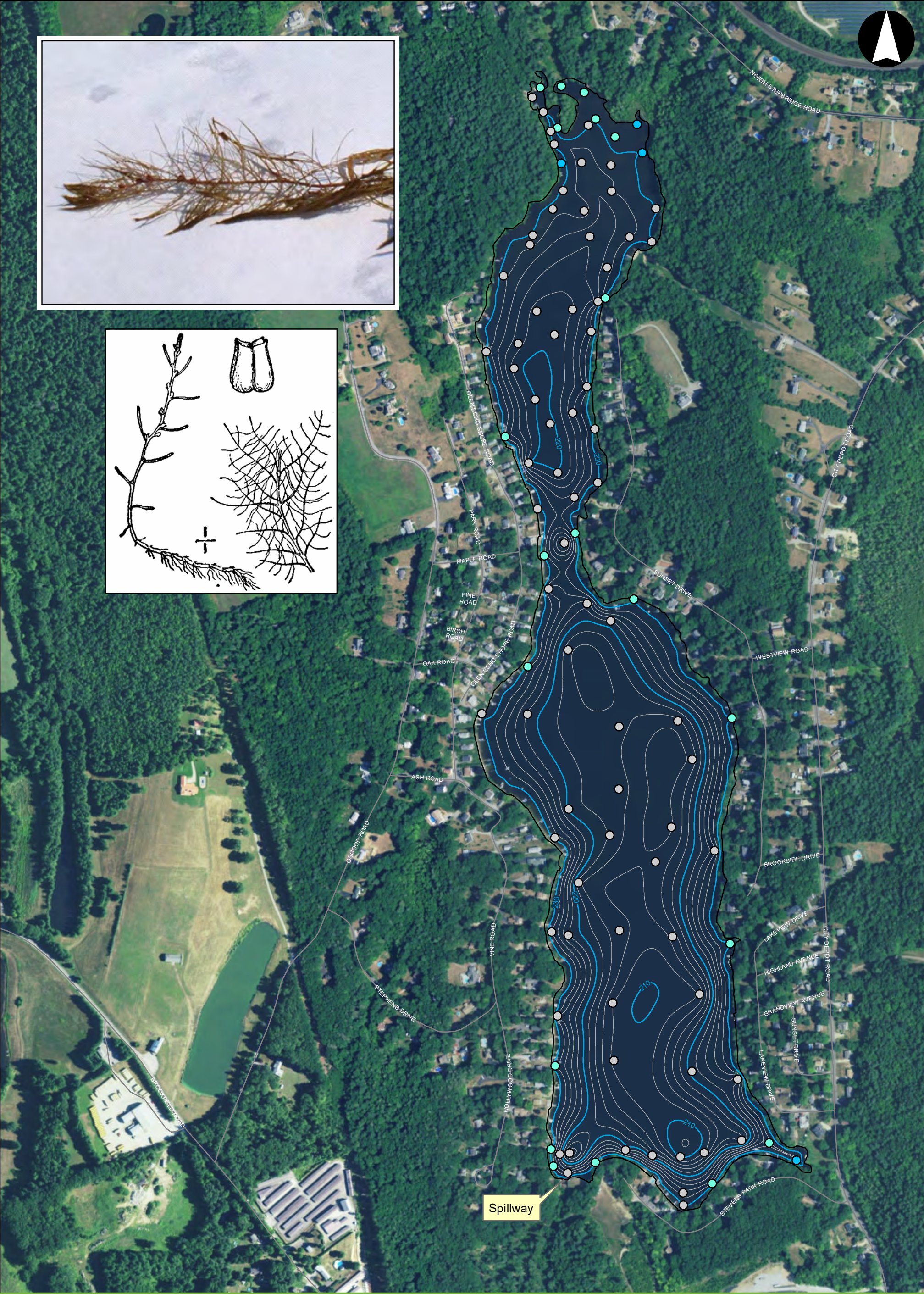
**Biomass of Spikerush (*Eleocharis* sp.)**

Figure 4









**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

- Legend**
- \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline

- Myriophyllum humile* % Plant Biomass at Sample Location**
- 0%
  - 1% - 25%
  - 26% - 50%

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

**Biomass of Low Milfoil**  
**(*Myriophyllum humile*)**

Figure 6





**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

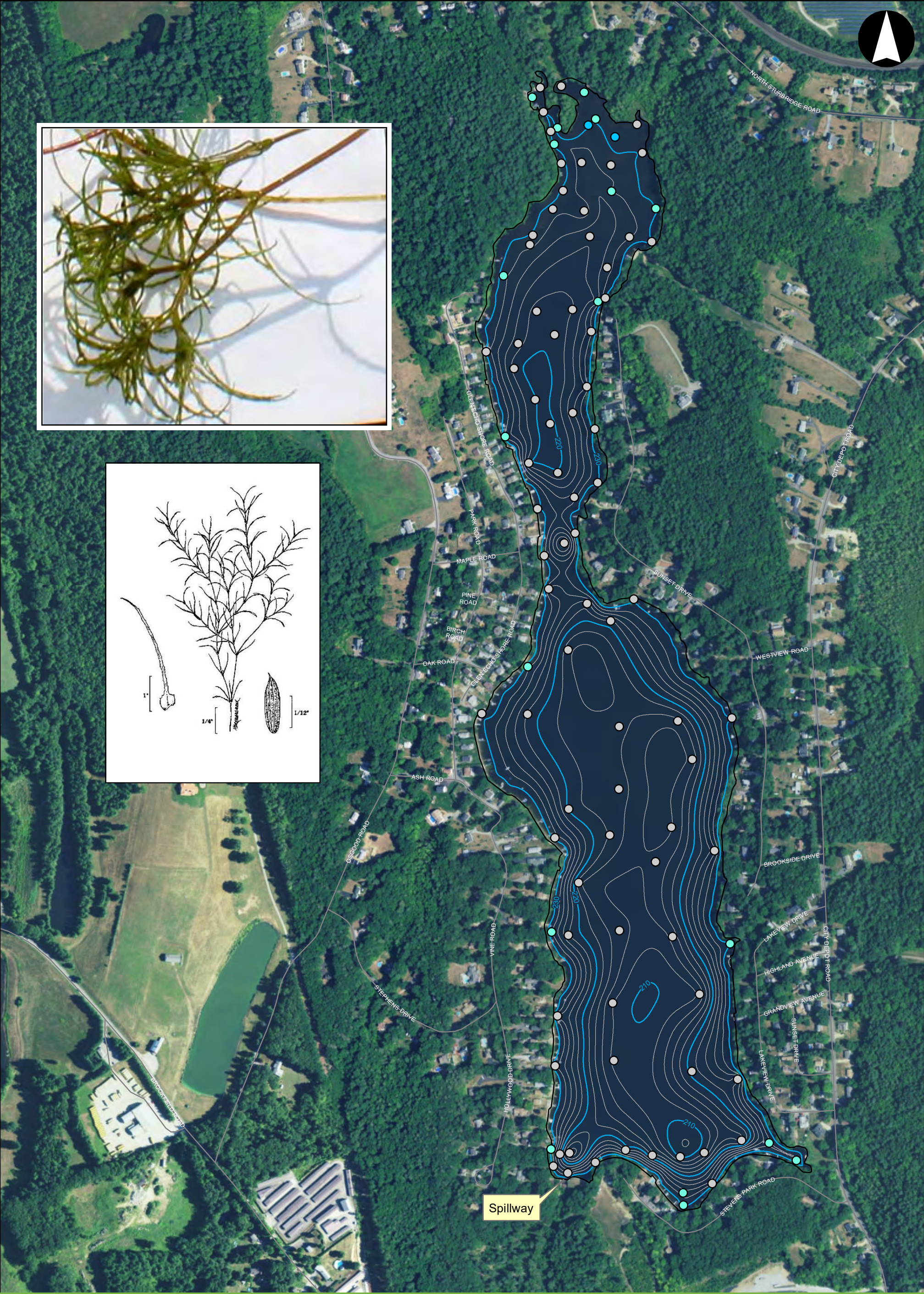
- Legend**
- \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline
- Nitella* % Plant Biomass at Sample Location**
- 0%
  - 1% - 25%

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

**Biomass of Stonewort  
(*Nitella* sp.)**

Figure 7





**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

- Legend**
- \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline

***Najas minor* % Plant Biomass at Sample Location**

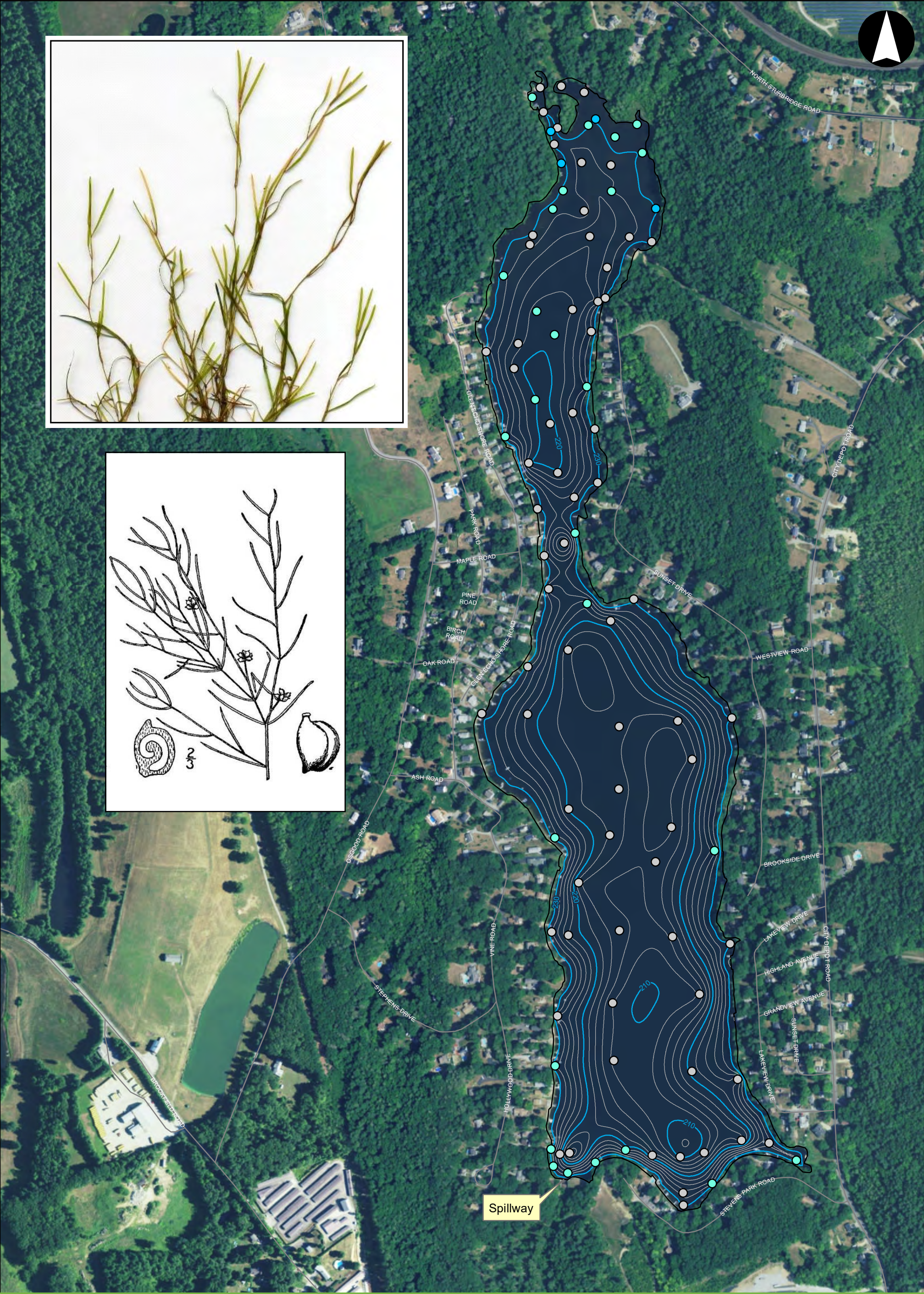
- 0%
- 1% - 25%
- 26% - 50%

**Biomass of Brittle Naiad  
(*Najas minor*)**

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

**Figure 8**





**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

- Legend**
- \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline

**Biomass of Thinleaf Pondweed (*Potamogeton pusillus*)**

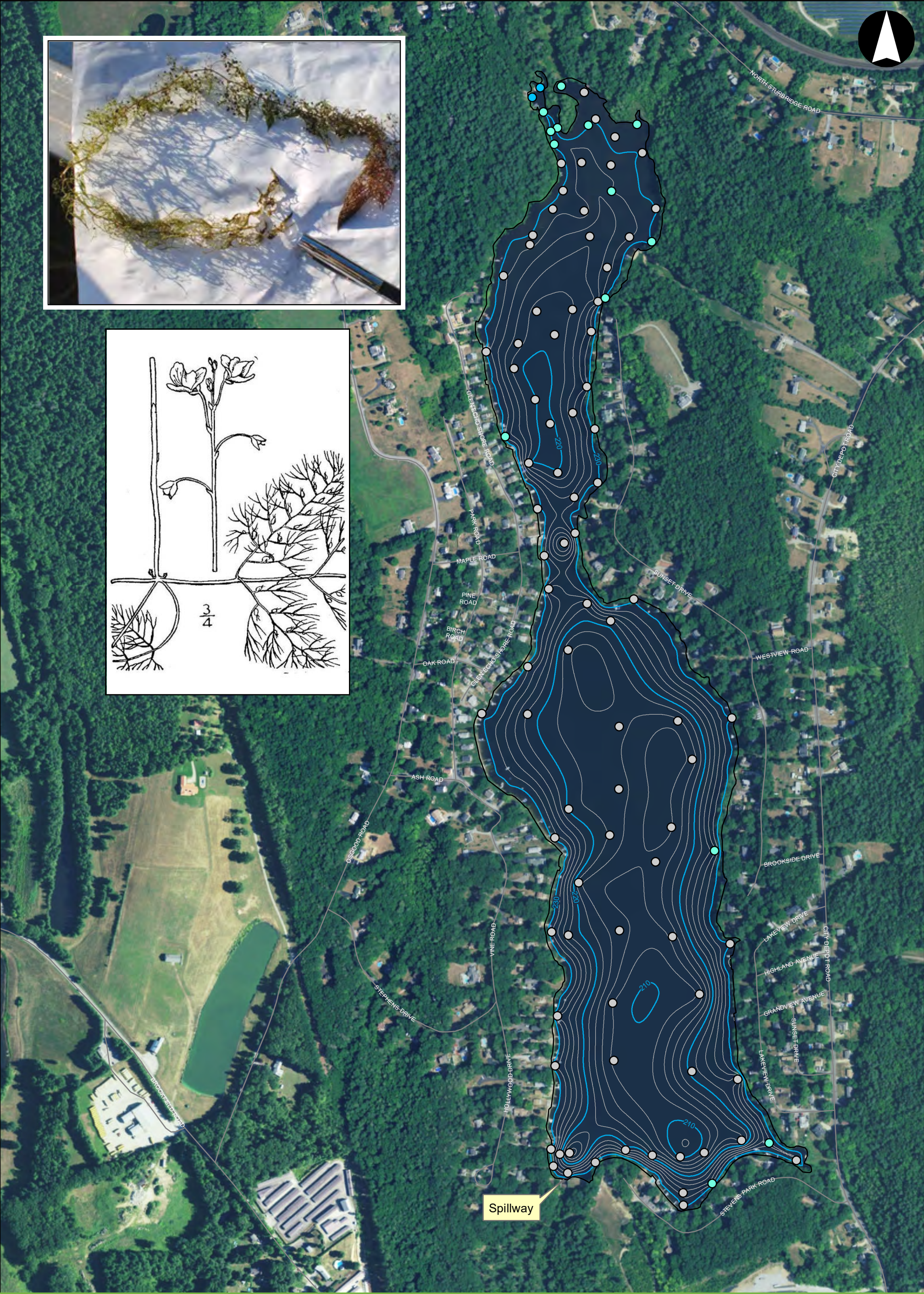
***Potamogeton pusillus* % Plant Biomass at Sample Location**

- 0%
- 1% - 25%
- 26% - 50%

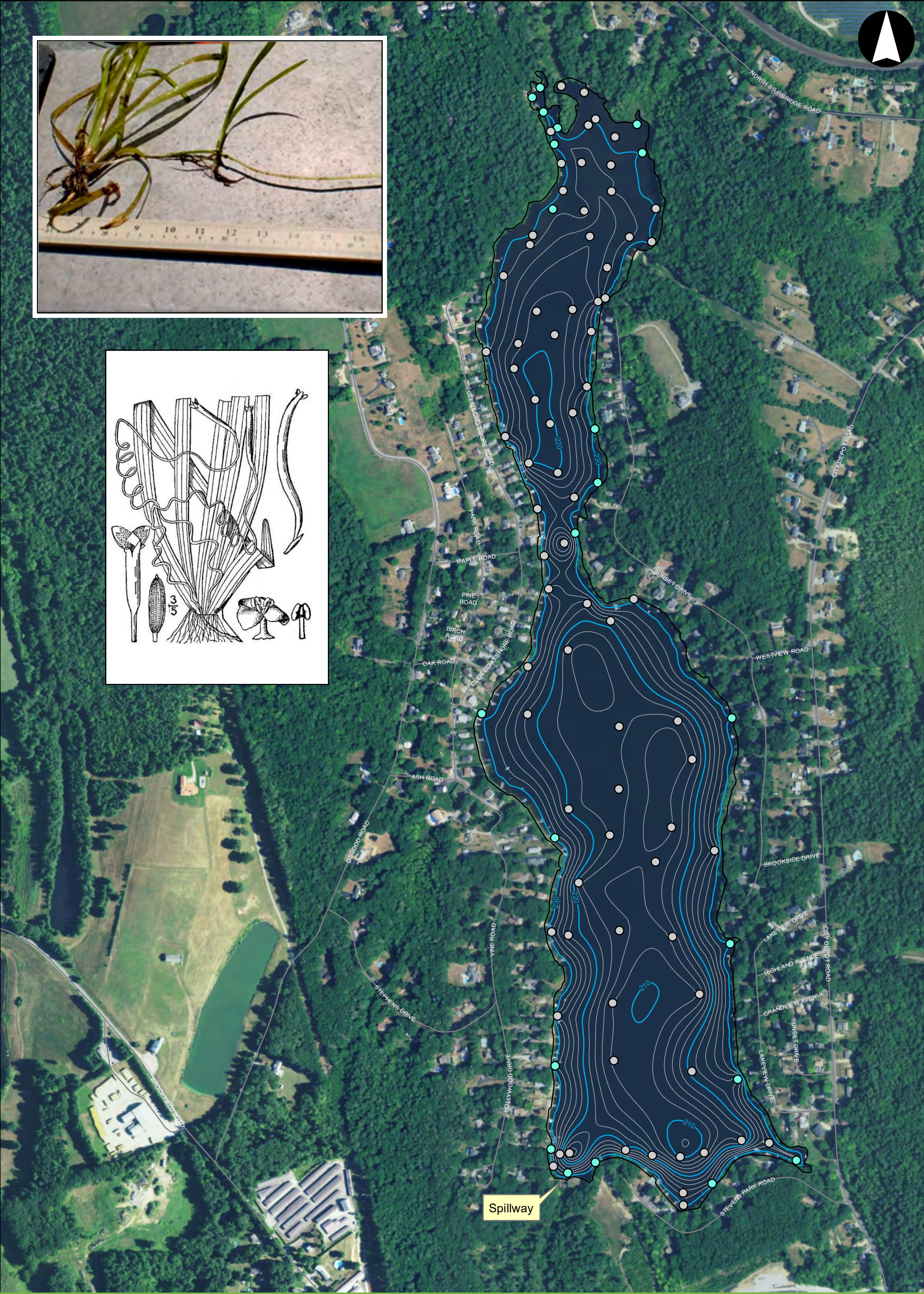
Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

Figure 9

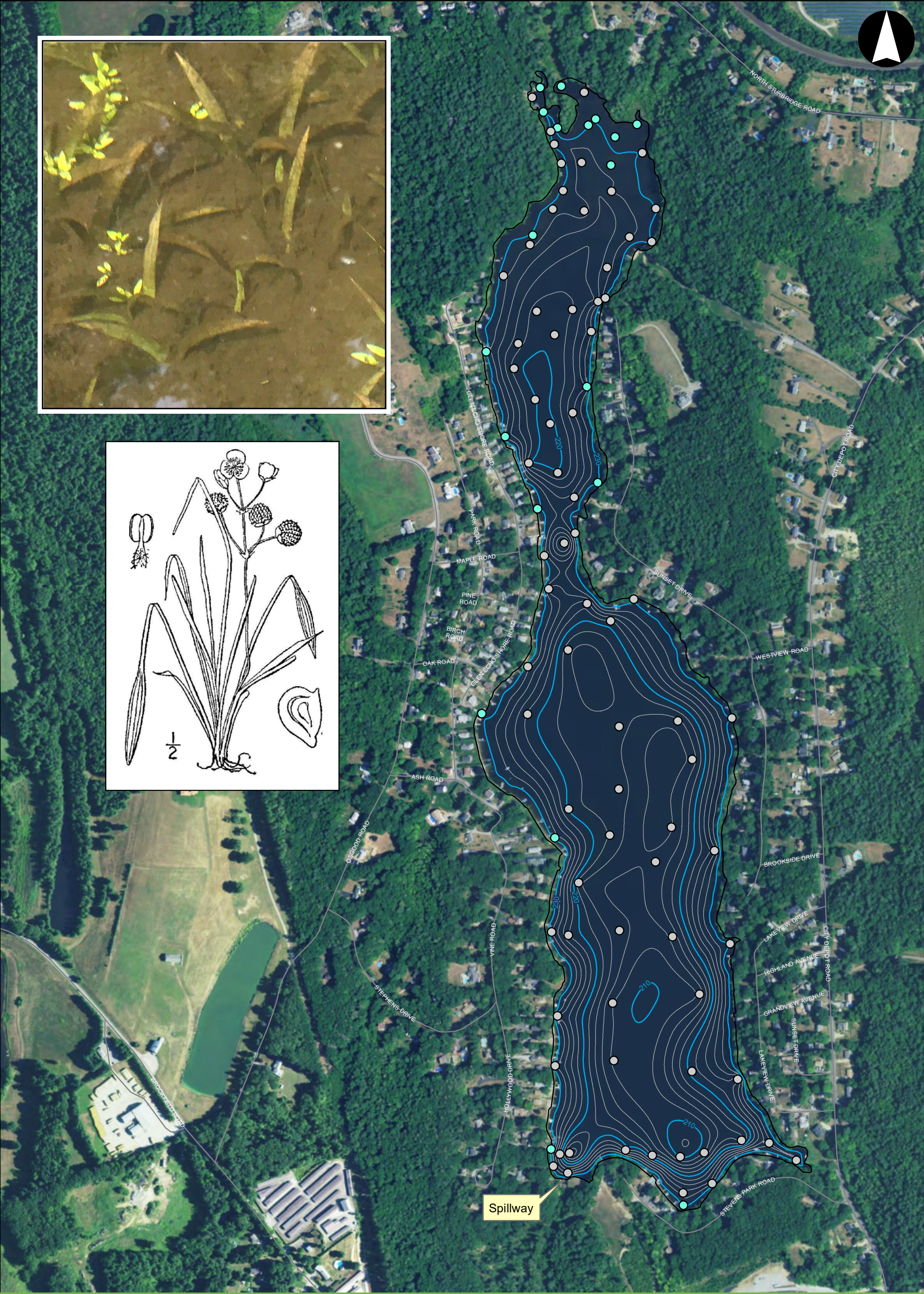




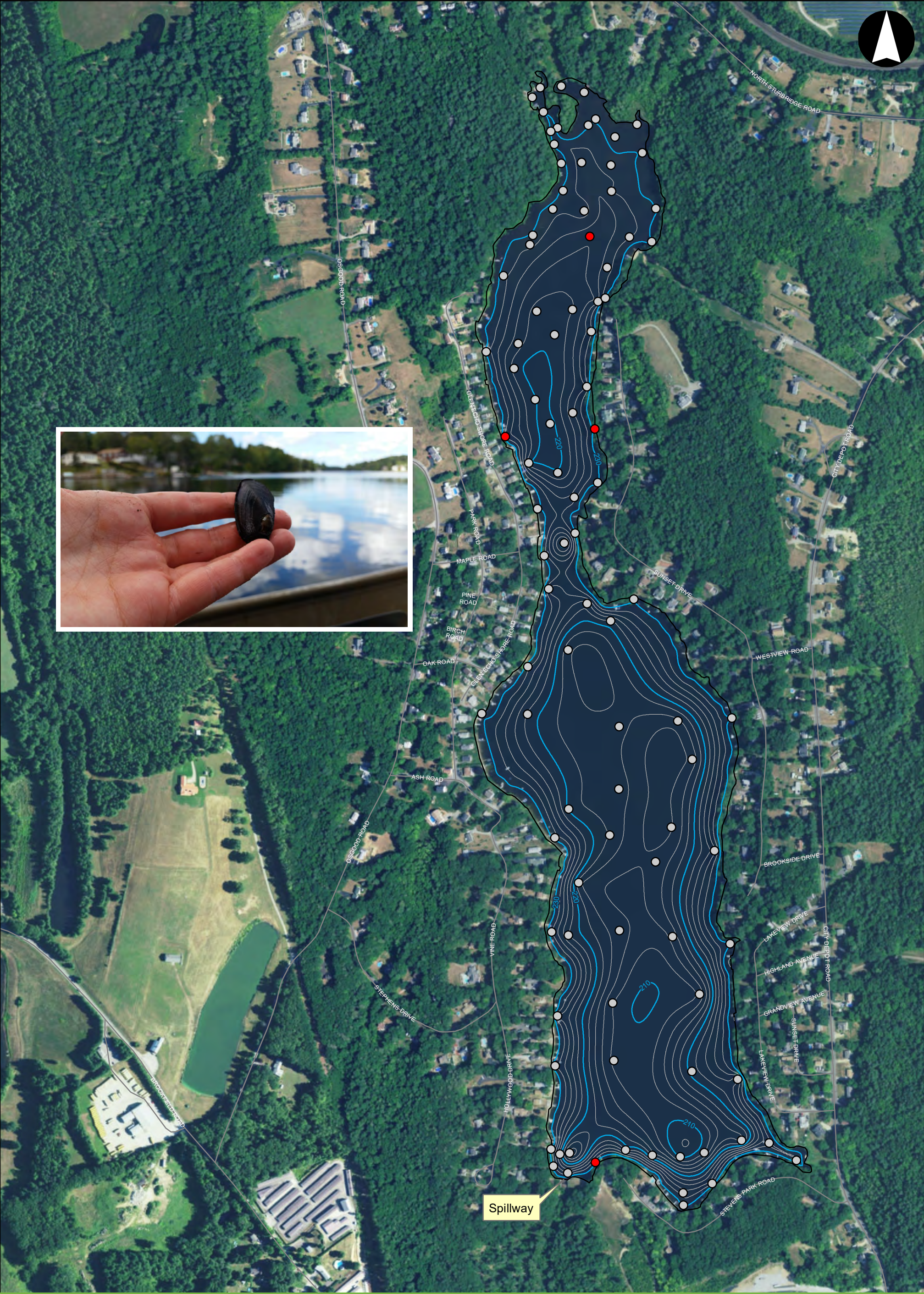












**Glen Echo Lake**  
Charlton, MA

1 inch = 500 feet

Source: 1) ESRI, World Imagery, 2016  
2) ESS, GPS Field Survey, 9/27/2017  
3) Shoreline digitized by ESS from NAIP imagery (circa 2011)

- Legend**

  - \*Detail Contour (2' Interval)
  - \*Index Contour (10' Interval)
  - Shoreline
- Mussels at Sample Location**

  - No
  - Yes

Note: Shoreline elevation on date of survey (9/27/2017) was 231.83', 2-inches below the top of the spillway.

Mussel Locations

Figure 13