SWCA
ENVIRONMENTAL CONSULTANTS
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15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092
www.swca.com

November 22, 2022

David Morgan
Town of Arlington
730 Massachusetts Avenue
Arlington, MA 02474
Via email: dmorgan@town.arlington.ma.us

Re: Summary Report of 2022 Botanica Surveys of Spy Pond, Arlington, Massachusetts / SWCA Project No. 68573

Dear Mr. Morgan:

SWCA Environmental Consultants (SWCA) is pleased to provide you with this report summarizing the results of our Spring and Fall 2022 aquatic botanical surveys of Spy Pond in Arlington, Massachusetts. SWCA was contracted to perform spring and fall surveys in 2022. The spring survey was meant to provide a report on pre-management conditions, and the fall survey would generate data on post-management conditions.

Spy Pond is located within mapped Priority Habitat (PH 1381) for Engelman's flatsedge (*Cyperus engelmannii*), as mapped by the Massachusetts Natural Heritage & Endangered Species Program (NHESP). Engelman's flat sedge is a state-Threatened species in Massachusetts and is typically found along pond and lake shorelines. SWCA was also tasked with identifying and mapping the current distribution of a species of naiad observed in the pond. This species had tentatively been identified as *Najas minor*, lesser naiad; however, it is our understanding that NHESP had no records of this species in Middlesex County, where Spy Pond is located.

PROJECT BACKGROUND

Vegetation management has been ongoing within Spy Pond for the last 12 years. The 103-acre kettle hole pond has been populated by aquatic invasive plant species such as curly-leaf pondweed, snail-seed pondweed, possibly lesser naiad throughout, as well as others in past years. The littoral zone is approximately 45 acres in size. The nuisance and invasive plants as well as filamentous algae and cyanobacteria are anticipated to require management throughout upcoming management seasons. No herbicide applications were able to be conducted in 2022 due to permitting constraints and the requirement to collect additional rare plant data from NHESP. Furthermore, algae presence within the pond did not trigger the need for algaecide applications. Therefore, no algaecide applications were conducted in 2022.

In 2021, SOLitude Lake Management conducted an aquatic plant survey of Spy Pond using a point-intercept method to sample the pond to document both pre- and post-management conditions within the pond's littoral zone. A total of 86 sampling stations were established, based on a 60-meter grid (this was reported as 87 points on a 100-meter grid in the 2021 SOLitude report). SOLitude also reportedly conducted an inspection of the entire littoral zone to identify beds of target species, mapping the extent of vegetation beds they observed; however, the mapped vegetation bed data was not provided in the 2021 report. SWCA was asked to duplicate these efforts in 2022 to document the current state of Spy Pond so that data could be easily compared.

SURVEY AREA

The 2022 fall survey of Spy Pond included both an in-water survey of the littoral zone as well as a shoreline survey of the Engelman's flatsedge, as required by NHESP. As stated above, the littoral zone is divided into 87 quadrats and there is approximately 4.0 kilometers of shoreline around the pond, including the shore of one small island in the pond. The Survey Area encompassed the entire pond shoreline for Engelman's flatsedge, as well as the open water habitat of the pond to map the distribution of submerged aquatic vegetation within the pond.

METHODS

The 2022 spring and fall surveys were conducted by a team of two biologists, led by SWCA Lead Biologist Steve Johnson. The following methods were followed by the survey team for the submerged aquatic vegetation survey (within the littoral zone) and the Engelman's sedge survey.

Submerged Aquatic Vegetation Survey (Littoral Zone)

Utilizing the Geographic Information System (GIS) ArcGIS, SWCA replicated the 86 survey stations established by SOLitude in 2021 and installed the station locations on a tablet map with Global Positioning System (GPS) capabilities. On June 15 and 16, 2022, SWCA biologists collected data from the 86 stations using a rake toss method. At each station, SWCA conducted four rake tosses, one in each cardinal direction, to collect vegetation data. SWCA returned to Spy Pond September 6 to 8, 2022 to repeat the point-intercept survey, and to map any observed beds of aquatic vegetation, particularly all beds of naiad or curly-leaf pond weed. SWCA biologists collected GPS data for all observed beds of naiad and collected information on the estimated precent cover of each bed and the dimensions of each bed. Because NHESP has no records of *Najas minor* in Middlesex County, SWCA collected specimens of naiad for species identification. SWCA also conducted a survey for Engelman's flatsedge during the September survey period.

Engelmann's Flatsedge Survey (Shoreline)

Engelmann's flatsedge is an annual herbaceous plant species that is a member of the Sedge family (Cyperaceae). This species is found along pond shores and disturbed muddy areas and is 10 to 50 centimeters (4-20 inches) in height. The leaves are V- or M-shaped in cross section, 2 to 10 millimeters (0.08-0.4 inches) wide and 5 to 30 centimeters (0.2-1.2 inches) long. Prior to surveying Spy Pond, SWCA developed a survey protocol for finding and distinguishing Engelman's flatsedge from other similar appearing flatsedges. The protocol was approved by NHESP on September 8, 2022. A copy of the protocol can be found in Appendix A.

The Engelman's sedge survey was conducted via meander surveys throughout the shorelines within the Survey Area, focusing on all potential habitat for Engelman's flatsedge. SWCA corresponded with NHESP Conservation Planning Biologist Karro Frost on the first day of survey efforts to discuss the species of *Cyperus* observed on site, and how best to distinguish *C. engelmannii* from the more common species.

When *C. engelmannii* was observed, SWCA first visually searched for all nearby individual plants, and then counted individuals, or estimated the number of individua plants per population. The botanists then measured the distance from shore, both horizontally and vertically, of the individual plants closest to shore. SWCA took GPS points for each location where these measurements were taken. SWCA took representative photographs of all observed diagnostic features, with a reference for scale, as well as of entire populations and associated habitat, and collected data on associated species and habitat to be submitted with all other observation data to NHESP via the Heritage Hub reporting system.

SURVEY RESULTS

Submerged Aquatic Vegetation Survey (Littoral Zone)

During the June 2022 survey, SWCA observed very low overall vegetation densities for combined submerged aquatic species found at most of the survey stations. There was no vegetation at 46 stations, trace amounts (1-20 % cover) at 35 stations, 27 of which were in the north basin and sparce to moderate amounts (21-50% cover) at five stations (Figure 1). Percent cover for the overall vegetation in Figure 1 matches the categories used by SOLitude in their report. Biomass was particularly low in the northern half of the pond (Figure 2). No biomass was detected at 39 stations (27 in northern basin), low biomass at 40 stations, and moderate biomass was observed at seven stations. Curly-leaf pondweed (*Potamageton crispus*) and stonewort (*Chara* spp.) were the primary species observed during the June survey period. Figure 3 shows that the majority of stations with curly-leaf pondweed present were located in the southern basin. No pondweed was observed at 47 stations, and only sparse amounts of curly-leaf pondweed were observed at 39 stations (only eight of which were in the north basin). Stonewort also occurred primarily in the southern basin although half of eight stations with higher abundance (sparce) were located within the north basin. Fifty-one stations had no stonewort, while 28 had trace amounts, and eight had sparse densities. Filamentous algae were fairly uncommon at the time of the June survey, also though SWCA did noted that the water column in general was green due to free floating algae. Traces amounts of filamentous algae were found at only 9 of the 86 stations.

Overall vegetation densities of all submerged aquatics were generally lower during the September 2022 survey period than the June Survey. However, fall densities were higher than spring densities at some locations. No vegetation was observed at 71 stations, sparce/moderate (21-50%) amounts were observed at 13 stations, and dense vegetation (71-100%) was observed at only two stations (Figure 6). As expected, biomass was also lower during the fall survey (Figure 7). No biomass was recorded at 71 stations, moderate biomass was recorded at 11 stations, and high biomass was recorded at four stations.

SWCA positively identified the *Najas* species observed in Spy Pond as *N. minor*. This species did not occur throughout much of the pond. Seventy-one stations had no naiad recorded, eight stations had sparce amounts of naiad, five stations had moderate densities, and two had dense beds of naiad. SWCA mapped the distribution of this species within Spy Pond. The largest patch of *N. minor* was located between the island and the west shore of Spy Pond (Figure 9). This patch was approximately 4,525 square meters in size. Approximately 24,000 square meters of *N. minor* were mapped scattered within the shallower portions of the pond. Sampling done across the north and southern halves of the pond detected no *N. minor* or other aquatic vegetation at depths beyond the mapped distribution of *N. minor* shown in Figure 9. Filamentous algae were even less prevalent during the September survey, occurring at only two stations in the southeast corner of the pond (Figure 10).

Engelmann's Flatsedge Survey (Shoreline)

During the September 6 through September 8, 2022, surveys, SWCA observed both *Cyperus engelmannii* and *C. strigosus* along much of the shoreline portions of the Survey Area. These two species are very similar in appearance. Both species have floral scales that do not overlap; however, those of *C. engelmannii* are typically shorter (2 to 2.8 millimeters) than those of *C. strigosus* (3.2 – 4.5 millimeters). Another distinction between the two is that *E. engelmannii* is an annual species, while *C. strigosus* and some other similar appearing species are perennial with a swollen corm-like base to its stem. Representative photos of both species can be found in Appendix B.

Distinguishing between these two species was difficult in the field without digging up the bases of plants to determine if a swollen base was present, particularly since the bases of some *C. engelmannii* appeared to be slightly swollen. To facilitate surveying and ensure that data on the closest possible individual plants of *C. engelmannii* was collected, SWCA chose to collect data on the *Cyperus* plants closest to shore that resembled either of these two species. Estimated stem counts also included both species since they were

impossible to distinguish without measuring the floral scales of each plant with a hand lens and checking the bases of each plant.

SWCA estimated a total of 6,300 stems of *C. engelmannii* and *C. strigosus* and collected data for 118 individual plants around the pond (Figure 11); these represented the closest individual plants in 22 populations around the pond. These two species of flatsedge were observed and recorded along approximately 645 meters of shoreline. The average horizontal distance from the water's edge to the closest plants was 59.7 centimeters, while the vertical distance was 7.5 centimeters. Horizontal distance ranged from -5 centimeters (in water) to 3.04 meters. Vertical distance ranged from -2.5 centimeters to 48.25 centimeters. Based on the gauge reading at the time of the survey (33 centimeters), *C. engelmannii* should be safe from aquatic herbicides at gauge readings of 30.5 or lower. *Cyperus* plants resembling *C. engelmannii* and *C. strigosus* were observed well above what appeared to be the high-water line of the pond, even encroaching into lawns.

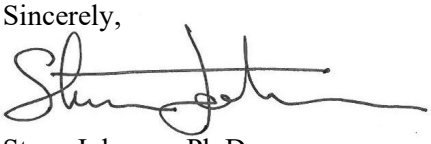
CONCLUSIONS

During the June survey period, the two primary aquatic species observed were curly-leaf pondweed and stonewort. However, more than half of the stations recorded neither of these species as present. The primary species observed during the September survey was *Najas minor.* SWCA positively identified and mapped the distribution of this invasive species throughout the pond. This species was only observed in shallower portions of the pond and occurred in only 15 of the 86 survey stations.

SWCA also collected location and water level data at the time of the Engleman's flatsedge survey, for *Cyperus* plants at 118 locations around the shoreline of Spy Pond. The average horizontal distance from the water's edge to the closest plants was 59.7 centimeters, while the vertical distance was 7.5 centimeters. Horizontal distance ranged from -5 centimeters (in water) to 3.04 meters. Vertical distance ranged from -2.5 centimeters to 48.25 centimeters. Based on the gauge reading at the time of the survey (33 centimeters), the majority of *C. engelmannii* plants should be safe from aquatic herbicides at gauge readings of 30.5 or lower. *Cyperus* plants resembling *C. engelmannii* and *C. strigosus* were observed well above what appeared to be the high-water line of the pond, even encroaching into lawns.

All vegetation updates will also be sent to NHESP and permitting for continued management at Spy Pond should be completed for the 2023 season. SWCA anticipates that there will be both algaecide and herbicide applications conducted to manage nuisance aquatic vegetation and algae. However, neither of these activities were conducted in 2022.

Sincerely,



Steve Johnson, Ph.D.
Lead Biologist

APPENDIX A

Representative Photographs

Botanical Surveys of Spy Pond

Photo 1. Trace amounts of curly-leaf pondweed stems and stonewort, June 15, 2022. Note green color of water due to algal bloom.

Photo 2. Example of more moderate density of curly-leaf pondweed and stonewort, June 15, 2022.

Photo 3. Submerged beds of spiny naiad observed September 8, 2022.

Photo 4. Submerged beds of spiny naiad close to pond surface, observed September 8, 2022.

Photo 5. Specimen of spiny naiad observed September 7, 2022.

Photo 6. Close up of flatsedge inflorescence (*Cyperus engelmannii* / *C. strigosus*).

Photo 7. Engelman's flatsedge (*Cyperus engelmannii*) observed September 7, 2022.

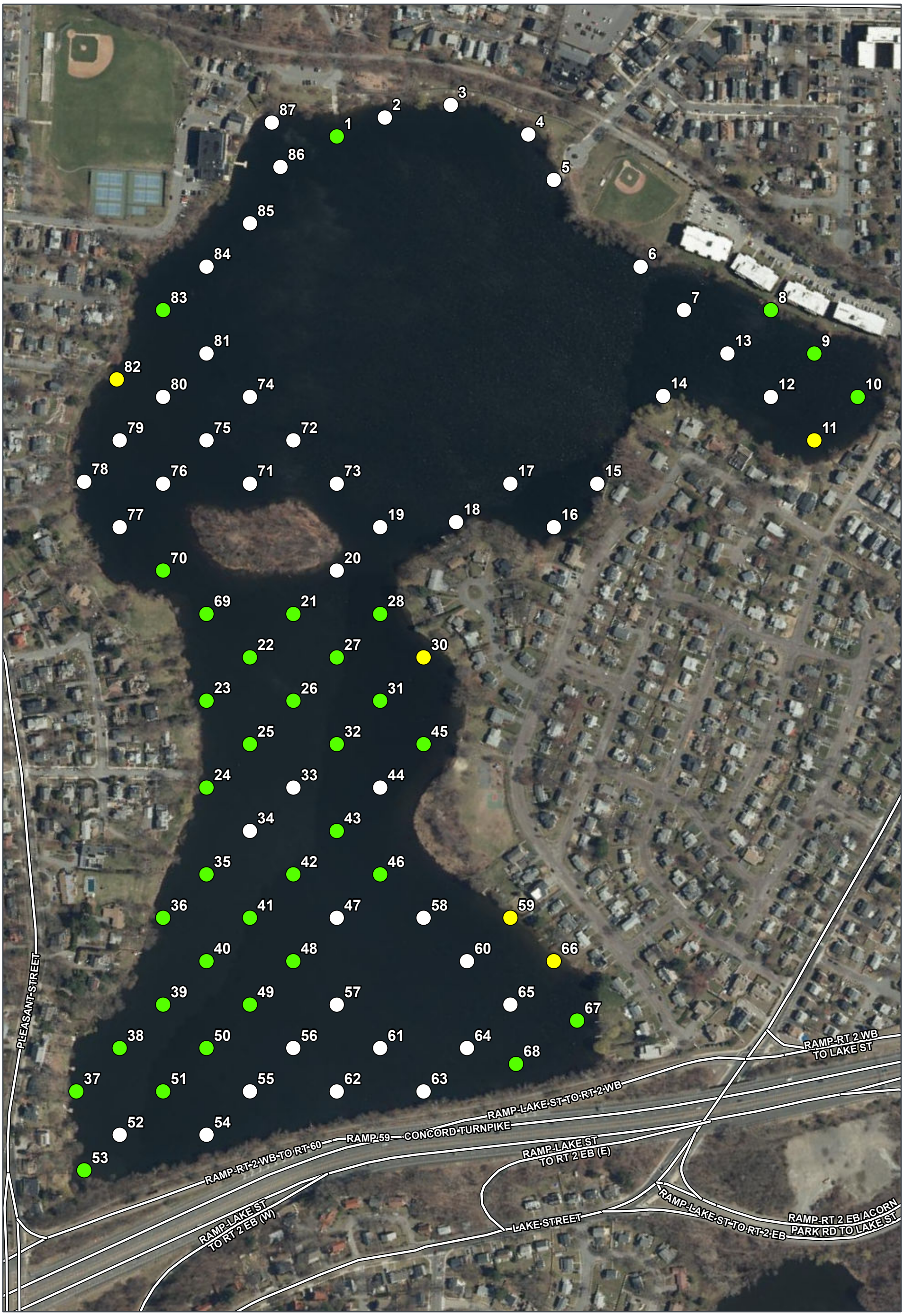
Photo 8. Close up of Engelman's flatsedge, showing slightly swollen base, September 7, 2022.

Photo 9. Measuring horizontal distance between *Cyperus* plant and water's edge in typical flatsedge habitat.

APPENDIX B

Figures

Botanical Surveys of Spy Pond



SPY POND BOTANICAL SURVEYS

Figure 1. Percent Cover of All Submersed Aquatic Vegetation Spring 2022

SWCA ENVIRONMENTAL CONSULTANTS

Major Road

Percent Cover

- 0 %
- 1-20 %
- 21-50 %

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

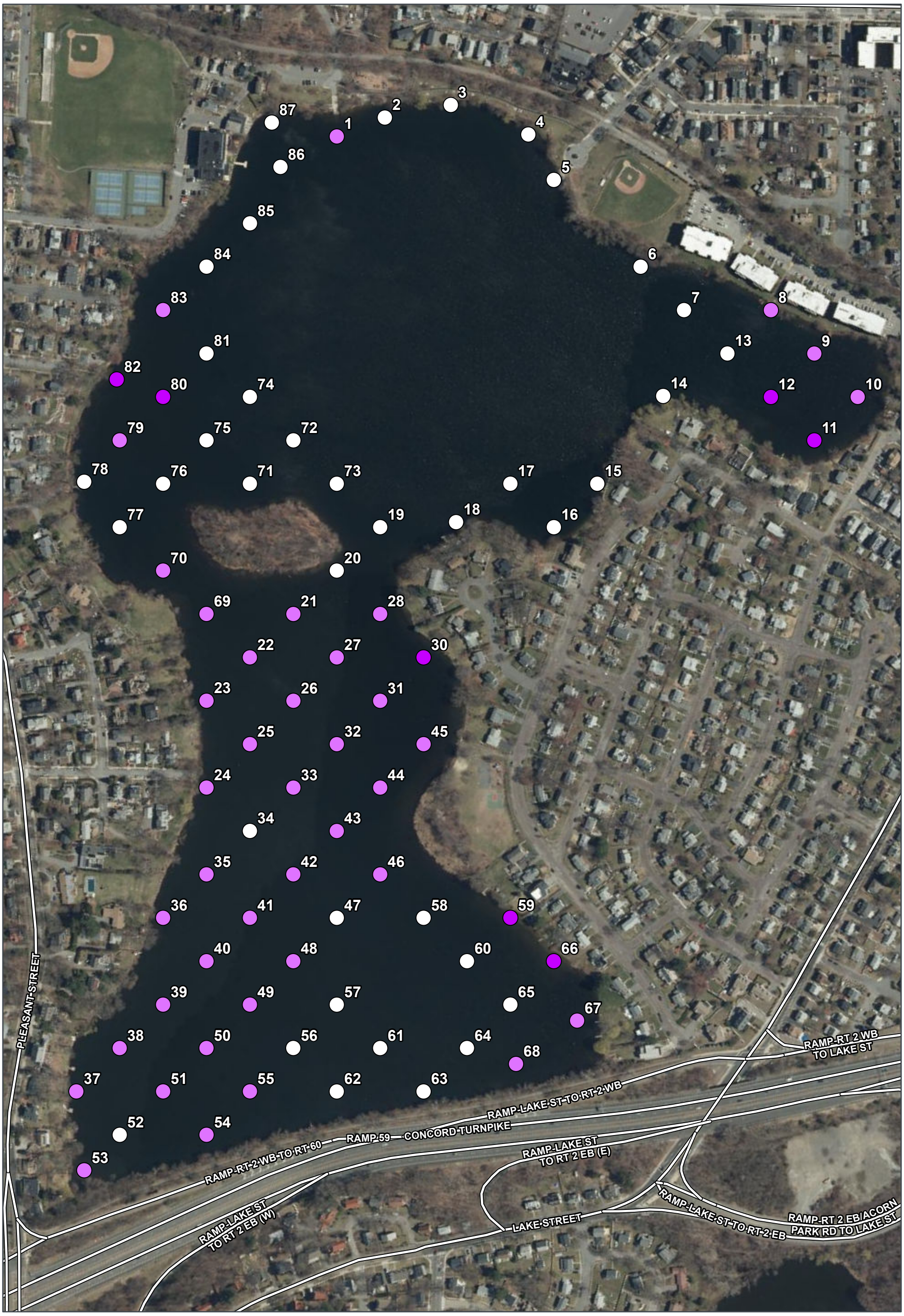
Updated: 11/10/2022
Project No. 68573

N

1:3,500

0 150 300 Feet

0 50 100 Meters



SPY POND BOTANICAL SURVEYS

Figure 2. Biomass
Spring 2022

Major Road

Biomass Index

- No Biomass
- Low Biomass
- Moderate Biomass

SWCA ENVIRONMENTAL CONSULTANTS

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

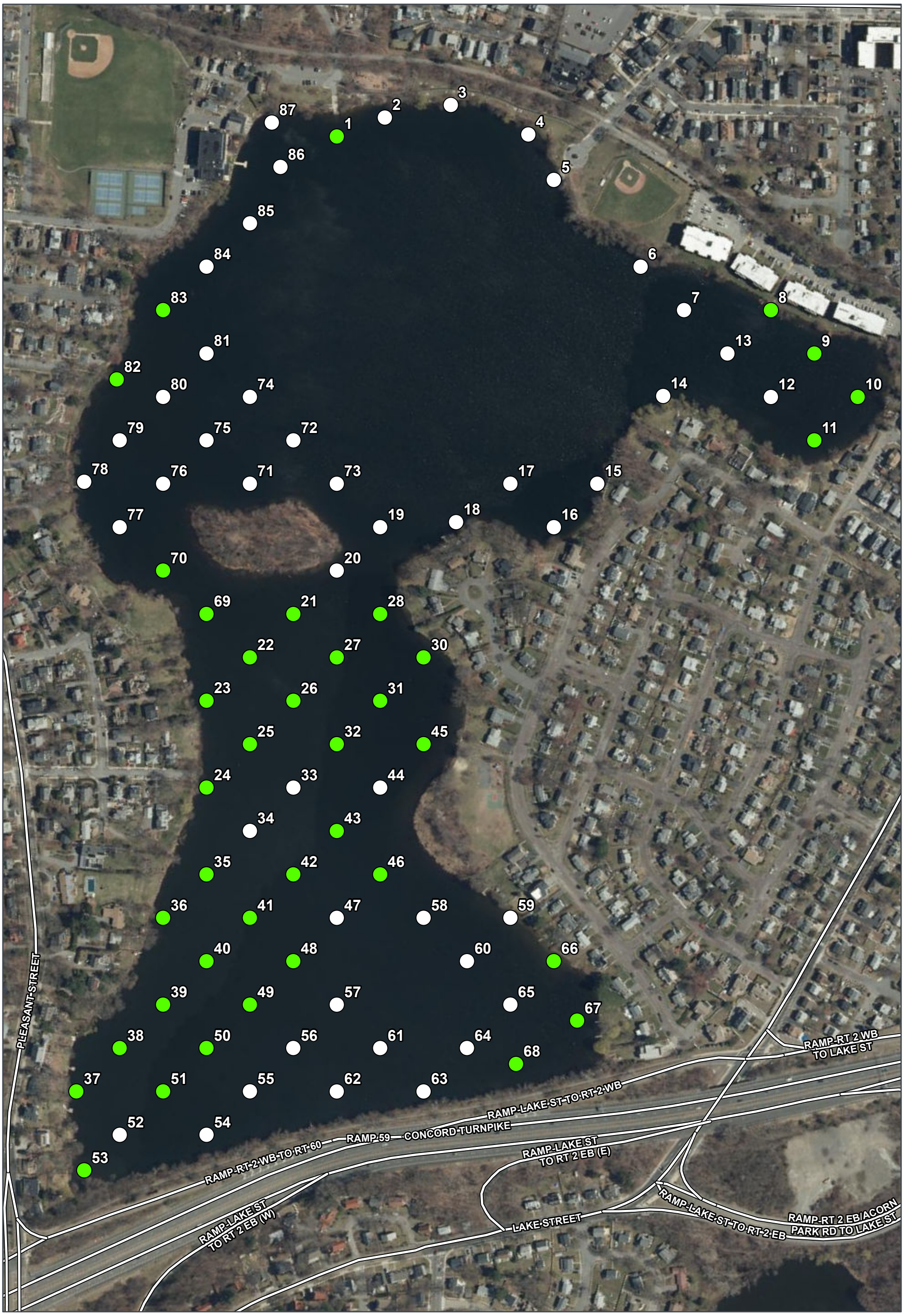
Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

N

1:3,500

0 150 300 Feet
0 50 100 Meters



SPY POND BOTANICAL SURVEYS

Figure 3. Curly-leaf Pondweed Relative Abundance Spring 2022

Major Road

Relative Abundance

- Zero
- Trace

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

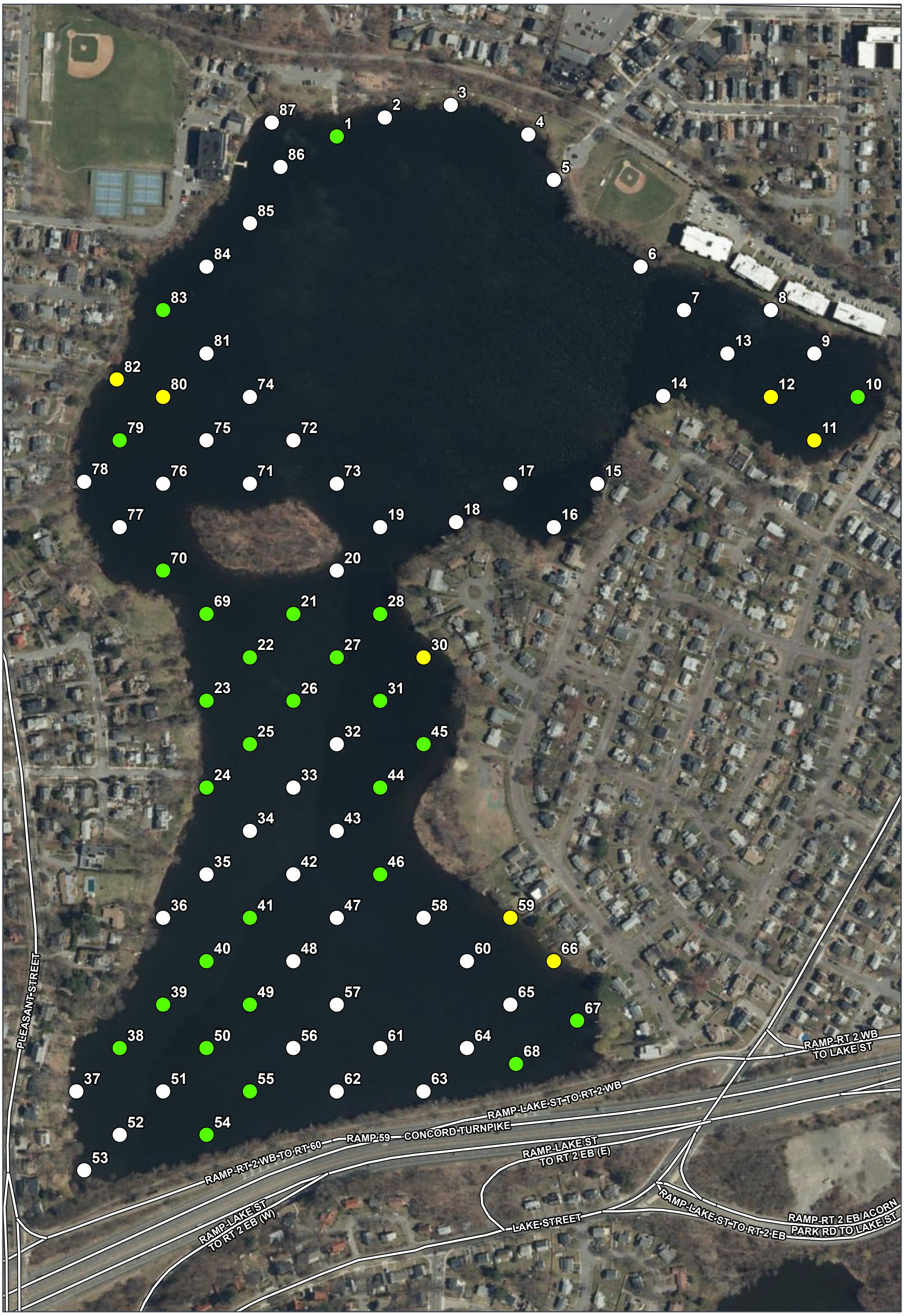
Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

1:3,500

0 150 300 Feet
0 50 100 Meters

SWCA ENVIRONMENTAL CONSULTANTS



SPY POND BOTANICAL SURVEYS

Figure 4. Stonewort Relative Abundance Spring 2022

SWCA ENVIRONMENTAL CONSULTANTS

Major Road

Relative Abundance

- Zero
- Trace
- Sparse

Arlington, MA
USGS 7.5' Quadrangle: Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

N

1:3,500

0 150 300 Feet

0 50 100 Meters

SPY POND BOTANICAL SURVEYS

Figure 5. Filamentous Algae Relative Abundance Spring 2022

Major Road

Relative Abundance

Zero

Trace

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

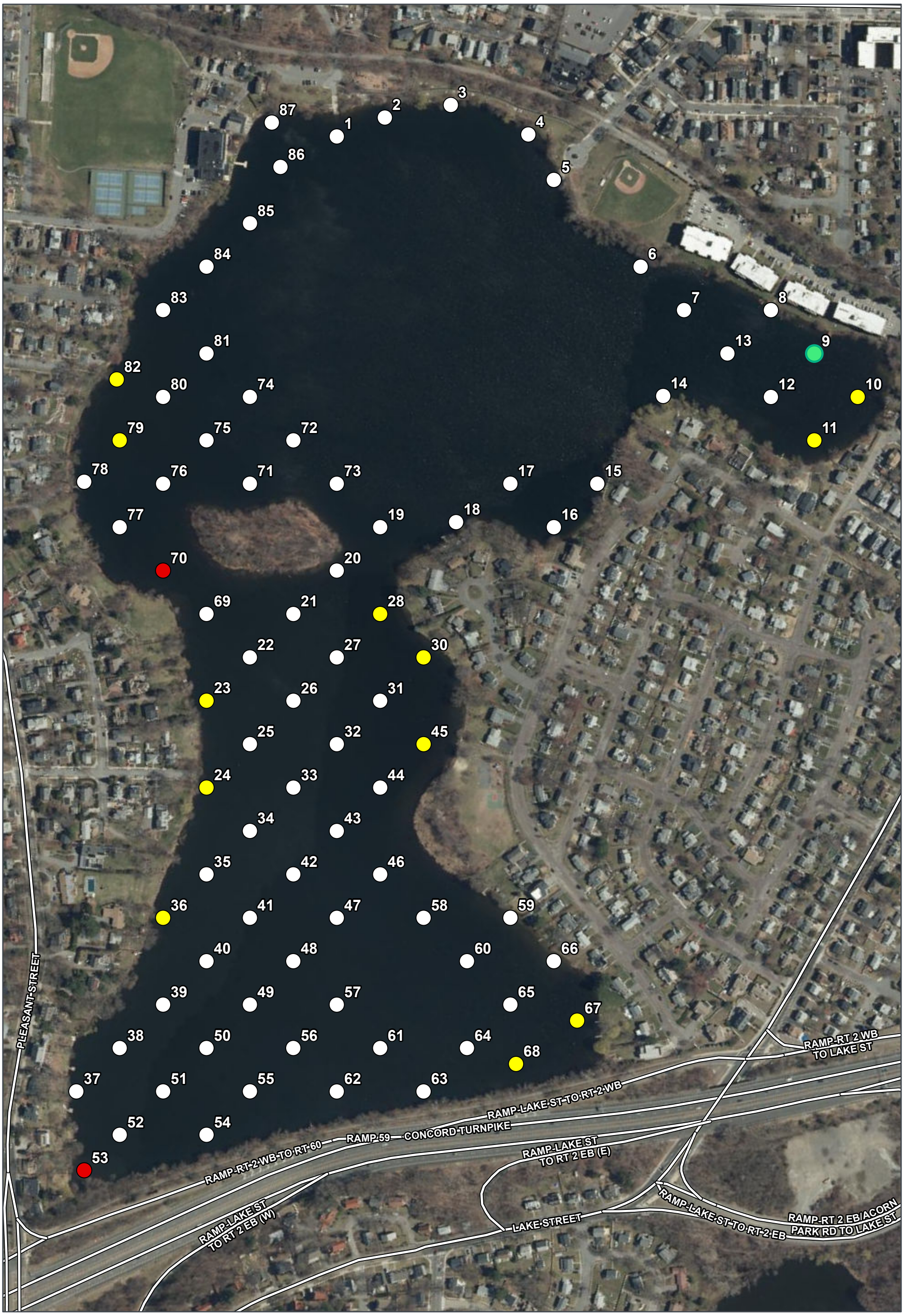
Updated: 11/10/2022
Project No. 68573

1:3,500

0 150 300 Feet

0 50 100 Meters

SWCA ENVIRONMENTAL CONSULTANTS



SPY POND BOTANICAL SURVEYS

Figure 6. Percent Cover of All Submersed Aquatic Vegetation Fall 2022

SWCA ENVIRONMENTAL CONSULTANTS

Major Road

Percent Cover

- 0 %
- 21-50 %
- 76-100 %

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

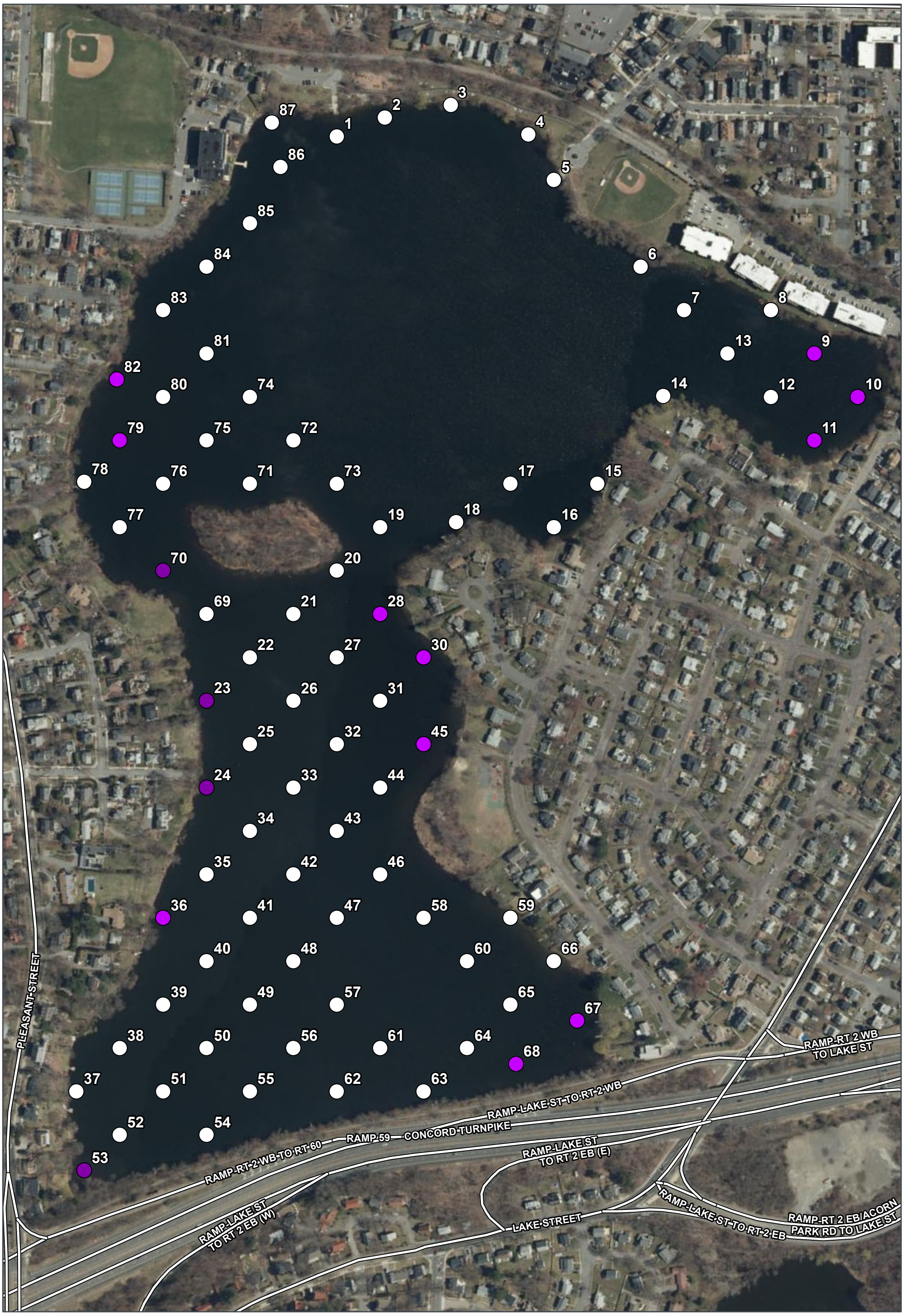
Updated: 11/10/2022
Project No. 68573

N

1:3,500

0 150 300 Feet

0 50 100 Meters



SPY POND BOTANICAL SURVEYS

Figure 7. Biomass
Fall 2022

Major Road

Biomass Index

- No Biomass
- Moderate Biomass
- High biomass

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

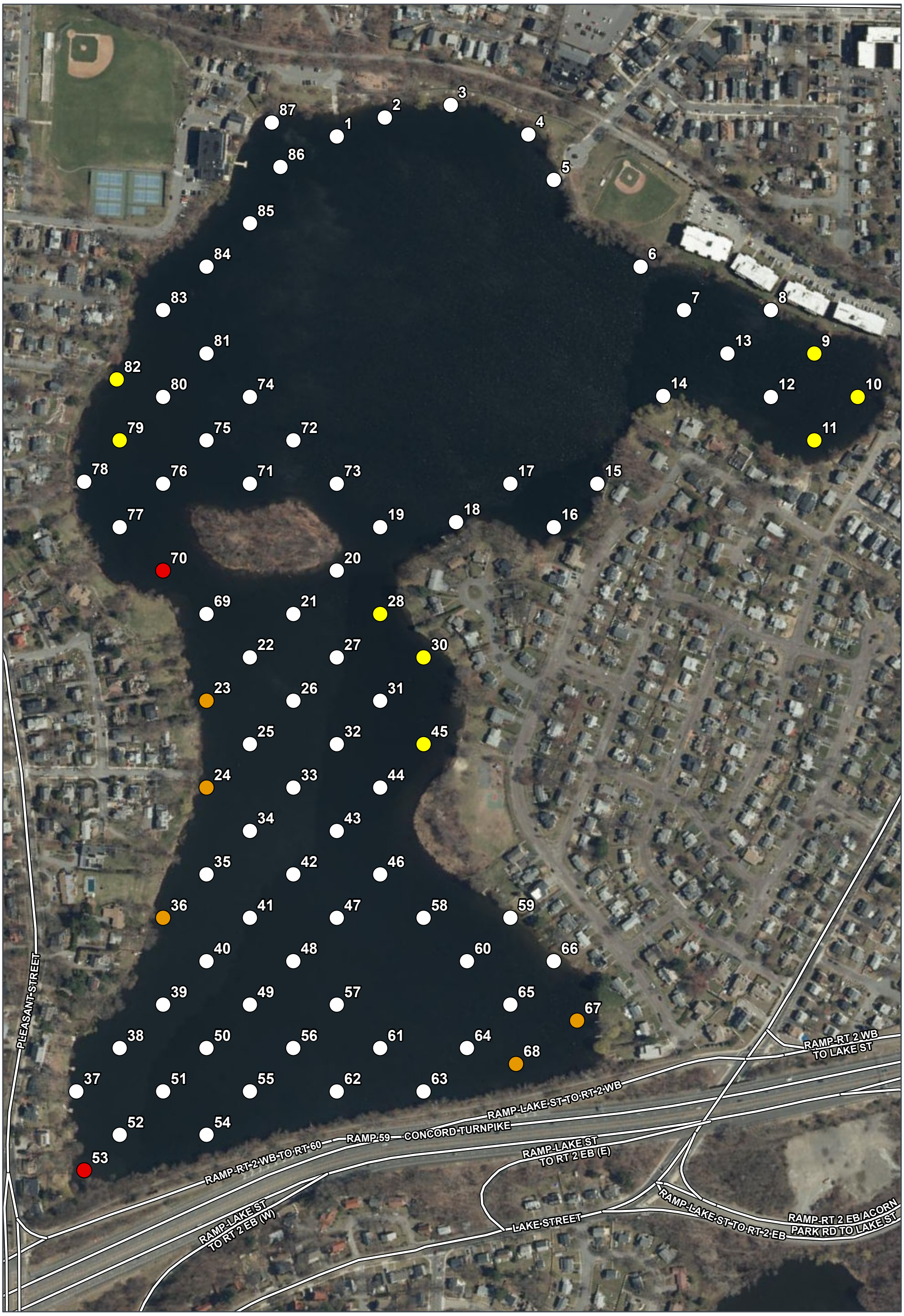
Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

1:3,500

0 150 300 Feet
0 50 100 Meters

SWCA ENVIRONMENTAL CONSULTANTS



SPY POND BOTANICAL SURVEYS

Figure 8. Spiny Naiad Relative Abundance Spring 2022

SWCA ENVIRONMENTAL CONSULTANTS

Major Road

Relative Abundance

- Zero
- Sparse
- Moderate
- Dense

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

N

1:3,500

0 150 300 Feet

0 50 100 Meters

PLEASANT STREET
RAMP RT 2 WB TO RT 60
RAMP 59
CONCORD TURNPIKE
RAMP LAKE ST TO RT 2 WB
RAMP LAKE ST TO RT 2 EB (E)
RAMP LAKE ST TO RT 2 EB (W)
LAKE STREET
RAMP LAKE ST TO RT 2 EB
RAMP RT 2 EB/ACORN PARK RD TO LAKE ST
RAMP RT 2 WB TO LAKE ST

SPY POND BOTANICAL SURVEYS

Figure 9. Observed Vegetation Beds Fall 2022

Curly-leaf Pondweed Bed
Spiny Naiad Bed
Major Road

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

1:3,500

0 150 300 Feet
0 50 100 Meters

SWCA ENVIRONMENTAL CONSULTANTS

SPY POND BOTANICAL SURVEYS

Figure 10. Filamentous Algae Relative Abundance Fall 2022

Major Road

Relative Abundance

- Zero
- Trace

Arlington, MA
USGS 7.5' Quadrangle: Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

1:3,500

0 150 300 Feet
0 50 100 Meters

SWCA ENVIRONMENTAL CONSULTANTS

PLEASANT STREET
RAMP RT 2 WB TO LAKE ST
RAMP LAKE ST TO RT 2 WB
RAMP RT 2 WB TO RT 60
RAMP 59
CONCORD TURNPIKE
RAMP LAKE ST TO RT 2 EB (E)
RAMP LAKE ST TO RT 2 EB (W)
LAKE STREET
RAMP LAKE ST TO RT 2 EB
RAMP RT 2 EB/ACORN PARK RD TO LAKE ST

SPY POND BOTANICAL SURVEYS

Figure 11. Flatsedge Surveys

Flatsedge

Major Road

Arlington, MA
USGS 7.5' Quadrangle:
Lexington
71.1547°W 42.407°N

Base Map: ESRI ArcGIS Online, accessed November 2022

Updated: 11/10/2022
Project No. 68573

N

1:3,500

0 150 300 Feet

0 50 100 Meters

SWCA ENVIRONMENTAL CONSULTANTS