The Connecticut Agricultural Experiment Station

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Lake Quonnipaug

Guilford, CT

Aquatic Vegetation Survey
State-Listed Species Survey
Water Chemistry
Aquatic Plant Management Options

2020

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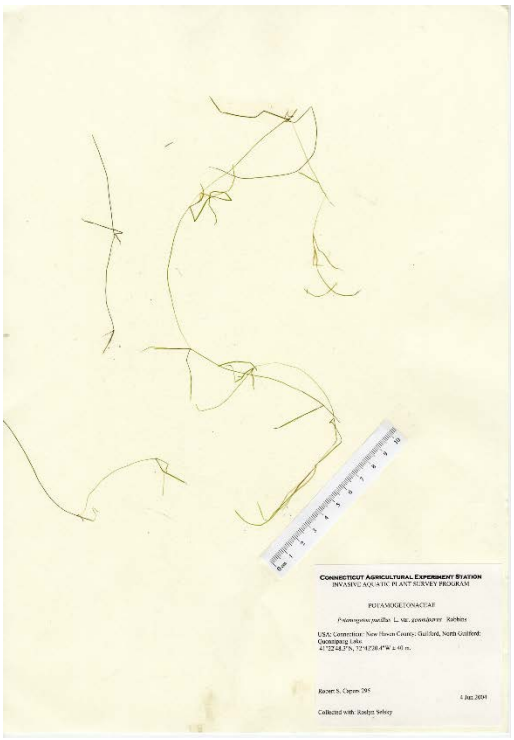
Table of Contents



Introduction

Quonnipaug Lake is a 99-acre waterbody located in Guilford, Connecticut. There is a public boat launch in the north cove of the lake and a public beach on the western shore. The shoreline is moderately developed with private residences. Guilford High School and Choate Rosemary Hall use the lake for their crew teams. The Connecticut Agricultural Experiment Station (CAES) Invasive Aquatic Plant Program (IAPP) has provided detailed mapping of the aquatic vegetation in Lake Quonnipaug in 2004, 2010, 2015, and 2020. These surveys document 44 plant species making Lake Quonnipaug one of the most species rich lakes in Connecticut. Unfortunately, the lake has extensive areas of the invasive aquatic plant species fanwort (*Cabomba caroliniana*), curlyleaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), and variable-leaf watermilfoil (*Myriophyllum heterophyllum*). Nuisance populations of native white water lily (*Nymphaea odorata*), yellow water lily (*Nuphar*

Figure 2. Entrance to southern cove of Lake Quonnipaug in 2020. Note white flowers of invasive fanwort.

variegata), and large-leaf pondweed (*Potamogeton amplifolius*) are intermixed with the invasive species in the coves. In the central shoal areas abundant Eurasian watermilfoil and large-leaf pondweed reach the surface and restrict recreational activities. Occurrences of state-listed water marigold (*Bidens beckii*) and capillary pondweed (*Potamogeton gemmiparus*) have also been documented in the lake (Figure 1).

Concern regarding the preponderance of invasive and native nuisance vegetation in the northern, central, and southern portions of the lake prompted the Town of Guilford to begin herbicide applications in 2016 when All Habitat Services Inc., Branford, CT treated the areas with a combination of diquat and flumioxazin. In 2017 and 2019, follow-up treatments were performed on the same areas with the same herbicides, however, in 2017 a central boat lane in the south cove was treated with the herbicide glyphosate. This eliminated most of the emergent vegetation in the boat lane and allowed regrowth with a mix of invasive and native plant species. To reduce regrowth of water lilies and other emersed vegetation in the boat lane, the area was retreated with glyphosate in 2019. In August 2020, the south cove was again choked with fanwort and other submersed plants which impeded access (Figure 2). On August 12, 2020, All Habitat Services again treated the north end of

the lake and the center shoal area with the diquat – flumioxazin combination and the south end's boat lane with glyphosate.

Objectives

- Survey Lake Quonnipaug for aquatic vegetation and compare with previous surveys to provide information on aquatic plants for improved management.
- Survey Lake Quonnipaug pre- and post-2020 treatment for state-listed plants water marigold and capillary pondweed
- Analyze water to quantify changes in water chemistry and relate to plant populations.

Materials and Methods

CAES IAPP Aquatic Plant Surveys and Mapping in 2020

We performed a full survey for aquatic vegetation of Lake Quonnipaug from June 24th to July 6th, 2020. This was a repeat of surveys done in 2004, 2010, and 2015. The surveys were conducted from small boats traveling over areas shallow enough to support aquatic plants. Plant species were recorded based on visual observation or collections with a long-handled rake or grapple. Locations were recorded on a tablet using ArcMap 10.8.1. Quantitative information on plant abundance was obtained from 17 transects that were positioned perpendicular to the shoreline during our first survey in 2004 using GPS. Transect locations represented the variety of habitat occurring in the lake. We sampled along each transect at points 0, 5, 10, 20, 30, 40, 50, 60, 70, and 80 m from the shore or until depth exceeded the littoral zone with no plant growth. A total of 101 transect points were taken. Abundances of species present at each point were ranked on a scale of 1 – 5 (1 = very sparse/one plant, 2 = sparse, 3 = moderately abundant, 4 = abundant, 5 = extremely abundant/to the surface). One specimen of each species collected in the lake was dried and mounted in the CAES aquatic

plant herbarium where digitized mounts can be viewed online (portal.ct.gov/caes-iapp).

We performed a pre-treatment survey for state-listed species on August 5th, 2020 and a post-treatment survey on October 1st, 2020. Techniques were similar to the full survey; however, GPS was used to track the boat path as required by the NDDB Determination. Littoral zone areas likely to contain water marigold and capillary pondweed were examined visually and by sample collection with a rake or grapple. Special attention was given to all areas where CAES IAPP found the plants in past years. Field identification of capillary pondweed is unreliable due to the cryptic nature of the species, thus plants with the slightest resemblance to capillary pondweed were collected for laboratory examination and herbarium mounting. High-Resolution scans of the mounts were then sent to noted pondweed expert Dr. Barre Hellquist for species confirmation.

Water Analysis

Water was analyzed from the same point in the deepest part of the lake each year. Water temperature and dissolved oxygen were measured 0.5 m beneath the surface and at depth intervals of 1 m to approximately 0.5 m above the bottom. Water samples for pH, alkalinity, conductivity, and total phosphorous concentration were obtained 0.5 m below the surface and 0.5 m about the bottom. Sample size was 250-mL, and all samples were stored at 3˚C until analyzed. A Fisher AR20® meter was used to determine pH and conductivity. Alkalinity (expressed as mg/L $CaCO_3$) was quantified by titration with 0.016 N H_2SO_4 to an end point of pH 4.5. We determined total phosphorus using the ascorbic acid method preceded by digestion with potassium persulfate (APHA, 1995). Phosphorus was quantified using a Milton Roy Spectronic 20D® spectrometer with a light path of 2 cm and a wavelength of 880 nm. Water was tested for temperature and dissolved oxygen using an YSI 58® meter. Water clarity was measured by lowering a six-inch diameter black and white Secchi disk into the water and determining to what depth it could be viewed.

Table 1. List of aquatic plant species found on CAES IAPP surveys. Presence (X) indicates plants found in our general survey. FOQ is the frequency of occurrence of the species on 101 transect points. Invasive species in bold.

Lake Quonnipaug Aquatic Plants									
Common Name*	Scientific Name	2004		2010		2015		2020	
		Presence	FOQ	Presence	FOQ	Presence	FOQ	Presence	FOQ
Arrowhead	*Sagittaria* species	X	5.0%	X	8.9%	X	5.0%	X	9.9%
Berchtold's pondweed	*Potamogeton berchtoldii*	X	1.0%					X	5.9%
Bur-Reed	*Sparganium* species			X	1.0%	X	0.0%		
Cattail	*Typha* species					X	0.0%	X	0.0%
Clasping-Leaf pondweed	*Potamogeton perfoliatus*							X	0.0%
Common bladderwort	*Utricularia macrorhiza*	X	0.0%			X	2.0%	X	0.0%
Common duckweed	*Lemna minor*			X	2.0%	X	3.0%	X	0.0%
Coontail	*Ceratophyllum demersum*	X	4.0%	X	9.9%	X	13.9%	X	0.0%
Curlyleaf pondweed	***Potamogeton crispus***	**X**	**2.0%**	**X**	**2.0%**	**X**	**0.0%**	**X**	**9.9%**
Eelgrass	*Vallisneria americana*	X	3.0%			X	6.9%	X	10.9%
Eurasian watermilfoil	***Myriophyllum spicatum***	**X**	**30.7%**	**X**	**17.8%**	**X**	**22.8%**	**X**	**12.9%**
Fanwort	***Cabomba caroliniana***	**X**	**27.7%**	**X**	**26.7%**	**X**	**12.9%**	**X**	**7.9%**
Flat-Stemmed pondweed	*Potamogeton zosteriformis*	X	1.0%	X	7.9%	X	7.9%	X	4.0%
Floating-Leaf pondweed	*Potamogeton natans*	X	0.0%			X	1.0%	X	0.0%
Great duckweed	*Spirodela polyrhiza*			X	0.0%	X	1.0%	X	0.0%
Humped bladderwort	*Utricularia gibba*	X				X	0.0%		
Illinois pondweed	*Potamogeton illinoensis*					X	0.0%		
Large-Leaf pondweed	*Potamogeton amplifolius*	X	40.6%	X	42.6%	X	41.6%	X	13.9%
Leafy pondweed	*Potamogeton foliosus*			X	5.9%	X	1.0%	X	2.0%
Little floating heart	*Nymphoides cordata*			X	0.0%				
Oakes' pondweed	*Potamogeton oakesianus*	X							
Pickerelweed	*Pontederia cordata*			X	2.0%	X	1.0%	X	3.0%
Primrose-Willow	*Ludwigia* species			X	0.0%			X	0.0%
Purple bladderwort	*Utricularia purpurea*	X	1.0%						
Quillwort	*Isoetes* species					X	1.0%	X	1.0%
Ribbon-Leaf pondweed	*Potamogeton epihydrus*	X	0.0%						
Robbins' pondweed	*Potamogeton robbinsii*	X	81.2%	X	76.2%	X	77.2%	X	61.4%
Sedge	*Carex*			X	10.9%	X	1.0%		
Slender naiad	*Najas flexilis*	X	1.0%			X	1.0%	X	1.0%
Small pondweed	*Potamogeton pusillus*	X	2.0%			X	0.0%	X	0.0%
Snailseed pondweed	*Potamogeton bicupulatus*							X	1.0%
Spikerush	*Eleocharis* species					X	1.0%		
Spiral pondweed	*Potamogeton spirillus*	X	0.0%						
Star duckweed	*Lemna triscula*			X	0.0%	X	5.9%		
Swamp loosestrife	*Decodon verticillatus*					X	2.0%	X	4.0%
Variable pondweed	*Potamogeton gramineus*	X	0.0%			X	0.0%		
Variable-Leaf watermilfoil	***Myriophyllum heterophyllum***	**X**	**4.0%**	**X**	**3.0%**	**X**	**2.0%**	**X**	**0.0%**
Water marigold	*Bidens beckii*			X	4.0%	X	9.9%		
Water stargrass	*Zosterella dubia*	X	5.0%	X	3.0%	X	10.9%		
Watershield	*Brasenia schreberi*	X	0.0%	X	2.0%	X	1.0%	X	3.0%
Waterwort	*Elatine* species			X	1.0%			X	0.0%
Western waterweed	*Elodea nuttallii*	X	11.9%	X	5.9%	X	11.9%	X	2.0%
White water lily	*Nymphaea odorata*	X	5.0%	X	10.9%	X	11.9%	X	12.9%
Yellow water lily	*Nuphar variegata*	X	1.0%	X	5.9%	X	4.0%	X	5.9%
Total Species Richness	44	26		25		34		30	
Invasive Species Richness	4	4		4		4		4	
Native Species Richness	40	22		21		30		28	
*Invasive Species in Bold									

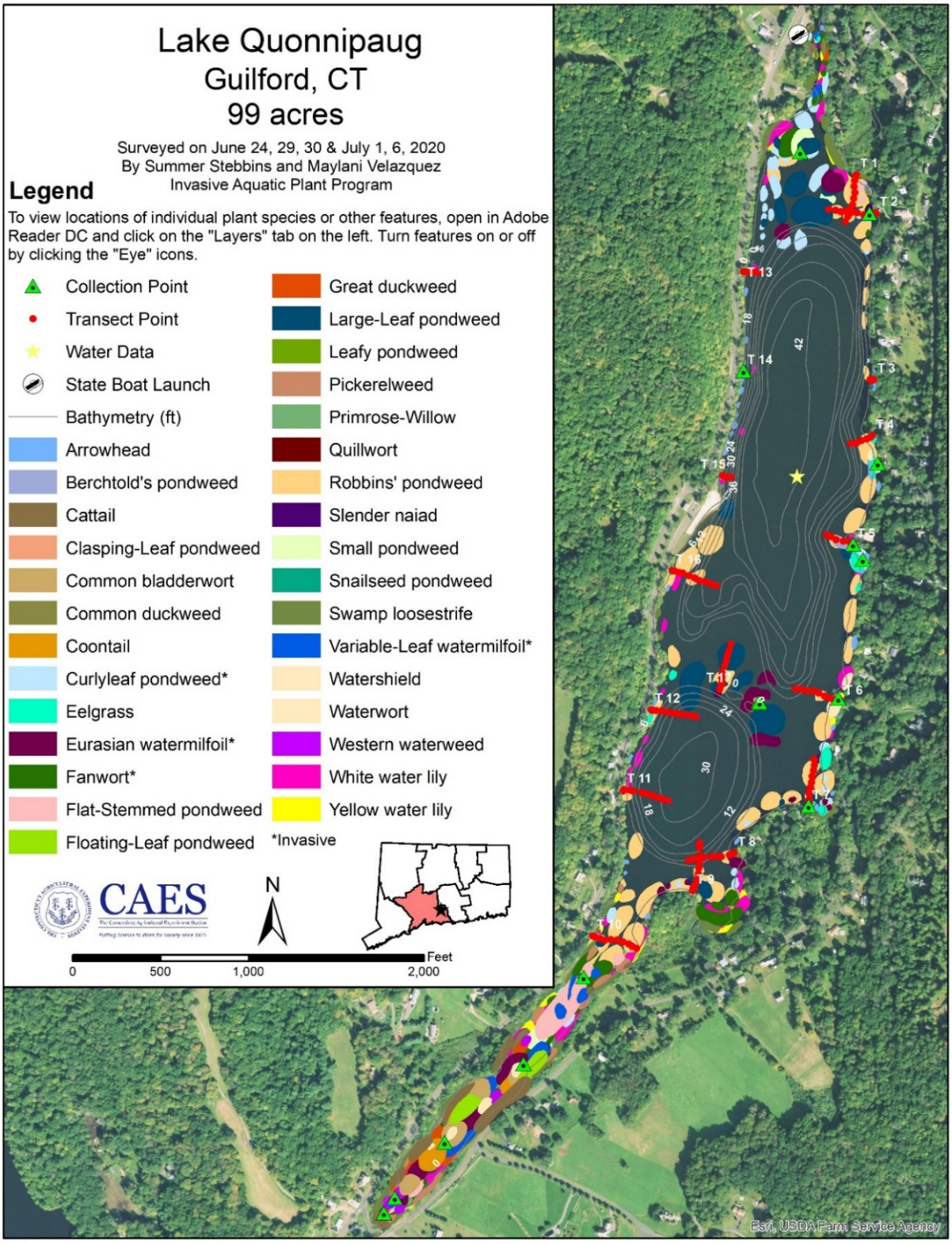


Figure 3. 2020 survey map of Lake Quonnipaug.

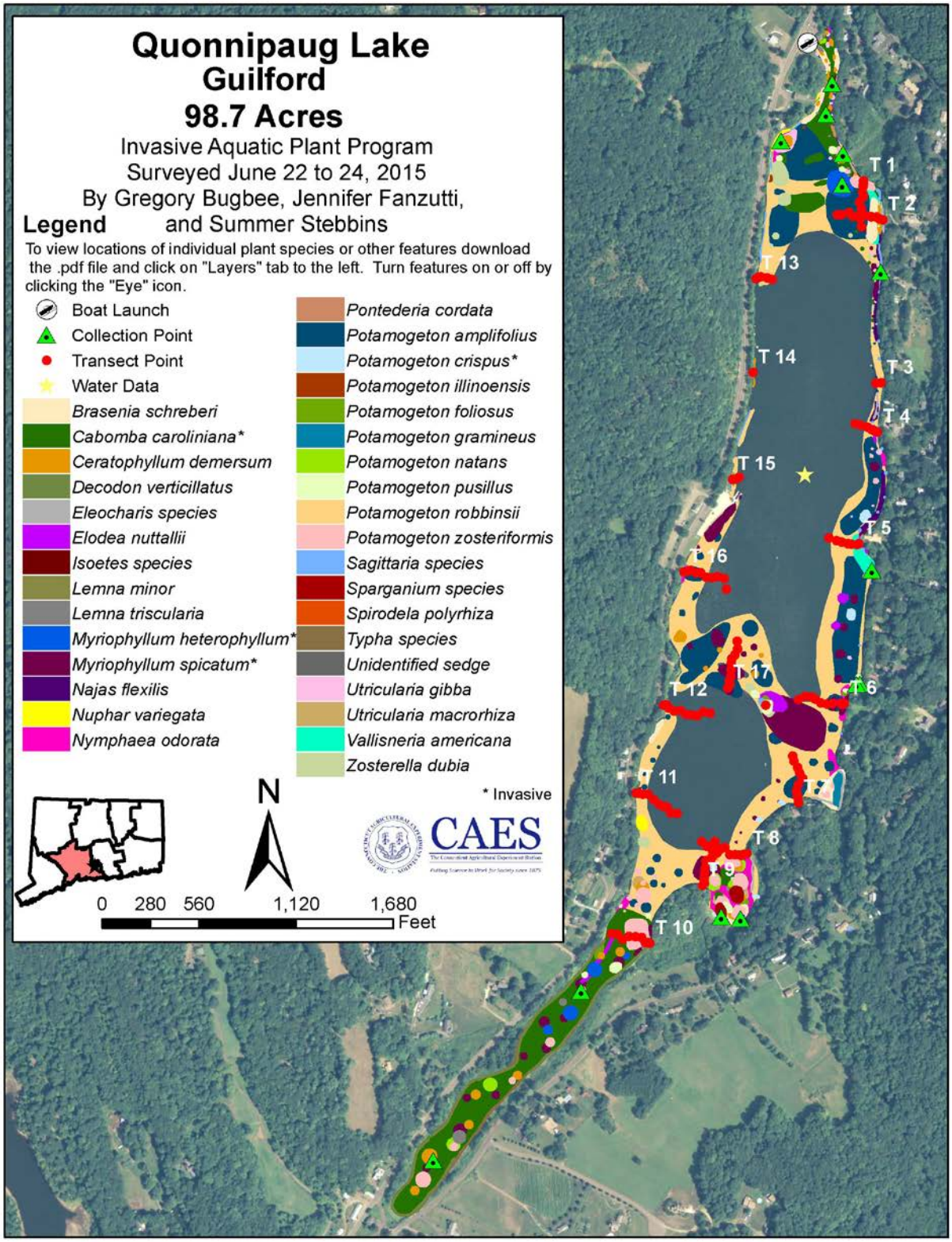


Figure 4. 2015 survey map of Lake Quonnipaug.

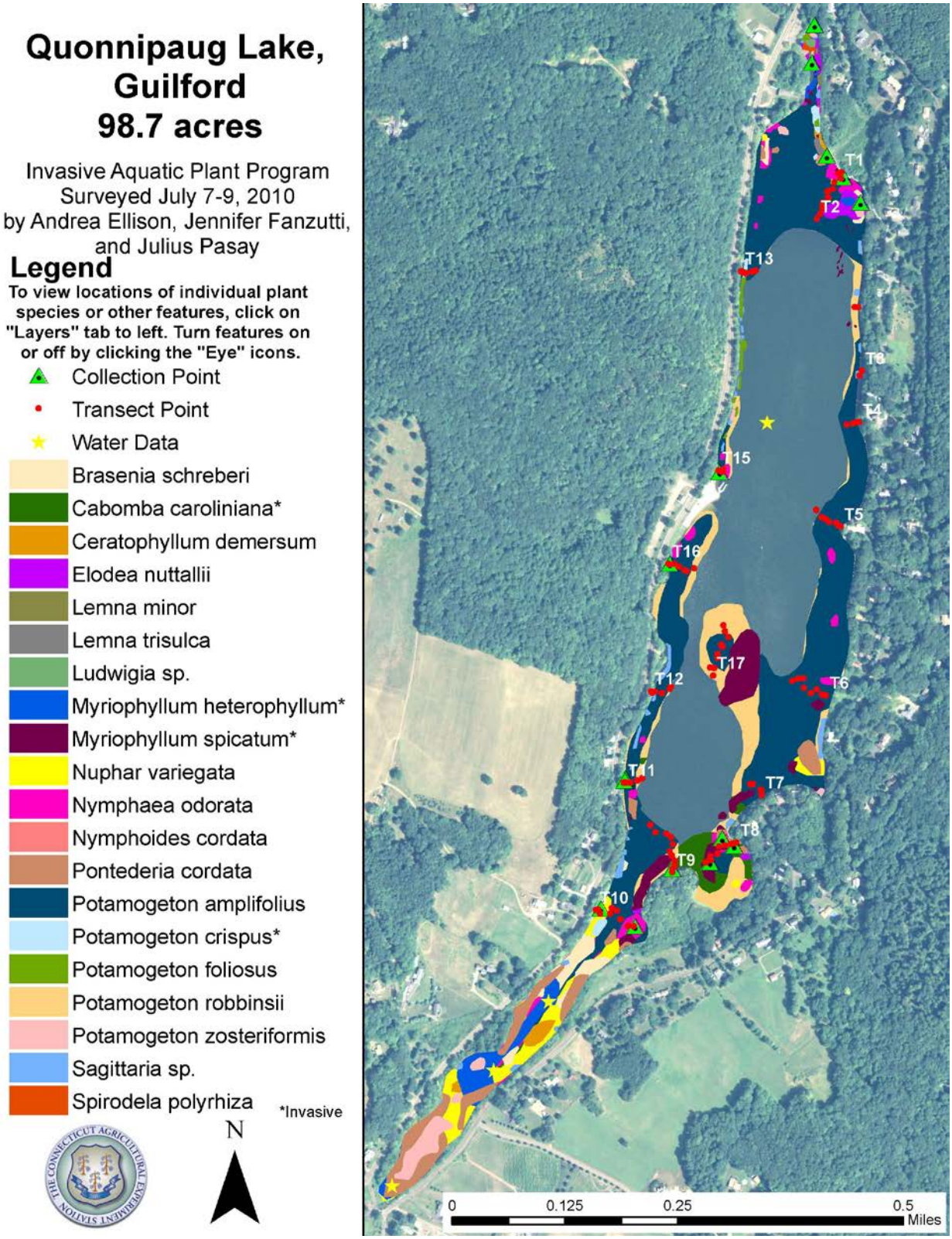


Figure 5. 2010 survey map of Lake Quonnipaug.

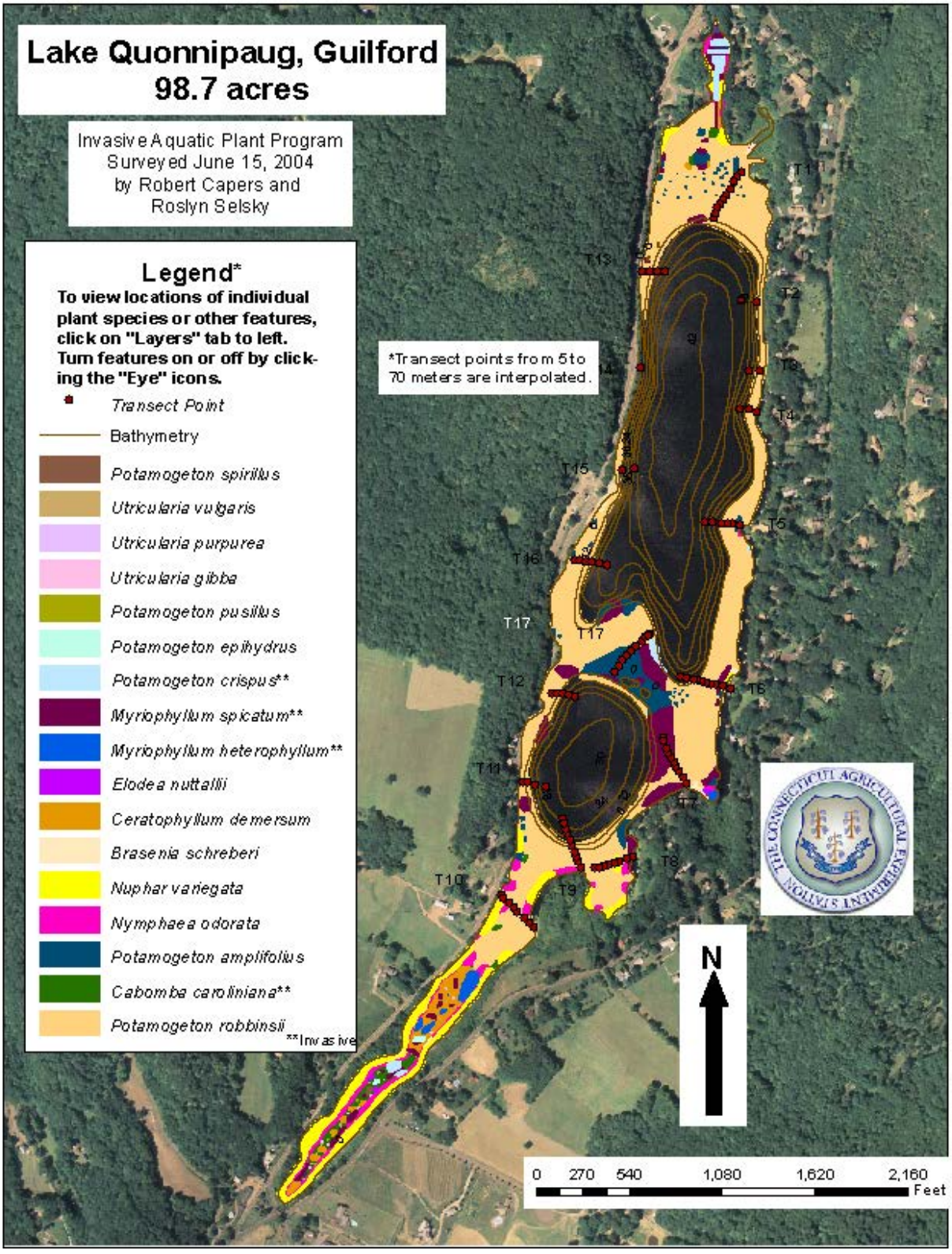


Figure 6. 2004 survey map of Lake Quonnipaug.

Results and Discussion

General Aquatic Plant Surveys and Transects

Our general aquatic plant surveys of Lake Quonnipaug from 2004 - 2020 found 25 - 34 plant species with 44 different aquatic plant species occurring over the four surveys (Table 1). The fewest species found by our general survey was 25 in 2010 and the greatest was 34 in 2015. Except for fanwort, Eurasian watermilfoil, variable-leaf watermilfoil, and curlyleaf pondweed, all were native. Robbins' pondweed (*Potamogeton robbinsii*) and large-leaf pondweed were the native species occupying the largest areas of the lake in all years. Robbins' pondweed is a fern-like, low-growing plant that is rarely a nuisance and by forming a dense mat near the bottom may provide resistance to invasive species. Native large-leaf pondweed reached the surface in large areas in the northern and central portions creating a nuisance to boaters and swimmers.

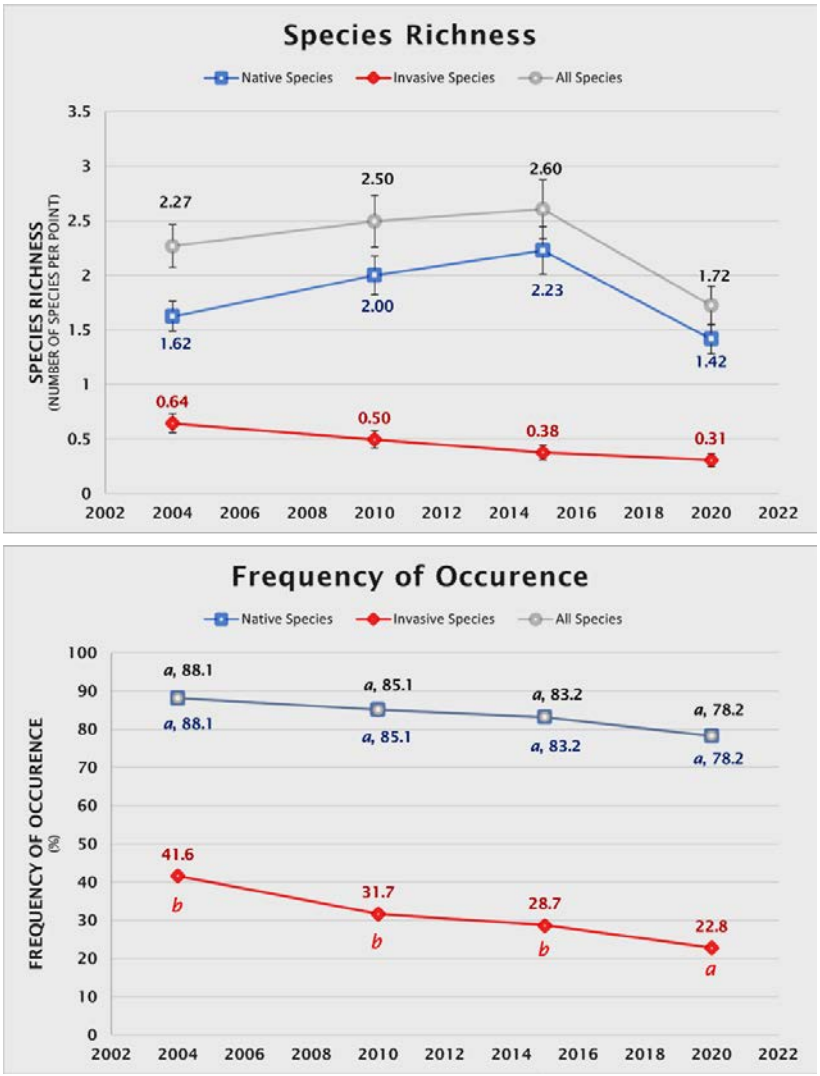


Figure 7. Species richness, the average number of species per transect point, and the frequency of occurrence of native species, invasive species, and all species in Lake Quonnipaug in 2004, 2010, 2015, and 2020.

Figure 8. Floating muck island in the southern cove of Lake Quonnipaug.

Our transect data revealed a statistically significant (± SEM) decrease in the species richness (number of plants species) of invasive species between 2004 and 2020; however, there was no significant change in native species (Figure 7, top). The frequency of occurrence (FOQ) of any species and native species on transects showed no significant difference (Tukey p = 0.05) in any year from 2004 to 2020 (Figure 7, bottom). Invasive species FOQ; however, was significantly lower in 2020 from all previous years largely due to a decrease in Eurasian watermilfoil. The FOQ of native species and all species were nearly identical because there was not a single transect point that had only invasive species. The significant decrease in invasive species, but not in native species suggests the treatments are improving the plant community in the lake. Our transect data does not include the southern cove of the lake, which becomes nearly impassible in the summer from dense stands of invasive fanwort and curlyleaf pondweed and native white water lily (Figure 2). The southern cove also has floating muck islands impeding boat access to the area (Figure 8). Muck islands often occur when water lilies are treated as decaying root systems float to the surface. Sometimes they will sink to the bottom, and other times they will form wetland-like stands when mechanical removal may be necessary.

CAES IAPP State-Listed Species Survey 2020

We performed pre- and post-treatment surveys for the two state-listed plants, water marigold and capillary pondweed, as required by the NDDB Determination No.: 202000699 received by the Town of Guilford on May 29, 2020 (see appendix). According to the determination, water marigold blooms from August to September, and capillary pondweed blooms from July to August. Our pre-treatment survey on August 5th was in the appropriate timeframe to search for these plants (Figure 9). Capillary pondweed has not been found in the lake since 2004, and water marigold has not been found since 2015 (CAES IAPP, 2020). We have performed specific surveys looking for these two plants since 2018 and have not found them. In 2020, all potential specimens collected in the field were identified as Berchtold's pondweed (*Potamogeton berchtoldii*), small pondweed (*Potamogeton pusillus*), and leafy pondweed (*Potamogeton foliosus*).

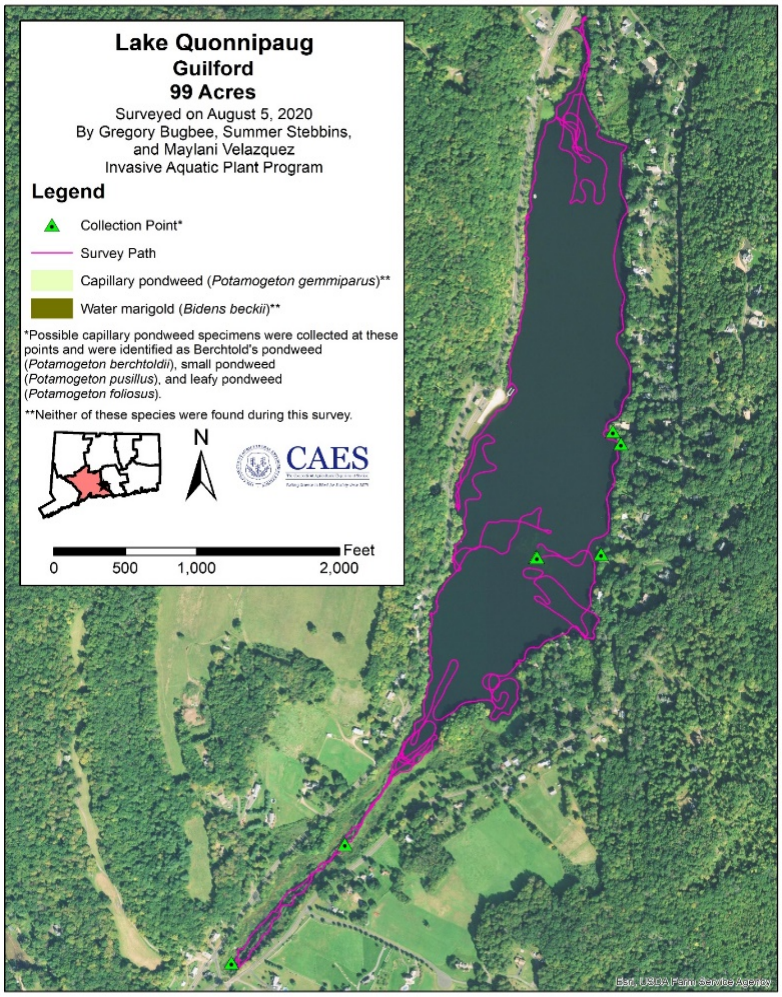


Figure 9. State-Listed species survey of Lake Quonnipaug on August 5, 2020.

Table 2 Water chemistry preferences of invasive plants in Connecticut lakes (CAES IAPP 2020).

Group	Species	Alkalinity mg/L $CaCO_3$	Conductivity µS/cm	pH	Phosphorus µg/L
1	Fanwort Variable watermilfoil	0 - 28	39 - 107	5.6 - 7.0	1 - 27
2	Curlyleaf pondweed Euarasian watermilfoil Minor naiad	17 - 77	108 - 232	6.3 - 8.1	0 - 85

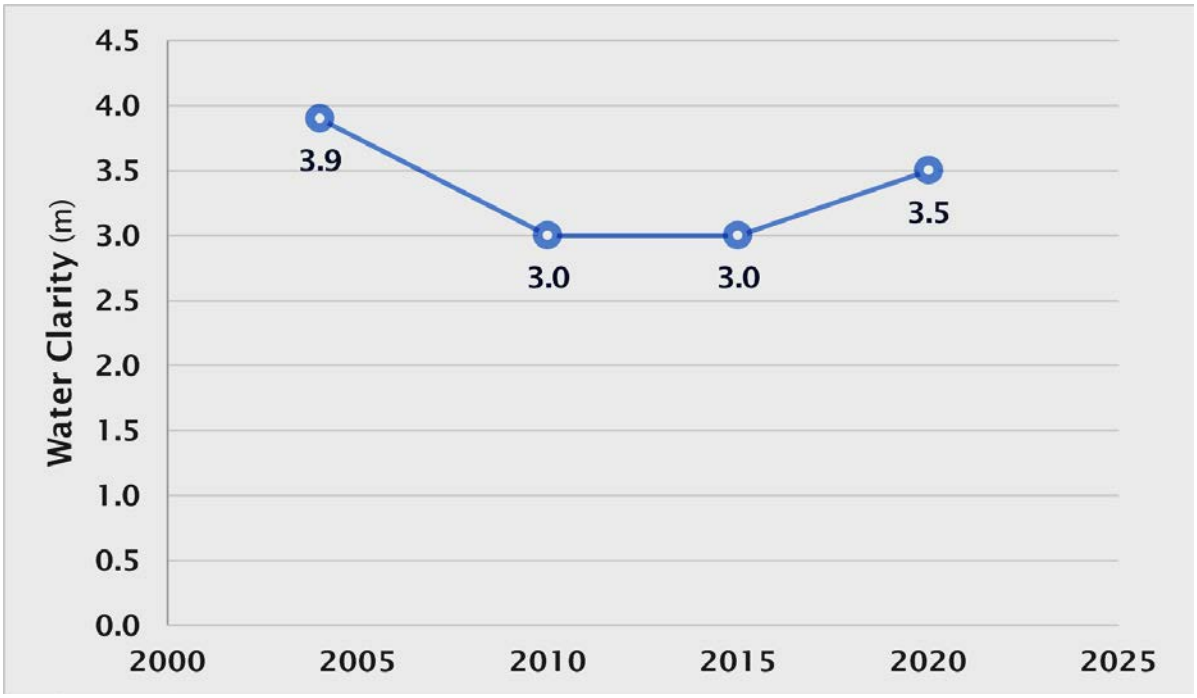


Figure 10. Water clarity in Lake Quonnipaug in 2004, 2010, 2015, and 2020 measured with a Secchi disk.

Water Chemistry

CAES IAPP has found that the occurrence of invasive plants in lakes can be attributed to specific water chemistries (June-Wells et al., 2013). For instance, lakes with higher alkalinities and conductivities are more likely to support Eurasian watermilfoil, curlyleaf pondweed, and minor naiad (*Najas minor*) while lakes with lower

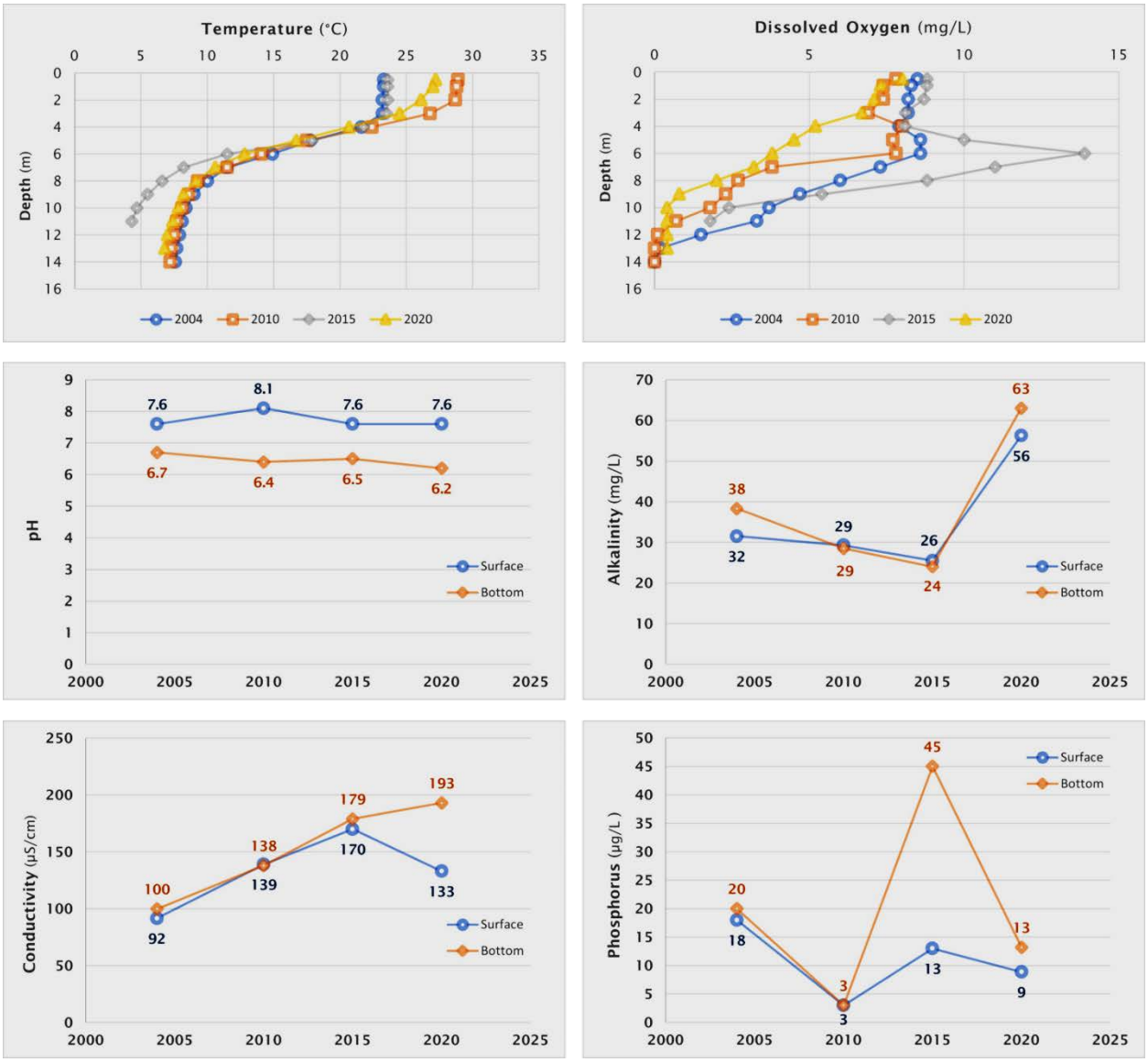


Figure 11. Water chemistry of Lake Quonnipaug in 2004, 2010, 2015, and 2020.

values support fanwort and variable-leaf watermilfoil (Table 2). Invasive zebra mussels (*Dreissena polymorpha*), a problem in nearby lakes, also prefer water in the former category. Water chemistry may be altered when nutrients are utilized by plants, while nutrients not used by plants can support nuisance algal blooms. The water clarity in Lake Quonnipaug (Figure 10) ranged between 3.0 and 3.9 m in the survey years. Poorest clarity (3.0 m) occurred in 2010 and 2015 suggesting more recent changes in the plant community and management practices may have caused an improvement. Because the measurements were made in June when Connecticut lakes

are often the clearest, this may not reflect conditions later in the summer. Water clarities in Connecticut's lakes ranged from 0.3 - 10 m with an average of 2.3 m (CAES IAPP, 2020). Thus, the clarity of Lake Quonnipaug ranks slightly above the average.

Water temperature in Lake Quonnipaug ranged from 23 - 29°C at the surface and from 4 – 8°C near the bottom (Figure 11, top left). The thermocline (depth where water temperature showed a rapid decline) was between 3 and 7 m each year. Similarly, dissolved oxygen concentrations (Figure 11, top right) were high from 0 - 3 meters and rapidly declined to an anaerobic condition at depths greater than 6 m. Anaerobic bottom conditions favor phosphorus release from the sediment which can mix with surface water and promote algal growth.

The pH of Lake Quonnipaug's water ranged from 7.6 - 8.1 at the surface and from 6.2 - 6.7 near the bottom (Figure 11, middle left). Higher pH (less acidic) near the surface is consistent with daytime removal of carbon dioxide by algae and aquatic plants. Lake Quonnipaug's alkalinity ranged from 26 - 56 mg/L $CaCO_3$ at the surface with no trends throughout the survey years (Figure 11, middle right). Bottom water alkalinity was slightly higher in 2004 and 2020 and ranged between 24 and 63 mg/L $CaCO_3$. As with the surface alkalinity, there was no trend throughout the survey years.

Conductivity is an indicator of dissolved ions that come from natural and man-made sources (mineral weathering, organic matter decomposition, fertilizers, septic systems, road salts, etc.). The conductivities of Lake Quonnipaug's water generally showed an upward trend throughout the survey years (Figure 11, bottom left). The levels were similar at the surface and bottom but at the surface, rose from 92 µS/cm in 2004 to near 170 µS/cm in 2015 and then decreased to 133 µS/cm in 2020. Near the bottom, conductivity rose from 100 µS/cm in 2004 to 193 µS/cm in 2020. The conductivity for Connecticut lakes average near 95 µS/cm, and thus Lake Quonnipaug would be considered above average (CAES IAPP, 2020).

A key parameter used to categorize a lake's trophic state is the concentration of total phosphorus (P) in the water column. High levels of P can cause problematic

algal blooms (Frink and Norvell, 1984) while rooted macrophytes are less affected as they obtain most nutrients from the substrate (Bristow and Whitcombe, 1971). Lakes with P levels from 0 - 10 µg/L are considered nutrient-poor or oligotrophic. When P concentrations reach 15 - 25 µg/L, lakes are classified as moderately fertile or mesotrophic and when P reaches 30 - 50 µg/L they are considered fertile or eutrophic (Frink and Norvell, 1984). Lakes with P concentrations over 50 µg/L are categorized as extremely fertile or hypereutrophic. Surface total P concentrations in Lake Quonnipaug declined from 18 µg/L in 2004 to 9 µg/L in 2020 with a low of 3 µg/L in 2010 (Figure 11, bottom right). This could be due to P uptake by the greater biomass of aquatic plants, changes in watershed inputs or random events. A decline in P, during the survey years, was not evident in the bottom water with total P varying from 20 µg/L in 2004, to 3 µg/L in 2010, to 45 µg/L in 2015 and 13 µg/L in 2020. Increased P in the bottom water is common during the summer as anoxic conditions release P from the sediment (Frink and Norvell 1984).

Lake Quonnipaug's alkalinity, conductivity, and phosphorus levels categorize the lake as highly susceptible to invasion from curlyleaf pondweed, Eurasian watermilfoil, and minor naiad as well as some susceptibility to fanwort and variable-leaf watermilfoil (June-Wells et al. 2013). With the possible exception of minor naiad, this has already occurred. Minor naiad is a seed-borne annual that begins growth in the early summer and can easily be missed in June surveys. Zebra mussels are currently present in the Housatonic River and associated lakes. Lake Quonnipaug's water chemistry makes it a prime candidate for zebra mussel invasion.

Aquatic Plant Management Options

Past treatments of the north cove and middle shoals of Lake Quonnipaug have successfully reduced plant growth in the treatment year. This will help prevent the spread of invasive species to other water-bodies from boats and trailers leaving the lake (CAES IAPP, 2020). After treatments, the area just outside of the north cove had no invasive species, but the large-leaf pondweed and Robbins' pondweed showed leaf dieback and living stems (Figure 12, top). The central shoal area was similar with no invasive species but browned-out large-leaf pondweed and Robbins' pondweed. The southern cove of the lake showed regrowth from a marginally effective treatment. Because the southern cove was only treated with glyphosate to control emersed vegetation (i.e., water lilies), abundant growth of fanwort and other submersed species was evident, and access to the southern cove by boat was nearly impossible (Figure 12, bottom). Native species such as primrose-willow (*Ludwigia* species) and coontail (*Ceratophyllum demersum*) were unaffected by the treatment. Areas outside of the treatment areas were unaffected with clear water and an abundance of plant species. Water marigold has not been found since before the 2016 treatments and therefore may have been adversely affected.

Conclusion

Lake Quonnipaug is an extremely diverse lake with 44 different aquatic plant species recorded on surveys in 2004, 2010, 2015, and 2020. The invasive species, fanwort, Eurasian watermilfoil, curlyleaf pondweed, and variable-leaf watermilfoil, are present in the lake posing a risk to the diverse native plant community as well as impeding recreation including boating, swimming, and high school rowing. Native species richness and frequency have not changed significantly from 2004 to 2020, but the frequency of invasive species has significantly decreased suggesting the treatments are having the intended impact on the lake. State-listed species surveys over the past three years conclude the absence of water marigold and capillary pondweed in Lake Quonnipaug. The north cove and shoaling have seen a successful reduction in invasive plants; however, the southern cove is suffering from a dominating stand of fanwort, other nuisance native and invasive species, and floating muck islands.

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References

American Public Health Association. 1995. Standard methods for the examination of water and wastewater. 19th ed. American Public Health Association, 1015 Fifteenth St. NW Washington, DC 2005. 4:108-116.

Bristow JM and Whitcombe M. 1971. The role of roots in the nutrition of aquatic vascular plants. Amer. J. Bot., 58:8-13.

CAES IAPP. 2020. The Connecticut Agricultural Experiment Station Invasive Aquatic Plant Program (CAES IAPP). Retrieved December 15, 2020. https://portal.ct.gov/caes-iapp.

Frink CR and Norvell WA. 1984. Chemical and physical properties of Connecticut lakes. Conn. Agric. Exp. Sta. Bull. 817.

June-Wells MF, Gallagher J, Gibbons JA, Bugbee GJ. 2013. Water chemistry preferences of five nonnative aquatic macrophyte species in Connecticut: A preliminary risk assessment tool. Lake and Reservoir Management. 29:303-316.

Appendix

Invasive Plant Descriptions

Cabomba caroliniana

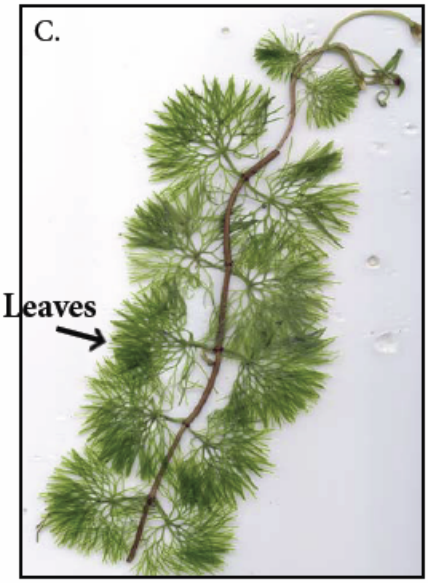

Photo by CAES IAPP

Common names:
Fanwort
Carolina fanwort

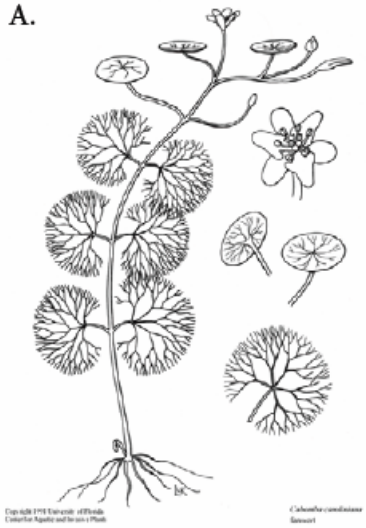
Origin:
Southeast United States
South America

Key features:
Plants are submersed
Stems: Can be 6 feet (2 m) long
Leaves: Dissected, opposite leaves 0.8-2 inches (2-5 cm) are fan-like and made up of forked leaflets attached to the stem by a petiole. Floating leaves 0.2-0.8 inches (6-20 mm) wide are oblong and produced on flower shoots
Flowers: Small, solitary flowers are usually white to pinkish
Fruits/Seeds: Flask shaped
Reproduction: Seed and fragmentation

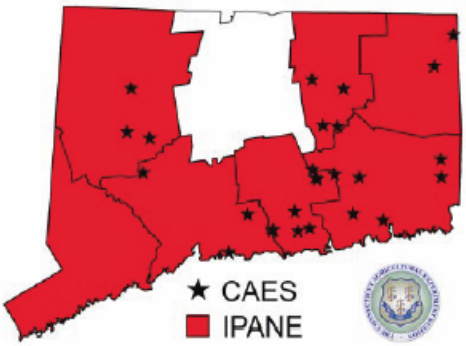
Easily confused species:
Watermilfoils: *Myriophyllum* spp.
White water crowfoot: *Ranunculus longirostris*
Water marigold: *Megalodonta beckii*



A.



A. Copyright 1991 Univ. of Florida, Center for Aquatic and Invasive Plants
B. Copyright 2002 Univ. of Florida, Photo by A. Murray
C. Photo by A. Smagula



Myriophyllum heterophyllum

Common names:
Variable-leaf watermilfoil
Variable watermilfoil
Two-leaf watermilfoil

Origin:
Southern United States

Key features:
Plants are submersed

Stems: Dark brown stems extend to the water's surface and spread to form large mats

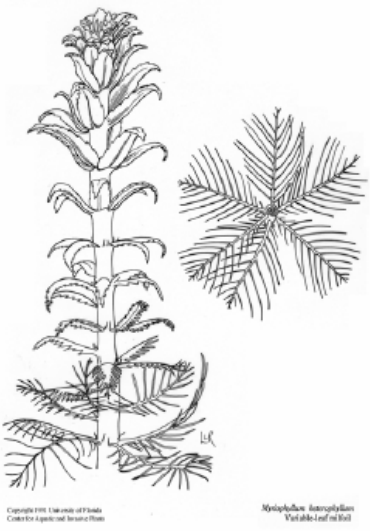
Leaves: Triangular with ≤ 11 pairs of leaflets. Leaves are dissected and whorled (4-6 leaves/whorl) resulting in a feathery appearance with leaf whorls < 1 inch apart giving it a ropy appearance

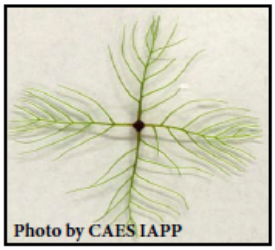
Flowers: Inflorescence spike 2-14 inches (5-35 cm) long extend beyond the water's surface with flowers in whorls of four with reddish petals

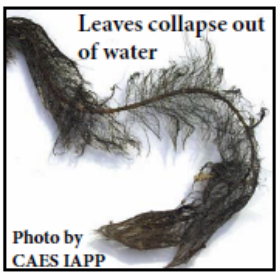
Fruits/Seeds: Fruits are almost round, with a rough surface

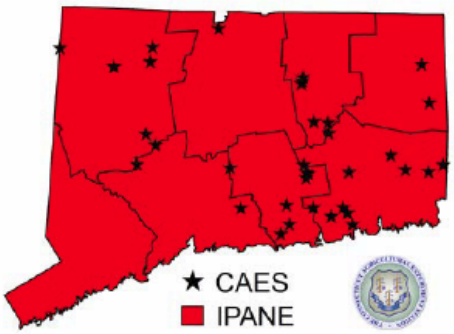
Reproduction: Fragmentation and seeds

Easily confused species:
Eurasian watermilfoil: *Myriophyllum spicatum*
Low watermilfoil: *Myriophyllum humile*









Myriophyllum spicatum


Photo by CAES IAPP

Common name:
Eurasian watermilfoil

Origin:
Europe and Asia

Key features:
Plants are submersed

Stems: Stem diameter below the inflorescence is greater with reddish stem tips

Leaves: Leaves are rectangular with ≥ 12 pairs of leaflets per leaf and are dissected giving a feathery appearance, arranged in a whorl, whorls are 1 inch (2.5 cm) apart

Flowers: Small pinkish male flowers that occur on reddish spikes, female flowers lack petals and sepals and have 4 lobed pistil

Fruits/Seeds: Fruit are round 0.08-0.12 inches (2-3 mm) and contain 4 seeds

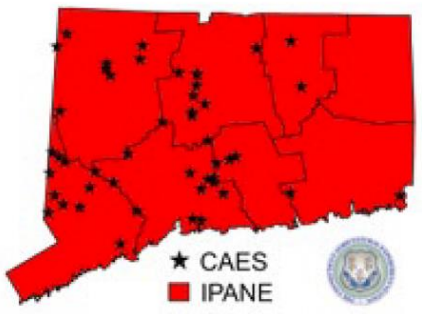
Reproduction: Fragmentation and seeds

Easily confused species:
Variable-leaf watermilfoil: *Myriophyllum heterophyllum*
Low watermilfoil: *Myriophyllum humile*
Northern watermilfoil: *Myriophyllum sibiricum*
Whorled watermilfoil: *Myriophyllum verticillatum*


Photo by CAES IAPP


Photo by CAES IAPP


Photo by CAES IAPP



Potamogeton crispus

Common names:
Curly leaf pondweed
Crispy-leaved pondweed
Crisped pondweed

Origin:
Asia, Africa, and Europe

Key features:
Plants are submersed

Stems: Stems are flattened, can form dense stands in water up to 15 feet (5 m) deep

Leaves: Alternate leaves 0.3-1 inches (3-8 cm) wide with wavy edges (similar to lasagna) with a prominent mid-vein

Flowers: Brown and inconspicuous

Fruits/Seeds: Fruit is oval 0.1 inches (3 mm) long

Reproduction: Turions (right) and seeds

Easily confused species:
None

Natural Diversity Database Determination No.: 202000699

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

May 29, 2020

Mr. Kevin Magee
Town of Guilford
50 Boston Street
Guilford, CT 06437
mageek@ci.guilford.ct.us

Project: Aquatic Plant Control in Lake Quonnipaug using Diquat and Clipper to Control Fanwort, Curlyleaf Pondweed, Eurasian Milfoil and Water Lilies, Durham Rd (RTE 77), Guilford, Connecticut
NDDB Determination No.: 202000699 (201903219 --REVISED)

Dear Kevin Magee,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map provided for the proposed aquatic plant control in Lake Quonnipaug using Diquat and Clipper to control Fanwort, Curlyleaf Pondweed, Eurasian Milfoil and Water Lilies, Durham Rd (RTE 77), Guilford, Connecticut. Thank you for including the aquatic plant survey reports for Lake Quonnipaug completed by Gregory Bugbee, CT Agricultural Experiment Station, for the years 2016, 2017 and 2019. Although no state listed plants were discovered as part of these surveys, these investigations allow the treatment of this lake for invasive aquatic plants while continuing to protect state listed species from potential adverse impacts following chemical treatment.

PLANT SPECIES

According to our records, the following State-listed plant species have been documented at Lake Quonnipaug:

- **Water-marigold (*Bidens beckii*)**
  Protection Status: State Special Concern
  Habitat: Circumneutral ponds and slow rivers. Blooms Aug – Sep.

- **Capillary pondweed (*Potamogeton gemmiparus*)**
  Protection Status: State Threatened
  Habitat: Quiet waters of ponds and streams. Blooms Jul-Aug.
  Capillary pondweed is a globally rare endemic of the New England states and nearby Quebec. At this time, only six populations are known to exist in Connecticut.

To prevent impacts to the State Threatened Capillary pondweed and Water-marigold, I recommend the following strategies for each effective year of this determination:

Plant surveys should be done each year during the time these plants would be visible. The surveys must focus on locating the two state listed species (*Bidens beckii* and *Potamogeton gemmiparus*). Please contact The Native Plant Trust to find a qualified botanist familiar with this plant.

Survey reports should also include short and long term treatment recommendations by your qualified aquatic botanist to both protect any observed state listed plant species while selecting chemical treatments that will control the invasive plants that are being targeted. The results of the aquatic plant surveys and protection strategies by your qualified aquatic plant botanist should be forwarded to the Natural Diversity Data Base (deep.nddbrequest@ct.gov) for review – not later than December 31st of each year of the effective term of this determination.

Given that Capillary pondweed can be difficult to distinguish from closely related species, I recommend that aquatic plant surveys be conducted by, or in collaboration with, an individual who has a demonstrated ability to identify this State Threatened plant. **Please contact The Native Plant Trust to find a qualified botanist familiar with this**

plant. Previous collections of this species may be found in the George Safford Torrey Herbarium at the University of Connecticut Storrs Campus. Please also refer to *Flora Novae Angliae* (Arthur Haines; 2011) for recent information regarding the identification of this species.

No treatments should occur in areas where *Bidens beckii* and *Potamogeton gemmiparus* are observed. In addition, herbicides should not be applied within a 50' buffer of *Bidens beckii* and *Potamogeton gemmiparus* known locations. If a state-listed plant is observed, a map showing the plant location(s) and the area(s) treated should be submitted to the Natural Diversity Data Base (deep.nddbrequest@ct.gov) not later than December 31st of each year of the effective term of this determination.

FISH SPECIES

According to our information, there are records of **Bridle shiner (*Notropis bifrenatus*; State Special Concern)** in the vicinity of this project. Please be advised that a DEEP Fisheries Biologist will review the permit applications you may submit to DEEP regulatory programs to determine if your project could adversely affect bridle shiner. DEEP Fisheries Biologists are routinely involved in pre-application consultations with regulatory staff and applicants in order to identify potential fisheries issues and work with applicants to mitigate negative effects, including to endangered species. If you have not already talked with a Fisheries Biologist about your project, you may contact the Permit Analyst assigned to process your application for further information, including the contact information for the Fisheries Biologist assigned to review your application.

Please re-submit an NDDB Request for Review if the scope of work changes or if work has not begun on this project by December 31, 2021.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available. The result of this review does not preclude the possibility that listed species may be encountered on site and that additional action may be necessary to remain in compliance with certain state permits.

Please contact me if you have further questions at (860) 424-3592, or dawn.mckay@ct.gov . Thank you for consulting the Natural Diversity Data Base.

Sincerely,

Dawn M. McKay

Dawn M. McKay
Environmental Analyst 3

Transect Data

Appendix Lake Quonnipaug Transect Data 2004 (1 of 3)

Transect	Point	Distance from Shore (m)	Latitude	Longitude	Date	CabCar	CerDem	EloCan	MyrHet	MyrSpi	NajFle	NupVar	NymOdo	PotAmp	PotBer	PotCri	PotPus	PotRob	PotZos	SagSpp	UtrPur	ValAme	ZosDub
1	1	0	41.39642	-72.69589	6/16/2004	2	0	0	2	2	0	0	2	2	0	0	0	5	0	0	0	0	0
1	2	10	41.39642	-72.69589	6/16/2004	1	0	0	0	2	0	0	0	2	0	0	0	5	0	1	1	0	0
1	3	20	41.39642	-72.69589	6/16/2004	3	0	0	2	2	0	0	0	0	0	0	0	5	0	3	0	0	0
1	4	30	41.39642	-72.69589	6/16/2004	1	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0
1	5	40	41.39642	-72.69589	6/16/2004	3	1	0	0	4	0	0	0	4	0	0	0	5	0	0	0	0	0
1	6	50	41.39569	-72.69647	6/16/2004	2	3	0	0	3	0	0	0	4	0	0	0	5	0	0	0	0	0
1	7	60	41.39569	-72.69647	6/16/2004	1	5	0	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0
1	8	70	41.39569	-72.69647	6/16/2004	1	0	0	0	0	0	0	0	4	0	0	0	5	0	0	0	0	0
1	9	80	41.39569	-72.69647	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
1	10	90	41.39569	-72.69647	6/16/2004	0	0	0	0	1	0	0	0	5	0	0	0	4	0	0	0	0	0
2	1	0	41.39433	-72.69558	6/16/2004	2	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0
2	2	10	41.39436	-72.69589	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	0	41.39325	-72.69550	6/16/2004	0	0	0	0	1	0	0	0	0	0	2	0	5	0	0	0	0	0
3	2	10	41.39325	-72.69572	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	0	41.39258	-72.69556	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
4	2	10	41.39264	-72.69592	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
4	3	20	41.39264	-72.69592	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
5	1	0	41.39078	-72.69592	6/16/2004	1	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0
5	2	10	41.39078	-72.69592	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
5	3	20	41.39078	-72.69592	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
5	4	30	41.39083	-72.69667	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
5	5	40	41.39083	-72.69667	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
5	6	50	41.39083	-72.69667	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
6	1	0	41.38817	-72.69614	6/16/2004	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0
6	2	10	41.38817	-72.69614	6/16/2004	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	3	20	41.38817	-72.69614	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
6	4	30	41.38817	-72.69614	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
6	5	40	41.38817	-72.69614	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
6	6	50	41.38836	-72.69719	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	7	60	41.38836	-72.69719	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8	70	41.38836	-72.69719	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	9	80	41.38836	-72.69719	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10	90	41.38836	-72.69719	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0	41.38667	-72.69706	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
7	2	10	41.38667	-72.69706	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
7	3	20	41.38667	-72.69706	6/16/2004	0	0	0	0	0	0	0	0	4	0	0	0	5	0	0	0	0	0
7	4	30	41.38667	-72.69706	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
7	5	40	41.38667	-72.69706	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
7	6	50	41.38739	-72.69756	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
7	7	60	41.38739	-72.69756	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2004 (2 of 3)

Transect	Point	Distance from Shore (m)	Latitude	Longitude	Date	CabCar	CerDem	EloCan	MyrHet	MyrSpi	NajFle	NupVar	NymOdo	PotAmp	PotBer	PotCri	PotPus	PotRob	PotZos	SagSpp	UtrPur	ValAme	ZosDub
7	8	70	41.38739	-72.69756	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
7	9	80	41.38739	-72.69756	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
7	10	90	41.38739	-72.69756	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
8	1	0	41.38550	-72.69819	6/16/2004	3	0	4	0	4	0	0	1	2	0	0	0	0	0	0	0	0	2
8	2	10	41.38550	-72.69819	6/16/2004	2	0	5	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0
8	3	20	41.38550	-72.69819	6/16/2004	0	0	2	0	1	0	0	0	3	0	0	0	5	0	0	0	0	0
8	4	30	41.38550	-72.69819	6/16/2004	2	0	2	0	2	0	0	0	2	0	0	0	5	0	0	0	0	0
8	5	40	41.38531	-72.69900	6/16/2004	1	0	0	0	1	0	0	0	2	0	0	0	5	0	0	0	0	0
8	6	50	41.38531	-72.69900	6/16/2004	2	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
8	7	60	41.38531	-72.69900	6/16/2004	2	0	0	0	2	0	0	0	3	0	0	0	5	0	0	0	0	0
8	8	70	41.38531	-72.69900	6/16/2004	2	0	0	1	4	0	0	0	4	0	0	0	0	0	0	0	0	4
9	1	0	41.38531	-72.69931	6/16/2004	0	0	1	0	5	0	0	0	0	0	0	0	1	0	0	0	0	4
9	2	10	41.38531	-72.69931	6/16/2004	0	0	0	0	4	0	0	0	5	0	0	0	4	0	0	0	0	3
9	3	20	41.38531	-72.69931	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
9	4	30	41.38531	-72.69931	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
9	5	40	41.38531	-72.69931	6/16/2004	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	0	0	0
9	6	50	41.38611	-72.69969	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
9	7	60	41.38611	-72.69969	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
9	8	70	41.38611	-72.69969	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	9	80	41.38611	-72.69969	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
9	10	90	41.38611	-72.69969	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	41.38436	-72.70031	6/16/2004	4	1	5	4	2	0	0	2	2	0	0	0	1	3	0	0	0	0
10	2	10	41.38436	-72.70031	6/16/2004	3	0	0	0	1	0	0	3	2	0	0	0	5	0	0	0	0	0
10	3	20	41.38436	-72.70031	6/16/2004	0	0	0	0	1	0	0	0	3	0	0	0	5	0	0	0	0	0
10	4	30	41.38436	-72.70031	6/16/2004	2	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
10	5	40	41.38489	-72.70100	6/16/2004	0	0	0	0	1	0	0	0	2	0	0	0	5	0	0	0	0	0
10	6	50	41.38489	-72.70100	6/16/2004	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0
10	7	60	41.38489	-72.70100	6/16/2004	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0
10	8	70	41.38489	-72.70100	6/16/2004	1	0	1	0	2	1	0	3	1	2	0	1	5	0	1	0	2	1
11	1	0	41.38669	-72.70053	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
11	2	10	41.38669	-72.70053	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
11	3	20	41.38661	-72.70006	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	4	30	41.38661	-72.70006	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0	41.38811	-72.69992	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
12	2	10	41.38811	-72.69992	6/16/2004	0	0	0	0	4	0	0	0	0	0	0	0	5	0	0	0	0	0
12	3	20	41.38811	-72.69992	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12	4	30	41.38806	-72.69944	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12	5	40	41.38806	-72.69944	6/16/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	41.39483	-72.69800	6/17/2004	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
13	2	10	41.39483	-72.69800	6/17/2004	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2004 (3 of 3)

Transect	Point	Distance from Shore (m)	Latitude	Longitude	Date	CabCar	CerDem	EloCan	MyrHet	MyrSpi	NajFle	NupVar	NymOdo	PotAmp	PotBer	PotCri	PotPus	PotRob	PotZos	SagSpp	UtrPur	ValAme	ZosDub
13	3	20	41.39483	-72.69750	6/17/2004	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0
13	4	30	41.39483	-72.69750	6/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
14	1	0	41.39328	-72.69803	6/17/2004	0	0	1	0	0	0	0	0	0	0	0	1	5	0	0	0	2	0
15	1	0	41.39167	-72.69842	6/17/2004	1	0	0	0	0	0	0	0	3	0	0	0	5	0	3	0	2	0
15	2	10	41.39169	-72.69817	6/17/2004	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	1	0	41.39022	-72.69944	6/17/2004	2	0	2	0	0	0	0	0	2	0	0	0	5	0	2	0	0	0
16	2	10	41.39022	-72.69944	6/17/2004	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	0	0
16	3	20	41.39022	-72.69944	6/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
16	4	30	41.39014	-72.69875	6/17/2004	1	0	0	0	0	0	0	0	1	0	0	0	5	0	0	0	0	0
16	5	40	41.39014	-72.69875	6/17/2004	0	0	0	0	0	0	0	0	0	0	2	0	5	0	0	0	0	0
16	6	50	41.39014	-72.69875	6/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
17	1	0	41.38844	-72.69858	6/17/2004	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
17	2	10	41.38844	-72.69858	6/17/2004	0	0	0	0	0	0	0	0	4	0	0	0	5	0	0	0	0	0
17	3	20	41.38844	-72.69858	6/17/2004	0	0	0	0	2	0	0	0	5	0	0	0	3	0	0	0	0	0
17	4	30	41.38844	-72.69858	6/17/2004	0	0	0	0	0	0	0	0	4	0	0	0	5	0	0	0	0	0
17	5	40	41.38844	-72.69858	6/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	6	50	41.38906	-72.69783	6/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	7	60	41.38906	-72.69783	6/17/2004	1	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	0	0
17	8	70	41.38906	-72.69783	6/17/2004	0	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	9	80	41.38906	-72.69783	6/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	10	90	41.38906	-72.69783	6/17/2004	2	0	0	0	4	0	0	0	4	0	0	0	5	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2010 (1 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BidBec	Brasch	CabCar	CerDem	ElaSpp	EloNut	LemMin	MyrHet	MyrSpi	NupVar	NymOdo	PonCor	PotAmp	PotCri	PotFol	PotRob	PotZos	SagSpp	Sedge	SpaSpp	ZosDub
1	1	0	Greg Bugbee	41.39648	-72.69586	7/7/2010	0.5	Muck	0	0	1	0	0	0	0	1	0	1	3	0	3	0	0	2	2	0	1	0	0
1	2	5	Greg Bugbee	41.39645	-72.69592	7/7/2010	1.0	Muck	0	0	1	0	0	0	0	0	0	0	3	0	3	0	0	3	0	0	2	0	0
1	3	10	Greg Bugbee	41.39638	-72.69587	7/7/2010	1.0	Muck	0	0	1	0	0	1	1	1	1	0	0	0	3	0	0	3	1	0	1	0	0
1	4	20	Greg Bugbee	41.39632	-72.69601	7/7/2010	1.5	Muck	0	0	1	1	0	0	0	0	1	0	0	0	3	0	0	3	0	0	2	0	0
1	5	30	Greg Bugbee	41.39621	-72.69604	7/7/2010	2.0	Muck	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0
1	6	40	Greg Bugbee	41.39617	-72.69615	7/7/2010	2.0	Muck	0	0	1	0	0	0	0	0	1	0	0	0	3	0	0	4	1	0	0	0	0
1	7	50	Greg Bugbee	41.39607	-72.69614	7/7/2010	2.0	Muck	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	3	1	0	0	0	0
1	8	0	Greg Bugbee	41.39599	-72.69625	7/7/2010	2.0	Muck	0	0	0	1	0	0	0	0	2	0	0	0	2	0	0	3	1	0	0	0	0
1	9	70	Greg Bugbee	41.39591	-72.69626	7/7/2010	2.0	Muck	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	3	0	0	0	0	0
1	10	80	Greg Bugbee	41.39581	-72.69631	7/7/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	0	0
2	1	0.5	Greg Bugbee	41.39431	-72.69550	7/7/2010	1.5	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0
2	2	5	Greg Bugbee	41.39431	-72.69558	7/7/2010	3.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
3	1	0	Greg Bugbee	41.39329	-72.69542	7/7/2010	0.5	Muck	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
3	2	5	Greg Bugbee	41.39321	-72.69547	7/7/2010	3.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
4	1	0	Greg Bugbee	41.39246	-72.69549	7/7/2010	0.5	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
4	2	5	Greg Bugbee	41.39247	-72.69553	7/7/2010	1.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
4	3	10	Greg Bugbee	41.39245	-72.69561	7/7/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
5	1	0	Greg Bugbee	41.39079	-72.69588	7/7/2010	1.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
5	2	5	Greg Bugbee	41.39081	-72.69593	7/7/2010	1.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	0	0	0
5	3	10	Greg Bugbee	41.39085	-72.69598	7/7/2010	1.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
5	4	20	Greg Bugbee	41.39086	-72.69612	7/7/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
5	5	30	Greg Bugbee	41.39091	-72.69620	7/7/2010	2.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
5	6	40	Greg Bugbee	41.39094	-72.69629	7/7/2010	5.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
5	7	50	Greg Bugbee	41.39106	-72.69640	7/8/2010	7.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	2	5	Greg Bugbee	41.38808	-72.69620	7/8/2010	0.5	Muck	0	0	2	0	0	0	0	0	0	4	0	0	2	0	0	5	0	2	0	0	0
6	3	10	Greg Bugbee	41.38810	-72.69627	7/8/2010	0.5	Muck	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0
6	4	20	Greg Bugbee	41.38817	-72.69638	7/8/2010	1.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	0	0
6	5	30	Greg Bugbee	41.38812	-72.69651	7/8/2010	1.6	Muck	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0
6	6	40	Greg Bugbee	41.38820	-72.69666	7/8/2010	4.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
6	7	50	Greg Bugbee	41.38835	-72.69668	7/8/2010	6.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8	60	Greg Bugbee	41.38835	-72.69679	7/8/2010	6.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	9	70	Greg Bugbee	41.38831	-72.69691	7/8/2010	6.7	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0	Greg Bugbee	41.38648	-72.69756	7/8/2010	0.5	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
7	2	5	Greg Bugbee	41.38654	-72.69757	7/8/2010	1.1	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
7	3	10	Greg Bugbee	41.38657	-72.69758	7/8/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
7	4	20	Greg Bugbee	41.38666	-72.69775	7/8/2010	5.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	5	30	Greg Bugbee	41.38666	-72.69780	7/8/2010	5.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	0	Greg Bugbee	41.38572	-72.69810	7/8/2010	0.5	Muck	0	0	1	2	0	0	3	0	0	1	3	0	2	0	0	0	0	0	1	0	0
8	2	5	Greg Bugbee	41.38570	-72.69816	7/8/2010	1.0	Muck	0	0	1	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
8	3	10	Greg Bugbee	41.38570	-72.69823	7/8/2010	1.0	Muck	0	0	2	1	0	0	0	0	2	0	1	0	3	0	0	4	2	0	0	0	0
8	4	20	Greg Bugbee	41.38567	-72.69834	7/8/2010	1.0	Muck	0	0	3	0	0	2	0	0	3	0	0	0	3	0	0	4	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2010 (2 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BidBec	Brasch	CabCar	CerDem	ElaSpp	EloNut	LemMin	MyrHet	MyrSpi	NupVar	NymOdo	PonCor	PotAmp	PotCri	PotFol	PotRob	PotZos	SagSpp	Sedge	SpaSpp	ZosDub
8	5	30	Greg Bugbee	41.38566	-72.69848	7/8/2010	2.5	Muck	0	0	3	0	0	0	0	0	3	0	0	0	0	0	2	3	0	0	0	0	0
8	6	40	Greg Bugbee	41.38554	-72.69850	7/8/2010	2.0	Muck	0	0	3	0	0	0	0	0	2	0	0	0	2	0	2	0	0	0	0	0	0
8	7	50	Greg Bugbee	41.38544	-72.69864	7/8/2010	0.0	Muck	0	0	4	0	0	0	0	0	2	0	0	0	0	0	0	3	0	0	1	0	0
8	8	60	Greg Bugbee	41.38550	-72.69866	7/8/2010	2.0	Muck	0	0	4	0	0	2	0	0	2	0	0	0	2	1	2	0	0	0	1	0	0
8	9	70	Greg Bugbee	41.38540	-72.69876	7/8/2010	0.0	Muck	0	0	4	0	0	2	0	0	3	0	0	0	2	1	1	4	0	0	1	0	0
9	1	0	Greg Bugbee	41.38524	-72.69947	7/8/2010	0.0	Rock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	2	5	Greg Bugbee	41.38529	-72.69947	7/8/2010	1.0	Rock	0	0	2	0	0	0	0	0	2	1	0	0	2	0	0	3	0	2	0	0	4
9	3	10	Greg Bugbee	41.38534	-72.69943	7/8/2010	1.0	Rock	0	0	2	0	0	0	0	0	2	0	0	0	2	0	1	0	0	0	0	0	3
9	4	20	Greg Bugbee	41.38542	-72.69942	7/8/2010	0.0	Muck	0	0	2	2	0	0	0	0	2	0	0	0	3	0	0	4	0	0	0	1	0
9	5	30	Greg Bugbee	41.38551	-72.69948	7/8/2010	2.5	Muck	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0
9	6	40	Greg Bugbee	41.38558	-72.69953	7/8/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0
9	7	50	Greg Bugbee	41.38569	-72.69945	7/8/2010	4.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0
9	8	60	Greg Bugbee	41.38581	-72.69950	7/8/2010	5.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	9	70	Greg Bugbee	41.38586	-72.69960	7/8/2010	5.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
9	10	80	Greg Bugbee	41.38588	-72.69982	7/8/2010	3.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
9	10	90	Greg Bugbee	41.38600	-72.69994	7/8/2010	4.3		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	Greg Bugbee	41.38464	-72.70110	7/8/2010	0.5		0	5	0	3	0	2	0	0	0	0	5	2	2	0	0	1	0	3	2	0	0
10	2	5	Greg Bugbee	41.38464	-72.70106	7/8/2010	1.0		1	0	1	0	0	0	0	0	0	0	2	0	2	0	0	3	0	0	0	0	0
10	3	10	Greg Bugbee	41.38458	-72.70101	7/8/2010	1.3		0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
10	4	20	Greg Bugbee	41.38467	-72.70076	7/8/2010	1.7		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0
10	5	0	Greg Bugbee	41.38458	-72.70080	7/8/2010	1.6		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
10	6	40	Greg Bugbee	41.38462	-72.70065	7/8/2010	2.0		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0
10	7	50	Greg Bugbee	41.38449	-72.70058	7/8/2010	1.7		0	0	5	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10	8	60	Greg Bugbee	41.38439	-72.70042	7/8/2010	0.0		0	0	1	0	0	0	0	0	0	0	5	0	0	0	0	4	0	0	0	0	2
10	9	70	Greg Bugbee	41.38438	-72.70030	7/8/2010	0.0		2	0	4	2	0	0	0	3	0	5	3	2	1	0	2	3	1	0	2	0	0
11	1	0	Greg Bugbee	41.38668	-72.70050	7/8/2010	0.5		0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0
11	2	5	Greg Bugbee	41.38668	-72.70046	7/8/2010	1.3		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
11	3	10	Greg Bugbee	41.38668	-72.70036	7/8/2010	4.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
11	4	20	Greg Bugbee	41.38672	-72.70022	7/8/2010	6.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	5	30	Greg Bugbee	41.38676	-72.70011	7/8/2010	6.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0	Greg Bugbee	41.38815	-72.69992	7/8/2010	0.3		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0
12	2	5	Greg Bugbee	41.38812	-72.69990	7/8/2010	1.7		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
12	3	10	Greg Bugbee	41.38814	-72.69984	7/8/2010	2.3		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
12	4	20	Greg Bugbee	41.38811	-72.69969	7/8/2010	6.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	5	30	Greg Bugbee	41.38818	-72.69952	7/8/2010	6.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	6	40	Greg Bugbee	41.38822	-72.69950	7/8/2010	6.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	Greg Bugbee	41.39489	-72.69799	7/8/2010	0.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	2	5	Greg Bugbee	41.39487	-72.69795	7/8/2010	2.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
13	3	10	Greg Bugbee	41.39486	-72.69789	7/8/2010	2.2		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
13	4	20	Greg Bugbee	41.39489	-72.69777	7/8/2010	2.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
13	5	30	Greg Bugbee	41.39490	-72.69768	7/8/2010	4.5		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2010 (3 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BidBec	Brasch	CabCar	CerDem	ElaSpp	EloNut	LemMin	MyrHet	MyrSpi	NupVar	NymOdo	PonCor	PotAmp	PotCri	PotFol	PotRob	PotZos	SagSpp	Sedge	SpaSpp	ZosDub
15	1	0	Greg Bugbee	41.39169	-72.69848	7/9/2010	0.5	Gravel	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	2	0	0	0	0	0
15	2	5	Greg Bugbee	41.39167	-72.69840	7/9/2010	1.0	Gravel	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0
15	3	10	Greg Bugbee	41.39171	-72.69837	7/9/2010	1.7	Muck	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0
16	1	0	Greg Bugbee	41.39020	-72.69955	7/9/2010	0.5	Sand	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	3	0	2	0	0	0
16	2	5	Greg Bugbee	41.39018	-72.69952	7/9/2010	1.0	Sand	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	0	0	0	0	0
16	3	10	Greg Bugbee	41.39019	-72.69943	7/9/2010	1.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	0	0	0	0	0
16	4	20	Greg Bugbee	41.39015	-72.69933	7/9/2010	1.8	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
16	5	30	Greg Bugbee	41.39009	-72.69920	7/9/2010	2.3	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
16	6	40	Greg Bugbee	41.39007	-72.69915	7/9/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	1	0	Greg Bugbee	41.38840	-72.69860	7/9/2010	1.7	Muck	1	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	0
17	2	10	Greg Bugbee	41.38853	-72.69867	7/9/2010	1.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0
17	3	20	Greg Bugbee	41.38852	-72.69857	7/9/2010	1.5	Muck	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0
17	4	30	Greg Bugbee	41.38868	-72.69850	7/9/2010	1.7	Muck	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	2	0	0	0	0	0
17	5	40	Greg Bugbee	41.38875	-72.69850	7/9/2010	2.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0
17	6	50	Greg Bugbee	41.38886	-72.69840	7/9/2010	3.0	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	7	60	Greg Bugbee	41.38889	-72.69842	7/9/2010	2.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	8	70	Greg Bugbee	41.38902	-72.69827	7/9/2010	2.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	9	80	Greg Bugbee	41.38911	-72.69834	7/9/2010	2.7	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
17	10	90	Greg Bugbee	41.38921	-72.69838	7/9/2010	2.5	Muck	0	0	0	2	0	0	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2015 (1 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BidBec	Brasch	CabCar	CerDem	DecVer	EleSpp	EloNut	IsoSpp	LemMin	LemTri	MyrHet	MyrSpi	NajFle	NupVar	NymOdo	PonCor	PotAmp	PotFol	PotNat	PotRob	PotZos	SagSpp	Sedge	SpiPol	UtrMac	ValAme	ZosDub
1	1	0.5	Jennifer Fanzutti	41.39642	-72.69574	6/23/2015	0.4	Muck	0	0	1	4	0	0	0	0	0	3	0	2	0	4	2	0	1	0	0	3	4	0	0	0	0	0	0
1	2	5	Jennifer Fanzutti	41.39637	-72.69574	6/23/2015	0.6	Muck	2	0	3	3	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0	4	3	0	0	0	0	2	0
1	3	10	Jennifer Fanzutti	41.39634	-72.69575	6/23/2015	0.6	Muck	2	0	2	0	0	0	0	0	0	0	0	2	0	0	3	0	2	0	0	3	1	2	0	0	0	1	2
1	4	20	Jennifer Fanzutti	41.39625	-72.69576	6/23/2015	0.6	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
1	5	30	Jennifer Fanzutti	41.39618	-72.69574	6/23/2015	0.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
1	6	40	Jennifer Fanzutti	41.39609	-72.69582	6/23/2015	0.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
1	7	50	Jennifer Fanzutti	41.39598	-72.69578	6/23/2015	0.8	Silt	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
1	8	60	Jennifer Fanzutti	41.39591	-72.69580	6/23/2015	0.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
1	9	70	Jennifer Fanzutti	41.39582	-72.69581	6/23/2015	0.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
1	10	80	Jennifer Fanzutti	41.39570	-72.69578	6/23/2015	0.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
2	1	0.5	Jennifer Fanzutti	41.39581	-72.69534	6/23/2015	0.2	Sand	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0
2	2	5	Jennifer Fanzutti	41.39582	-72.69540	6/23/2015	0.6	Muck	2	3	0	2	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	5	0	0	0	0	0	3	3
3	1	0.5	Jennifer Fanzutti	41.39322	-72.69537	6/24/2015	0.6	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
3	2	5	Jennifer Fanzutti	41.39322	-72.69548	6/24/2015	4.0	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	0.5	Jennifer Fanzutti	41.39245	-72.69545	6/23/2015	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	2	5	Jennifer Fanzutti	41.39246	-72.69551	6/23/2015	0.4	Gravel	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
4	3	10	Jennifer Fanzutti	41.39248	-72.69557	6/23/2015	1.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
5	1	0.5	Jennifer Fanzutti	41.39068	-72.69585	6/24/2015	0.2	Sand	0	0	1	0	0	0	1	0	0	0	0	2	0	0	3	0	0	0	0	4	0	0	0	0	0	1	3
5	2	5	Jennifer Fanzutti	41.39066	-72.69588	6/24/2015	0.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	1	0
5	3	10	Jennifer Fanzutti	41.39067	-72.69600	6/24/2015	0.9	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
5	4	20	Jennifer Fanzutti	41.39068	-72.69607	6/24/2015	2.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
5	5	30	Jennifer Fanzutti	41.39070	-72.69620	6/24/2015	4.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
5	6	40	Jennifer Fanzutti	41.39073	-72.69631	6/24/2015	5.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
6	1	0.5	Greg Bugbee	41.38815	-72.69615	6/23/2015	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	3	0	0	0	0	0	2	0
6	2	5	Greg Bugbee	41.38813	-72.69620	6/23/2015	0.5	Silt	0	0	0	0	0	0	1	0	0	0	0	2	0	4	0	0	2	0	0	3	0	0	0	0	0	0	0
6	3	10	Greg Bugbee	41.38816	-72.69622	6/23/2015	11.8	Silt	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
6	4	20	Greg Bugbee	41.38815	-72.69640	6/23/2015	2.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
6	5	30	Greg Bugbee	41.38814	-72.69652	6/23/2015	3.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
6	6	40	Greg Bugbee	41.38816	-72.69664	6/23/2015	2.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
6	7	50	Greg Bugbee	41.38822	-72.69676	6/23/2015	5.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8	60	Greg Bugbee	41.38825	-72.69683	6/23/2015	6.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	9	70	Greg Bugbee	41.38826	-72.69697	6/23/2015	7.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10	80	Greg Bugbee	41.38821	-72.69712	6/23/2015	6.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0.5	Greg Bugbee	41.38658	-72.69712	6/23/2015	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
7	2	5	Greg Bugbee	41.38665	-72.69713	6/23/2015	1.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
7	3	10	Greg Bugbee	41.38669	-72.69715	6/23/2015	2.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	0	0	0	0
7	4	20	Greg Bugbee	41.38676	-72.69715	6/23/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
7	5	30	Greg Bugbee	41.38686	-72.69713	6/23/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0
7	6	40	Greg Bugbee	41.38696	-72.69703	6/23/2015	2.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
7	7	50	Greg Bugbee	41.38705	-72.69709	6/23/2015	2.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
7	8	60	Greg Bugbee	41.38713	-72.69714	6/23/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2015 (2 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BidBec	Brasch	CabCar	CerDem	DecVer	EleSpp	EloNut	IsoSpp	LemMin	LemTri	MyrHet	MyrSpi	NajFle	NupVar	NymOdo	PonCor	PotAmp	PotFol	PotNat	PotRob	PotZos	SagSpp	Sedge	SpiPol	UtrMac	ValAme	ZosDub
7	9	70	Greg Bugbee	41.38724	-72.69722	6/23/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
7	10	80	Greg Bugbee	41.38732	-72.69724	6/23/2015	2.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
8	1	0.5	Greg Bugbee	41.38577	-72.69820	6/23/2015	0.2	Muck	0	0	0	2	2	0	2	0	2	2	0	2	0	0	3	0	0	0	0	3	0	0	0	2	0	0	2
8	2	5	Greg Bugbee	41.38576	-72.69826	6/23/2015	1.0	Muck	0	0	0	2	0	0	2	0	2	2	0	2	0	0	4	0	2	0	0	3	0	0	0	0	0	0	2
8	3	10	Greg Bugbee	41.38575	-72.69832	6/23/2015	1.5	Muck	3	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	4	0	0	0	0	0	0	0
8	4	20	Greg Bugbee	41.38575	-72.69845	6/23/2015	2.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	0	0	0	0	0
8	5	30	Greg Bugbee	41.38576	-72.69856	6/23/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
8	6	40	Greg Bugbee	41.38587	-72.69866	6/23/2015	5.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	7	50	Greg Bugbee	41.38584	-72.69876	6/23/2015	5.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	8	60	Greg Bugbee	41.38582	-72.69892	6/23/2015	6.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0.5	Greg Bugbee	41.38527	-72.69914	6/23/2015	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	2	5	Greg Bugbee	41.38531	-72.69909	6/23/2015	1.8	Gravel	2	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	3	0	0	4	0	0	0	0	0	0	2
9	3	10	Greg Bugbee	41.38538	-72.69911	6/23/2015	1.8	Silt	0	0	0	2	0	0	2	0	0	0	0	3	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0
9	4	20	Greg Bugbee	41.38546	-72.69909	6/23/2015	2.0	Silt	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
9	5	30	Greg Bugbee	41.38554	-72.69908	6/23/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
9	6	40	Greg Bugbee	41.38566	-72.69906	6/23/2015	3.8	Silt	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
9	7	50	Greg Bugbee	41.38571	-72.69894	6/23/2015	3.2	Silt	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
9	8	60	Greg Bugbee	41.38579	-72.69883	6/23/2015	5.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
9	9	70	Greg Bugbee	41.38587	-72.69885	6/23/2015	5.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	10	80	Greg Bugbee	41.38596	-72.69888	6/23/2015	6.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0.5	Greg Bugbee	41.38436	-72.70024	6/23/2015	0.2	Muck	0	0	2	2	2	0	0	0	2	2	3	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	2
10	2	5	Greg Bugbee	41.38437	-72.70030	6/23/2015	1.0	Muck	2	0	3	2	0	0	0	0	0	2	2	2	0	2	4	0	0	0	0	0	2	0	0	0	2	0	2
10	3	10	Greg Bugbee	41.38437	-72.70034	6/24/2015	1.0	Muck	2	0	3	2	0	0	0	0	0	2	0	2	0	3	3	0	2	0	3	3	2	0	0	0	1	0	2
10	4	20	Greg Bugbee	41.38444	-72.70041	6/24/2015	1.2	Muck	2	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	4	2	0	0	0	0	0	0
10	5	30	Greg Bugbee	41.38446	-72.70055	6/24/2015	1.4	Muck	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	2	0	0	0	0	0	0
10	6	40	Greg Bugbee	41.38446	-72.70068	6/24/2015	1.8	Muck	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
10	7	50	Greg Bugbee	41.38442	-72.70082	6/24/2015	1.7	Muck	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
10	8	60	Greg Bugbee	41.38450	-72.70093	6/24/2015	1.8	Muck	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
11	1	0.5	Greg Bugbee	41.38674	-72.70053	6/24/2015	0.2	Gravel	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
11	2	5	Greg Bugbee	41.38673	-72.70048	6/24/2015	2.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
11	3	10	Greg Bugbee	41.38671	-72.70039	6/24/2015	2.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
11	4	20	Greg Bugbee	41.38671	-72.70028	6/24/2015	7.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0.5	Greg Bugbee	41.38812	-72.69995	6/24/2015	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	2	10	Greg Bugbee	41.38813	-72.69989	6/24/2015	1.8	Gravel	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
12	3	10	Greg Bugbee	41.38808	-72.69985	6/24/2015	2.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
12	4	20	Greg Bugbee	41.38803	-72.69974	6/24/2015	6.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	5	30	Greg Bugbee	41.38804	-72.69959	6/24/2015	7.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0.5	Jennifer Fanzutti	41.39488	-72.69800	6/23/2015	0.5	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	2	5	Jennifer Fanzutti	41.39490	-72.69795	6/23/2015	1.0	Silt	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
13	3	10	Jennifer Fanzutti	41.39491	-72.69791	6/23/2015	1.6	Silt	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
13	4	20	Jennifer Fanzutti	41.39489	-72.69777	6/23/2015	2.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2015 (3 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BidBec	Brasch	CabCar	CerDem	DecVer	EleSpp	EloNut	IsoSpp	LemMin	LemTri	MyrHet	MyrSpi	NajFle	NupVar	NymOdo	PonCor	PotAmp	PotFol	PotNat	PotRob	PotZos	SagSpp	Sedge	SpiPol	UtrMac	ValAme	ZosDub
14	1	0.5	Jennifer Fanzutti	41.39339	-72.69807	6/23/2015	0.2	Sand	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3
15	1	0.5	Jennifer Fanzutti	41.39170	-72.69850	6/23/2015	0.2	Sand	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	2	0	4	0	2	0	0	0	2	0
15	2	5	Jennifer Fanzutti	41.39169	-72.69843	6/23/2015	0.6	Organic	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	2	0	0	0	0	0	0
16	1	0.5	Greg Bugbee	41.39024	-72.69952	6/24/2015	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	3	0	2	0	0	0	0	0
16	2	5	Greg Bugbee	41.39024	-72.69946	6/24/2015	1.0	Silt	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
16	3	10	Greg Bugbee	41.39026	-72.69939	6/24/2015	2.0	Silt	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
16	4	20	Greg Bugbee	41.39022	-72.69927	6/24/2015	2.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	0	0	0	0
16	5	30	Greg Bugbee	41.39022	-72.69917	6/24/2015	3.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	0	0	0	0
16	6	40	Greg Bugbee	41.39015	-72.69905	6/24/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0
17	1	0.5	Greg Bugbee	41.38840	-72.69860	6/24/2015	1.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
17	2	5	Greg Bugbee	41.38845	-72.69856	6/24/2015	1.8	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0
17	3	10	Greg Bugbee	41.38850	-72.69857	6/24/2015	1.8	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	3	0	0	0	0	0	0	0	0
17	4	20	Greg Bugbee	41.38858	-72.69855	6/24/2015	1.8	Sand	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	0	0	2	0	0	0	0	0	0	0	0
17	5	30	Greg Bugbee	41.38869	-72.69853	6/24/2015	2.0	Sand	0	0	0	0	0	0	2	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	6	40	Greg Bugbee	41.38879	-72.69854	6/24/2015	2.5	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
17	7	50	Greg Bugbee	41.38886	-72.69852	6/24/2015	2.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
17	8	60	Greg Bugbee	41.38892	-72.69845	6/24/2015	2.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
17	9	70	Greg Bugbee	41.38902	-72.69839	6/24/2015	2.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
17	10	80	Greg Bugbee	41.38914	-72.69840	6/24/2015	2.9	Silt	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2020 (1 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	Brasch	CabCar	DecVer	EloNut	IsoSpp	MyrSpi	NajFle	NupVar	NymOdo	PonCor	PotAmp	PotBer	PotBic	PotCri	PotFol	PotRob	PotZos	SagSpp	UtrMac	ValAme
1	1	0.5	Summer Stebbins	41.39642	-72.69572	6/30/2020	0.2	Organic	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0	2	0	0	0	0
1	2	5	Summer Stebbins	41.39638	-72.69574	6/30/2020	0.7	Organic	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	2	0	0	0	0	0
1	3	10	Summer Stebbins	41.39632	-72.69575	6/30/2020	0.8	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
1	4	20	Summer Stebbins	41.39624	-72.69577	6/30/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
1	5	30	Summer Stebbins	41.39614	-72.69575	6/30/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
1	6	40	Summer Stebbins	41.39605	-72.69577	6/30/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
1	7	50	Summer Stebbins	41.39595	-72.69580	6/30/2020	1.2	Organic	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
1	8	60	Summer Stebbins	41.39588	-72.69587	6/30/2020	1.2	Organic	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
1	9	70	Summer Stebbins	41.39577	-72.69589	6/30/2020	1.2	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
1	10	80	Summer Stebbins	41.39569	-72.69595	6/30/2020	1.2	Organic	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
2	1	0.5	Summer Stebbins	41.39582	-72.69531	6/30/2020	0.1	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	5	Summer Stebbins	41.39582	-72.69537	6/30/2020	0.1	Sand	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	0	0	0	0	0
3	1	0.5	Summer Stebbins	41.39322	-72.69536	7/1/2020	0.1	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	5	Summer Stebbins	41.39322	-72.69544	7/1/2020	2.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
4	1	0.5	Summer Stebbins	41.39234	-72.69539	7/1/2020	0.1	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
4	2	5	Summer Stebbins	41.39232	-72.69543	7/1/2020	0.7	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	2	0
4	3	10	Summer Stebbins	41.39229	-72.69551	7/1/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
5	1	0.5	Summer Stebbins	41.39064	-72.69579	7/1/2020	0.2	Sand	0	0	0	0	0	0	0	0	2	0	0	2	0	2	2	0	0	2	0	2	0
5	2	5	Summer Stebbins	41.39068	-72.69583	7/1/2020	0.2	Sand	0	0	0	0	0	0	0	0	3	0	0	2	0	2	2	0	0	2	0	2	0
5	3	10	Summer Stebbins	41.39069	-72.69587	7/1/2020	0.3	Sand	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	2	0
5	4	20	Summer Stebbins	41.39070	-72.69600	7/1/2020	1.0	Silt	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	0	0
5	5	30	Summer Stebbins	41.39072	-72.69614	7/1/2020	1.5	Silt	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	0	0
5	6	40	Summer Stebbins	41.39077	-72.69625	7/1/2020	1.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
6	1	0.5	Summer Stebbins	41.38819	-72.69605	7/1/2020	0.1	Sand	3	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	2	0	2	0
6	2	5	Summer Stebbins	41.38823	-72.69609	7/1/2020	0.2	Sand	3	1	0	0	0	0	0	2	2	0	0	2	0	1	0	0	0	0	0	0	0
6	3	10	Summer Stebbins	41.38822	-72.69618	7/1/2020	0.6	Muck	4	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
6	4	20	Summer Stebbins	41.38825	-72.69627	7/1/2020	0.8	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6	5	30	Summer Stebbins	41.38827	-72.69639	7/1/2020	0.9	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
6	6	40	Summer Stebbins	41.38832	-72.69650	7/1/2020	1.3	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
6	7	50	Summer Stebbins	41.38836	-72.69661	7/1/2020	3.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8	60	Summer Stebbins	41.38836	-72.69675	7/1/2020	6.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	9	70	Summer Stebbins	41.38838	-72.69687	7/1/2020	6.9	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10	80	Summer Stebbins	41.38839	-72.69698	7/1/2020	7.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0.5	Summer Stebbins	41.38656	-72.69672	7/1/2020	0.1	Sand	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	2	5	Summer Stebbins	41.38662	-72.69670	7/1/2020	0.7	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
7	3	10	Summer Stebbins	41.38666	-72.69670	7/1/2020	1.3	Silt	0	0	0	0	0	2	0	0	0	0	3	0	0	2	0	3	0	0	0	0	0
7	4	20	Summer Stebbins	41.38675	-72.69671	7/1/2020	1.3	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
7	5	30	Summer Stebbins	41.38685	-72.69669	7/1/2020	1.3	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
7	6	40	Summer Stebbins	41.38693	-72.69666	7/1/2020	1.3	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
7	7	50	Summer Stebbins	41.38703	-72.69664	7/1/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2020 (2 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	Brasch	CabCar	DecVer	EloNut	IsoSpp	MyrSpi	NajFle	NupVar	NymOdo	PonCor	PotAmp	PotBer	PotBic	PotCri	PotFol	PotRob	PotZos	SagSpp	UtrMac	ValAme
7	8	60	Summer Stebbins	41.38712	-72.69661	7/1/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
7	9	70	Summer Stebbins	41.38720	-72.69660	7/1/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
7	10	80	Summer Stebbins	41.38729	-72.69660	7/1/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
8	1	0.5	Summer Stebbins	41.38583	-72.69826	7/6/2020	0.2	Organic	0	1	3	0	0	0	0	2	2	0	0	0	0	2	0	2	0	0	0	0
8	2	5	Summer Stebbins	41.38582	-72.69830	7/6/2020	1.1	Organic	0	1	0	0	0	1	0	0	2	0	1	0	0	0	0	2	0	0	0	0
8	3	10	Summer Stebbins	41.38580	-72.69836	7/6/2020	1.3	Organic	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0
8	4	20	Summer Stebbins	41.38577	-72.69853	7/6/2020	1.6	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
8	5	30	Summer Stebbins	41.38577	-72.69865	7/6/2020	3.3	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	6	40	Summer Stebbins	41.38577	-72.69874	7/6/2020	3.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	7	50	Summer Stebbins	41.38576	-72.69890	7/6/2020	3.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	8	60	Summer Stebbins	41.38575	-72.69897	7/6/2020	3.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0.5	Summer Stebbins	41.38524	-72.69913	7/6/2020	0.1	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	2	5	Summer Stebbins	41.38527	-72.69912	7/6/2020	0.9	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
9	3	10	Summer Stebbins	41.38533	-72.69908	7/6/2020	1.9	Organic	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	0
9	4	20	Summer Stebbins	41.38541	-72.69905	7/6/2020	1.9	Organic	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0
9	5	30	Summer Stebbins	41.38550	-72.69901	7/6/2020	1.9	Organic	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0
9	6	40	Summer Stebbins	41.38559	-72.69900	7/6/2020	1.9	Silt	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0
9	7	50	Summer Stebbins	41.38569	-72.69899	7/6/2020	4.0	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	8	60	Summer Stebbins	41.38579	-72.69898	7/6/2020	5.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	9	70	Summer Stebbins	41.38591	-72.69898	7/6/2020	6.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	10	80	Summer Stebbins	41.38598	-72.69899	7/6/2020	6.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0.5	Summer Stebbins	41.38453	-72.70120	7/6/2020	0.2	Organic	0	2	2	2	0	0	0	0	2	2	0	0	0	2	0	2	2	0	0	0
10	2	5	Summer Stebbins	41.38451	-72.70115	7/6/2020	0.5	Organic	0	2	0	2	0	0	0	0	2	2	0	0	0	2	0	4	2	0	0	0
10	3	10	Summer Stebbins	41.38449	-72.70105	7/6/2020	0.7	Organic	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0
10	4	20	Summer Stebbins	41.38446	-72.70095	7/6/2020	0.7	Organic	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0
10	5	30	Summer Stebbins	41.38447	-72.70082	7/6/2020	0.9	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
10	6	40	Summer Stebbins	41.38447	-72.70069	7/6/2020	0.9	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
10	7	50	Summer Stebbins	41.38444	-72.70057	7/6/2020	0.9	Organic	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0
10	8	60	Summer Stebbins	41.38441	-72.70045	7/6/2020	0.9	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
11	1	0.5	Summer Stebbins	41.38681	-72.70056	7/6/2020	0.1	Silt	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2	0	0
11	2	5	Summer Stebbins	41.38681	-72.70052	7/6/2020	1.2	Silt	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2	0	0
11	3	10	Summer Stebbins	41.38681	-72.70042	7/6/2020	1.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
11	4	20	Summer Stebbins	41.38680	-72.70036	7/6/2020	3.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0.5	Summer Stebbins	41.38807	-72.69999	7/6/2020	0.1	Silt	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2	0	0
12	2	5	Summer Stebbins	41.38805	-72.69997	7/6/2020	1.0	Silt	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	3	0	0	0	0
12	3	10	Summer Stebbins	41.38805	-72.69988	7/6/2020	1.4	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
12	4	20	Summer Stebbins	41.38805	-72.69976	7/6/2020	4.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	5	30	Summer Stebbins	41.38803	-72.69966	7/6/2020	4.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0.5	Summer Stebbins	41.39491	-72.69806	6/30/2020	0.1	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	2	5	Summer Stebbins	41.39490	-72.69797	6/30/2020	1.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix Lake Quonnipaug Transect Data 2020 (3 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	Brasch	CabCar	DecVer	EloNut	IsoSpp	MyrSpi	NajFle	NupVar	NymOdo	PonCor	PotAmp	PotBer	PotBic	PotCri	PotFol	PotRob	PotZos	SagSpp	UtrMac	ValAme
13	3	10	Summer Stebbins	41.39490	-72.69790	6/30/2020	1.7	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	4	20	Summer Stebbins	41.39490	-72.69782	6/30/2020	2.3	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0.5	Summer Stebbins	41.39336	-72.69807	6/30/2020	0.2	Sand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2
15	1	0.5	Summer Stebbins	41.39172	-72.69850	6/29/2020	0.2	Sand	0	1	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	2
15	2	5	Summer Stebbins	41.39169	-72.69843	6/29/2020	0.8	Sand	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
16	1	0.5	Summer Stebbins	41.39024	-72.69955	7/6/2020	0.1	Sand	0	0	0	0	0	0	2	0	2	0	0	0	2	0	0	2	0	2	0	2
16	2	5	Summer Stebbins	41.39023	-72.69950	7/6/2020	0.6	Sand	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	2
16	3	10	Summer Stebbins	41.39020	-72.69939	7/6/2020	0.8	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
16	4	20	Summer Stebbins	41.39020	-72.69932	7/6/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
16	5	30	Summer Stebbins	41.39015	-72.69919	7/6/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
16	6	40	Summer Stebbins	41.39012	-72.69907	7/6/2020	1.0	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
17	1	0.5	Summer Stebbins	41.38839	-72.69856	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
17	2	5	Summer Stebbins	41.38843	-72.69854	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	2	0	0	0	0
17	3	10	Summer Stebbins	41.38849	-72.69851	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
17	4	20	Summer Stebbins	41.38857	-72.69851	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
17	5	30	Summer Stebbins	41.38864	-72.69851	7/6/2020	1.1	Silt	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0
17	6	40	Summer Stebbins	41.38875	-72.69847	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
17	7	50	Summer Stebbins	41.38883	-72.69843	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
17	8	60	Summer Stebbins	41.38891	-72.69841	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0
17	9	70	Summer Stebbins	41.38899	-72.69837	7/6/2020	1.1	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
17	10	80	Summer Stebbins	41.38909	-72.69833	7/6/2020	1.1	Silt	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	3	0	0	0	0