The Connecticut Agricultural Experiment Station

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Taunton Lake

Newtown, CT

Aquatic Vegetation Survey

Water Chemistry

Aquatic Plant Management Options

2022

Summer E. Stebbins

Gregory J. Bugbee

Department of
Environmental Science and Forestry

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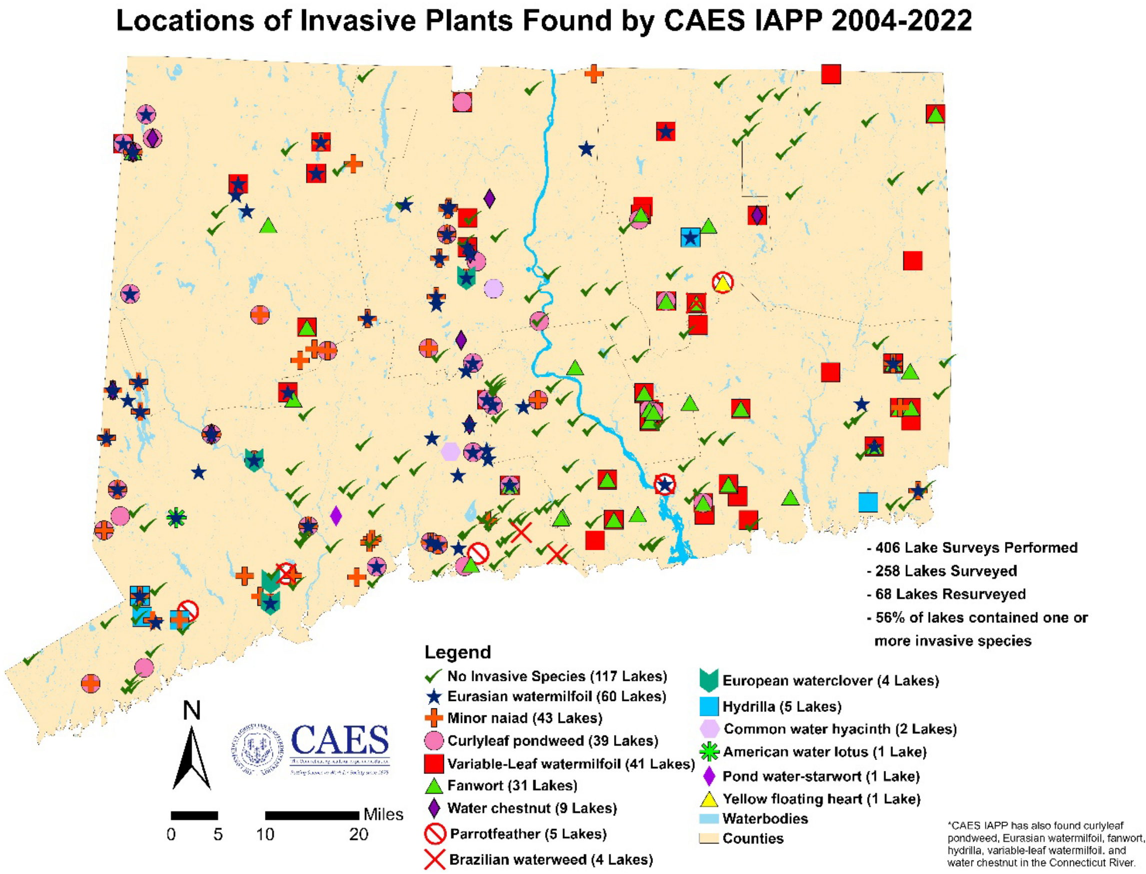

Figure 1. Locations of invasive aquatic plants found by CAES IAPP from 2004 – 2022.

Introduction

Since 2004, the Connecticut Agricultural Experiment Station (CAES) Invasive Aquatic Plant Program (IAPP) has surveyed or resurveyed aquatic vegetation and monitored water chemistry of nearly 400 Connecticut lakes, ponds, and rivers (Figure 1). Approximately 55% of the lakes and ponds contain invasive (non-native) plant species that can cause rapid deterioration of aquatic ecosystems, recreational opportunities, real estate value, and tax revenues. The presence of invasive species is related to water chemistry, public boat launches, random events, and climate change (Rahel and Olden, 2008). CAES IAPP provides an online database where stakeholders can view digitized vegetation maps, detailed transect data, temperature and dissolved oxygen profiles, and water test results for clarity, pH, alkalinity, conductivity, total phosphorus, and total nitrogen (portal.ct.gov/caes-iapp). This information allows citizens, government officials, and scientists to view past conditions, compare them with current conditions, and make educated management decisions.

Taunton Lake is a 124-acre private waterbody located in Newtown, CT. It has a maximum depth of about 9 meters (30 feet) and an average depth of about 6 meters (20 feet). The lake's littoral zone extends approximately 25 – 75 meters (82 – 246 feet) from the shore. Access is available to the Newtown Fish and Game Club (NFGC), their guests, and shoreline residents. Taunton Lake is stocked with brown, rainbow, and brook trout by the NFGC. Large and smallmouth bass, white and yellow perch, crappie, sunfish, and other fish species are present.

In the 1950's Taunton Lake had scarce vegetation, clear water, and a bottom of boulders, rubble, and gravel (State Board of Fisheries and Game Lake and Pond Survey Unit, 1959). The Connecticut Agricultural Experiment Station Invasive Aquatic Plant Program (CAES IAPP) began surveys of Taunton Lake in 2009 and has found considerable changes including abundant invasive Eurasian watermilfoil, frequent algal blooms, and a bottom composed mainly of muck and silt (Bugbee and Stebbins, 2020). Reasons for the changes include natural aging, land development, and the arrival of Eurasian watermilfoil. Over the last decade considerable efforts have been employed to mitigate the Eurasian watermilfoil. Techniques include hand harvesting and treatment of four acres with the herbicide Renovate 3® in 2007, suction harvesting in 2010, application of the herbicide 2,4-D in 2011 and 2013, and introductions of Triploid grass carp *(Ctenopharyngodon idella)* in 2013, 2015, and 2016.

Vegetation control with grass carp varies with plant species and abundance as well as the number and age of the carp. Usually, the effects of grass carp are not noticed until the fish have grown to the point of consuming large quantities of vegetation. In mixed populations of invasive and native vegetation, native species could be eliminated if they are preferred. Nutrients added through plant digestion combined with a reduction in plant nutrient uptake by a decreased plant biomass can lead to algal blooms (AERF, 2014). This 2022 survey explores the effects of the grass carp on both the invasive and native aquatic plant community over time.

This is the sixth CAES IAPP survey of Taunton Lake's aquatic vegetation and water chemistry. Previous surveys that occurred in 2009, 2010, 2014, 2017, and 2019 found Taunton Lake's plant community was dominated by invasive Eurasian watermilfoil (*Myriophyllum spicatum*) cohabitating with 6 - 12 native species. Invasive curlyleaf pondweed (*Potamogeton crispus*) grew sparsely in all survey years except 2019 when it was not found. In the initial 2009 survey, 17 geo-referenced transects were established. Each contained up to 10 points where plant species, abundance, depth, and sediment type were recorded. These points were then revisited during each survey to quantify changes.

CAES IAPP analyzed water chemistry each year to track changes that could influence plant populations. Tests included water clarity, dissolved oxygen, temperature, pH, alkalinity, conductivity, and total phosphorus. Taunton Lake was determined to be a mesotrophic/eutrophic alkaline waterbody that is highly suitable to plants that prefer this water chemistry, such as Eurasian watermilfoil and curlyleaf pondweed.

Objectives

- Survey Taunton Lake for aquatic vegetation and compare with previous surveys to provide information for improved nuisance plant management.
- Assess the effects of grass carp on invasive and native plant species.
- Analyze water to quantify changes in water chemistry and relate to plant populations and grass carp.

Materials and Methods

Aquatic Plant Surveys and Mapping:

We surveyed Taunton Lake for aquatic vegetation on July 12 and 14, 2022. The survey utilized methods established by CAES IAPP. Surveys were conducted from 16 and 18-foot motorized boats traveling over areas that supported aquatic plants. Plant species were recorded using a meandering survey method based on visual observation or collections with a long-handled rake or grapple. Lowrance® Hook 5 and HDS 5 sonar systems, ground truthed, with grapple tosses were used to identify vegetated areas in deep water. Quantitative information on plant abundance was obtained by resurveying 17 transects that were initially positioned perpendicular to the shoreline in 2009. Transect locations represented the variety of habitats in the lake. Transects were located using either a Trimble ProXT or Trimble® R1 GNSS global positioning system with sub-meter accuracy. Sampling data points were taken along each transect at points 0, 5, 10, 20, 30, 40, 50, 60, 70, and 80 m from the shore. No points were sampled when depths were below the littoral zone of 4 m (12 feet). We measured depth with a rake handle, drop line, or digital depth finder, and sediment type was estimated. Abundances of species present at each point were ranked on a scale of 1 – 5 (1 = very sparse, 2 = sparse, 3 = moderately abundant, 4 = abundant, 5 = very abundant). When field identifications of plants were questionable, samples were brought back to the lab for review using the taxonomy of Crow and Hellquist (2000*a*; 2000*b*). One specimen of each species collected was dried and mounted in the CAES IAPP aquatic plant herbarium. Digitized mounts can be viewed online (portal.ct.gov/caes-iapp).

Plant species are referred to by common name in the text of this report. Scientific names can be found in Table 1. We post-processed the GPS data in Pathfinder® 5.85 (Trimble Navigation Limited, Sunnyvale, CA) and then imported it into ArcGIS® Pro 3.0.3 (ESRI Inc., Redlands, CA). Data were then overlaid onto recent high-resolution aerial imagery for the continental United States made available by the USDA Farm Services Agency.

Table 1. Plants present in Taunton Lake from 2009, 2010, 2014, 2017, 2019, and 2022. Present indicates the species presence in the lake while frequency of occurrence (FOQ) indicates presence of a species recorded on transects.

Taunton Lake													
Species (invasives in bold)		2009		2010		2014		2017		2019		2022	
Common Name	Scientitic Name	Present	FOQ (%/point)	Present	FOQ (%/point)	Present	FOQ (%/point)	Present	FOQ (%/point)	Present	FOQ (%/point)	Present	FOQ (%/point)
Arrowhead	*Sagittaria species*	X		X	2%	X	2%	X		X	4%	X	
Bur-reed	*Sparganium species*					X		X	2%			X	1%
Common duckweed	*Lemna minor*					X		X	3%				
Curlyleaf pondweed	***Potamogeton crispus***	**X**	**1%**	**X**		**X**		**X**				**X**	
Eurasian watermilfoil	***Myriophyllum spicatum***	**X**	**35%**	**X**	**47%**	**X**	**65%**	**X**	**52%**	**X**	**43%**	**X**	**2%**
Great duckweed	*Spirodella polyrhiza*			X		X	2%						
Leafy pondweed	*Potamogeton foliosus*	X		X		X	2%	X	1%	X	1%	X	2%
Primrose-willow	*Ludwigia species*					X	1%	X	4%	X			
Quillwort	*Isoetes species*			X									
Slender naiad	*Najas flexilis*							X					
Snailseed pondweed	*Potamogeton bicupulatus*	X				X				X	1%	X	3%
Spikerush	*Eleocharis species*					X			1%			X	
Water chestnut	***Trapa natans***									**X**			
Water plantain	*Alisma species*					X				X	1%	X	
Watermeal	*Wolffia species*											X	2%
Waterwort	*Elatine species*	X		X		X			5%	X	2%	X	
Western waterweed	*Elodea nuttallii*	X	54%	X	30%	X	29%	X	22%	X			
Yellow water lily	*Nuphar variegata*	X	1%	X	1%	X		X	2%	X	5%	X	3%
Total Species Richness	18	8	4	9	4	14	6	10	9	10	7	11	6
Total Native Species Richnesss	15	6	2	7	3	12	5	8	8	8	6	9	5
Total Invasive Species Richness	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**

Water Analysis:

Water was analyzed from a deep part of the lake in the same place as our previous surveys. Water temperature and dissolved oxygen were measured 1.5 feet beneath the surface and at 3-foot intervals to the bottom. Water was tested for temperature and dissolved oxygen using a 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.

Water samples for pH, alkalinity, conductivity, total phosphorus, and total nitrogen testing were obtained from 1.5 feet beneath the surface and 1.5 feet above the bottom. The samples were stored at 38˚F until testing. A Fisher AR20® meter was used to determine pH and conductivity, and alkalinity (expressed as mg/L $CaCO_3$) was quantified by titration with 0.016 N H2SO4 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® spectrophotometer with a light path of 2 cm and a wavelength of 880 nm. Total Nitrogen was determined with an O-I Analytical 1080® Total Organic Carbon Analyzer.

Results and Discussion

Aquatic Plant Surveys and Transects:

The CAES IAPP aquatic plant surveys of Taunton Lake from 2009 - 2022 found between 8 - 14 aquatic plant species (Table 1). The fewest species (8) were found in 2009 and the greatest (14) in 2014. Three invasive aquatic plant species have been found in Taunton Lake over the years (Eurasian watermilfoil, curlyleaf pondweed, water chestnut). The 2022 survey found 11 different aquatic plant species, two of which are invasive (Eurasian watermilfoil and curlyleaf pondweed) (Table 1). All species were sparse in 2022 likely due to grass carp feeding. Aquatic plants were mainly found in very shallow areas less than two feet deep adjacent to the shoreline (Figure 3). These areas could be shallow enough to prevent grass carp feeding. The native plants included arrowhead, bur-reed, cattail, leafy pondweed, rush, snailseed pondweed, spikerush, water plantain, watermeal, waterwort, and yellow water lily. Changes in the aquatic plant community from 2009 to 2022 (Figure 3) are likely related to management practices, the grass carp introductions being most impactful. There was a robust population of both Eurasian watermilfoil and western waterweed in 2009 and 2010. By 2017, native western waterweed was extremely sparse and by 2019 it had disappeared. Eurasian watermilfoil showed a slight expansion in 2017 followed by a sharp decline in 2019 (Figure 3, see appendix for previous survey maps).

Invasive curlyleaf pondweed was found in low abundance each survey year, except for 2019 when it was not observed. In 2022, curlyleaf pondweed was found in small abundance near transect 17. Three water chestnut plants were found during the 2019 survey and immediately pulled before the seeds dropped. Water chestnut is a very destructive floating annual with spiked seed pods that can puncture a foot. Fortunately, it was not found in 2022.

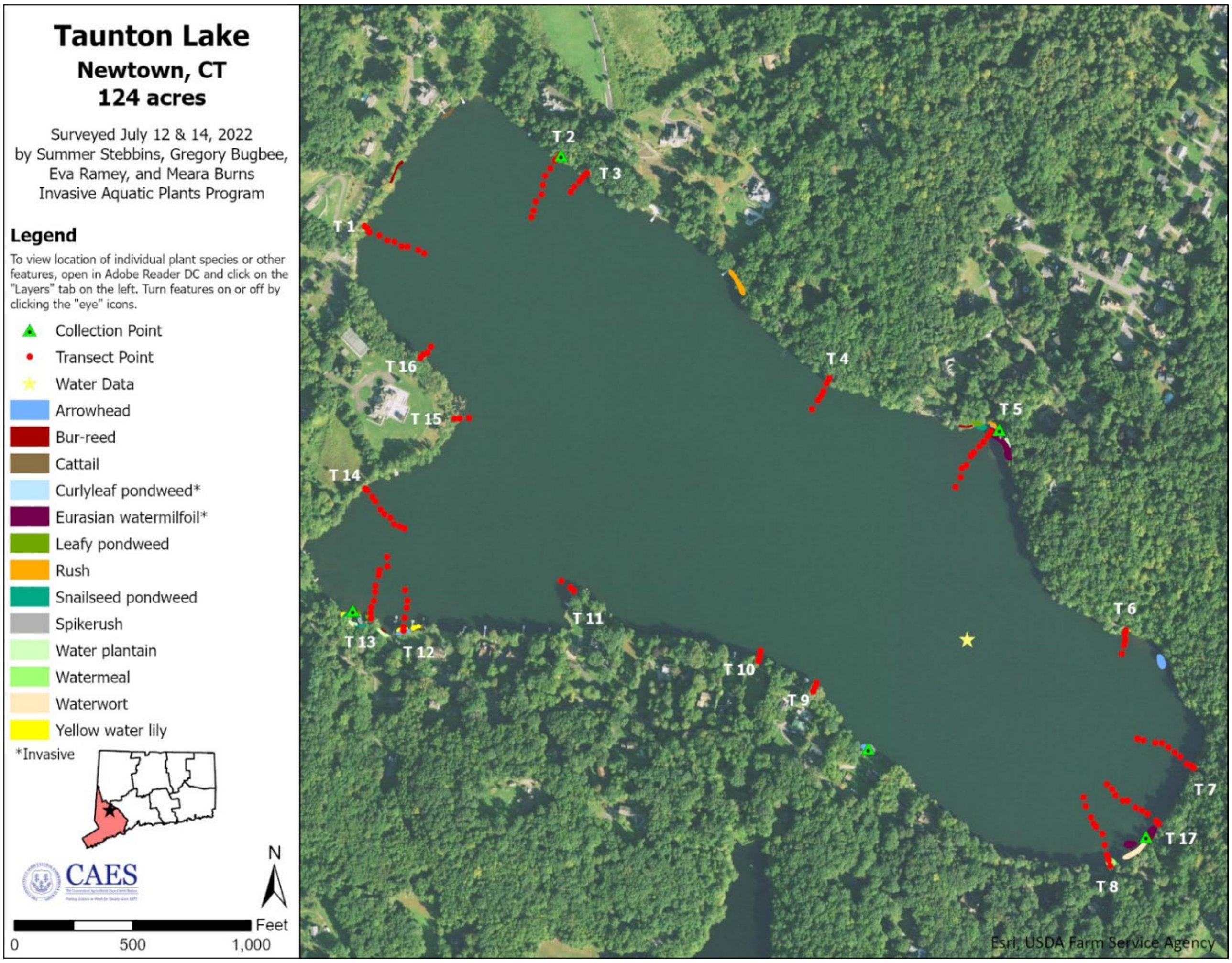

Figure 2. Aquatic plant survey map for 2022.

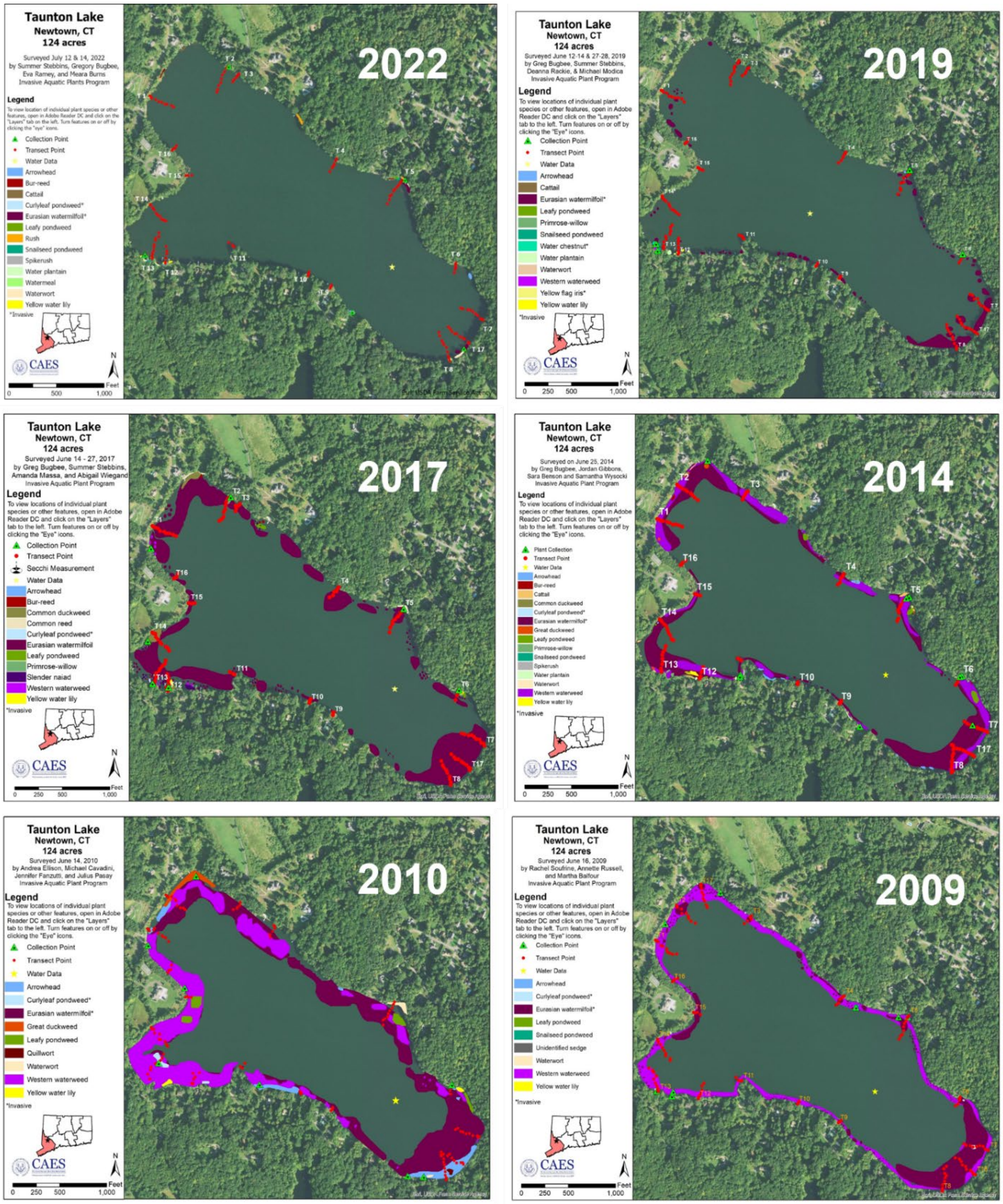

Figure 3. Changes in the aquatic plant community in Taunton Lake from 2009 - 2022.

Figure 4. Snailseed pondweed (left) growing in shallow area near transect 13 (right) in 2022.

Frequency of occurrence (FOQ) and species richness are important criteria for assessing an aquatic plant community. Our FOQ data refers to how frequently aquatic plant species are found on transects. Species richness refers to the average number of species found on transect points. Optimal aquatic plant diversity occurs when large numbers of native plant species are abundant at non-nuisance levels. Generally, a coverage of 20-40% of the lakes littoral zone is considered optimal for fish habitat (Jacobs and O'Donnell, 2002). Transect data revealed a slight decrease in the frequency of occurrence (FOQ) of native species and a significant decrease in the FOQ of invasive species (Tukey $p \leq 0.05$) from 2019 – 2022, which continued the downward trend beginning in 2014 (Figure 5, top). In 2014, 65 percent of the transect

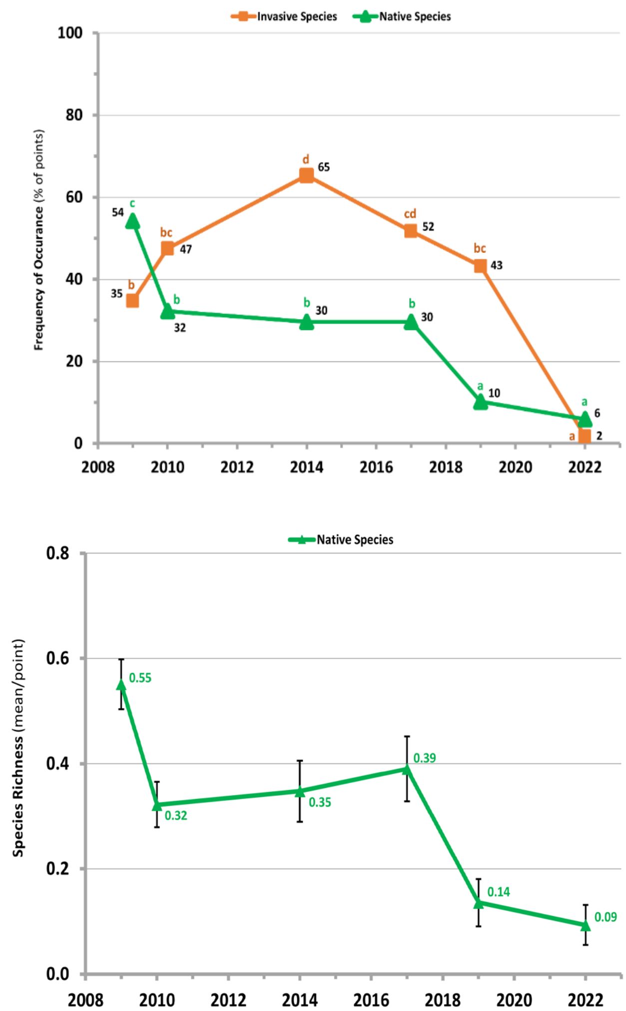

Figure 5. Frequency of occurrence (top) and species richness (bottom) of invasive and native plants in Taunton Lake in 2009, 2010, 2014, 2017, 2019, and 2022.

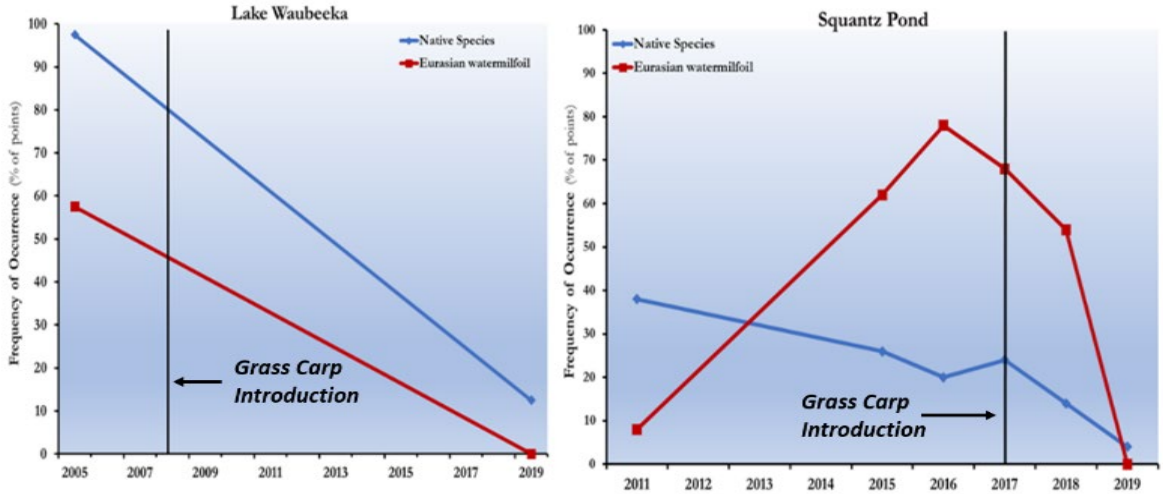

Figure 6. Yearly frequency of occurrence of invasive and native plants in Lake Waubeeka and Squantz Pond.

points contained one or more invasive species while in 2022 this declined to only two percent. While the FOQ of native species in 2022 (6%) was only a slight decrease from 2019 (10%), it demonstrates the continued decline in native species since 2009 (54%). The 2022 survey had the lowest FOQ of both native and invasive species to date. Curlyleaf pondweed and water chestnut have only been found in very low abundance, so the FOQ of invasive species is mainly influenced by Eurasian water-milfoil. The species richness on transects of native species was the lowest of all years in 2022 (0.09) (Figure 5, bottom). Only six plants were found on transects, and they were only found on seven of the 118 transect points. This significant decrease of both native and invasive species is likely due to grass carp feeding. Often grass carp have little effect until their population and size reach a critical mass when excessive vegetation may be consumed. When a rapid decline in the aquatic plant community occurs, harmful algal blooms can result, and the waterbody suffers from insufficient habitat for fish and other aquatic biota. Nearby Lake Waubeeka and Squantz Pond (Figure 6) and more recently Candlewood Lake have seen similar potentially harmful decreases in native plants after grass carp introductions (CAES IAPP, 2023). Returning aquatic vegetation to Taunton Lake will require reducing the number of grass carp either through natural mortality or manual removal. Grass carp can live for well over 10 years with the exact life expentency in Connecticut not well documented. Therefore, plant regrowth in Taunton Lake is not likely for many years without intervention. Manual grass carp removal using electro fishing and gill nets, led by CT DEEP, has begun in Candlewood Lake. Although laborious, the procedure offers hope that the feeding pressure on vegetation can be reduced and regrowth from propagules in the sediment can begin. Exactly what plants will regrow is unpredictable.

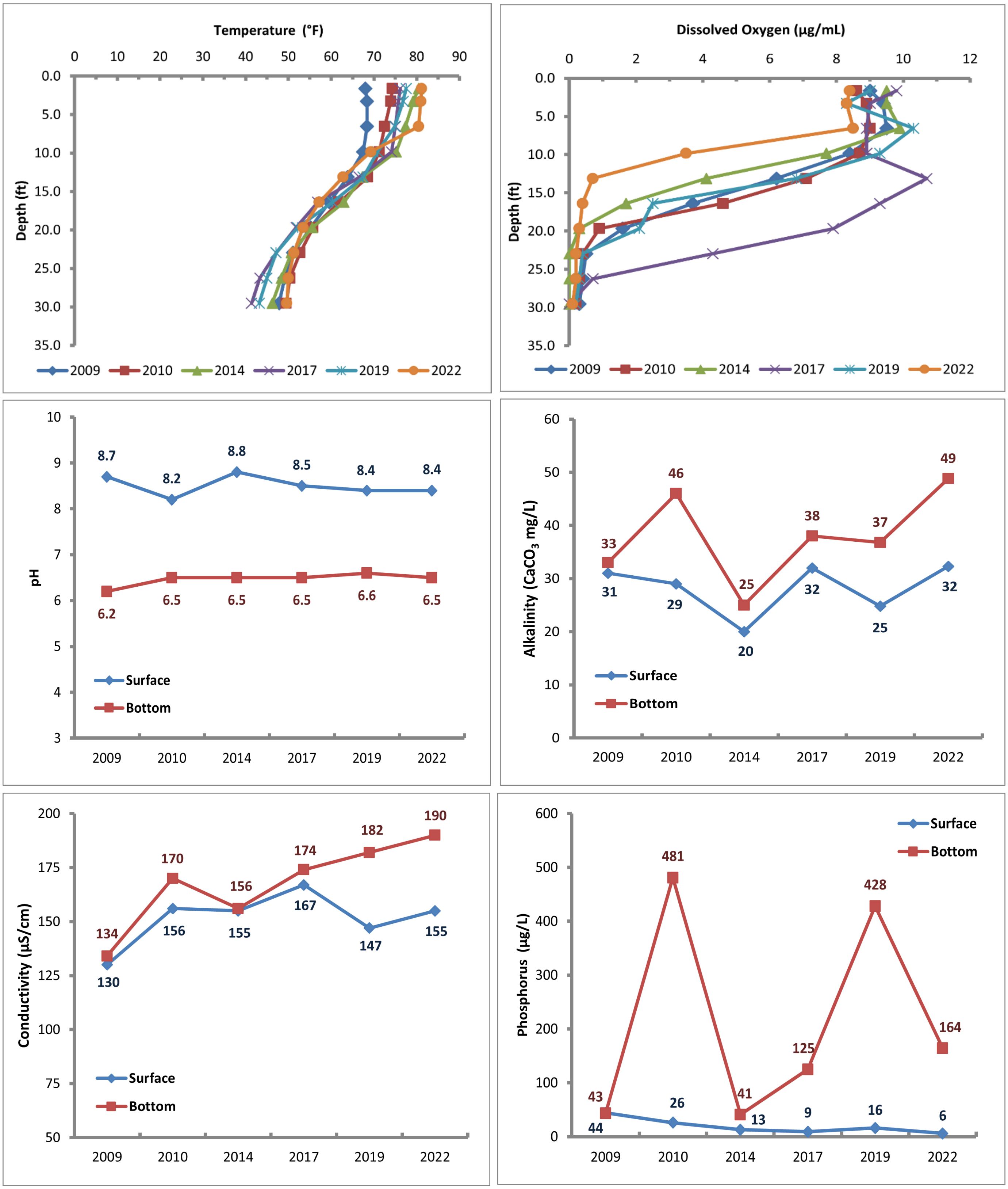

Figure 7. Water chemistry in Taunton Lake in 2009, 2010, 2014, 2017, 2019, and 2022.

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 while lakes with lower values support fanwort, and variable watermilfoil. Invasive zebra mussels (*Dreissena polymorpha*), a problem in nearby lakes, also prefer alkaline conditions. Nutrients are removed when utilized by aquatic plants, while nutrients not used by plants can support nuisance algal blooms.

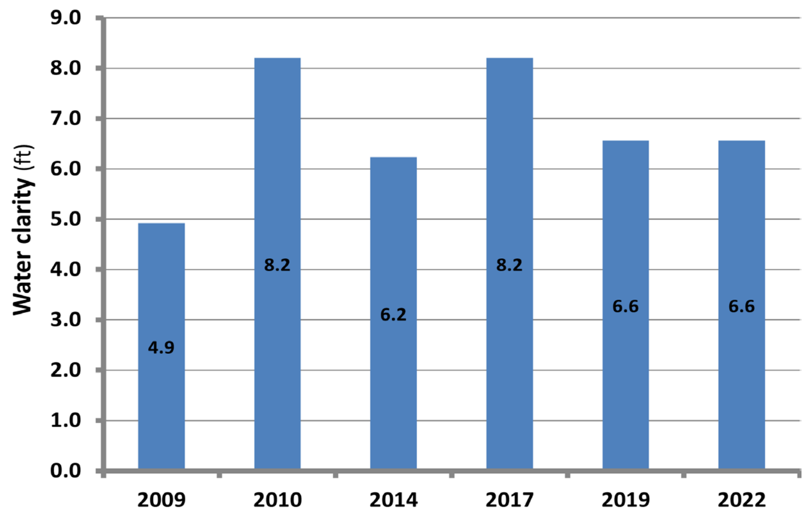

Figure 8. Water clarity in Taunton Lake in 2009, 2010, 2014, 2017, 2019, and 2022.

The water clarity in Taunton Lake ranged between 4.9 and 8.2 feet (1.5 and 2.5 m) in the survey years (Figure 8). Water clarity in 2022 was 6.6 feet (2.0 m), the same as in 2019. The poorest clarity measurement (4.9 feet or 1.5 m) occurred in 2009 suggesting more recent changes in the plant community and management practices may have caused an improvement. Because the measurements were taken when Connecticut lakes are often the clearest, this may not reflect conditions that occur later in the summer. Water clarities in Connecticut's lakes range from 1 - 32.8 feet (0.3 - 10 m) with an average of 7.5 feet (2.3 m) (CAES IAPP, 2023). Thus, the clarity of Taunton Lake ranks near the average.

The water temperature in Taunton Lake was 81°F (27.3 °C) at the surface and 50 °F (9.8°C) near the bottom during the 2022 survey (Figure 7, top left). The thermocline (depth where water temperature showed a rapid decline) was at approximately 10 feet (3 m). Similarly, dissolved oxygen concentrations (Figure 7, top right) were high between 0 – 6.5 feet (2 m) and rapidly declined to anaerobic conditions at depths greater than 10 feet (3 m). Anaerobic conditions favor phosphorus release from the sediment and are unsuitable for most fish.

The pH of Taunton Lake's water ranged between 8.2 - 8.8 at the surface and between 6.2 - 6.6 near the bottom in the survey years (Figure 7, middle, left). Higher pH (less acidic) near the surface is consistent with daytime removal of carbon dioxide by algae and aquatic plants. Taunton Lake alkalinity ranged between 20 - 32 mg/L $CaCO_3$ at the surface with no trend throughout the survey years (Figure 7, middle, right). Bottom water alkalinity was slightly higher and ranged between 25 - 49 mg/L $CaCO_3$. As with the surface alkalinity, there is 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 conductivity of Taunton Lake's surface water ranged between 130 – 167 µs/cm and showed no distinct trend over time (Figure 7, bottom, left). At the bottom, however an increase in conductivity was observed from near 130 µs/cm in 2009 to 190 µs/cm in 2022. The average conductivity for Connecticut lakes is about 95 µs/cm (CAES IAPP, 2023), thus Taunton Lake would be considered above average.

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 Taunton Lake decreased from 16 µg/L in 2019 to 6 µg/L in 2022 (Figure 7, bottom right). Bottom total P concentrations decreased from 428 µg/L in 2019 to 164 µg/L in 2022. The lowest total P concentrations at the bottom occurred in 2009 and 2014 (43 and 41 µg/L respectively) while the highest concentrations occurred in 2010, 2017, 2019, and 2022 (481, 125, 428, and 164 µg/L respectively). Increased P in the bottom water is common during the summer as anoxic conditions release P from the sediment (Norvell, 1974). Wide variations will occur due to mixing events such as high winds and heavy rains. We tested total nitrogen (TN) for the first time in 2022 and found 627 µg/L at the surface and 2636 µg/L near the bottom. Although nitrogen is likely less limiting to the growth of aquatic plants and algae compared to terrestrial plants, it may play a role in lake productivity. Frink and Norvell (1984) found TN in Connecticut lakes ranged from 193 - 1830 µg/L and averaged 554 µg/L.

Taunton Lake's alkalinity, conductivity, and phosphorus levels categorize the lake as highly susceptible to invasion from curlyleaf pondweed, Eurasian watermilfoil, and minor naiad (June-Wells et al. 2013). Besides minor naiad, this has already occurred. Zebra mussels are currently present in the Housatonic River and associated lakes. Taunton Lake's water chemistry makes it a prime candidate for zebra mussel invasion.

Conclusions

Since the 1950s, Taunton Lake has changed from a waterbody with a sandy/gravelly bottom with few plants to a silty/muck bottom with luxuriant plant growth. However, since the introduction of triploid grass carp in 2013, 2015, and 2016, aquatic vegetation in the lake has significantly declined. Invasive Eurasian watermilfoil was once the dominant plant species in the lake but is now sparse. Invasive water chestnut was found in 2019 and immediately pulled. Fortunately, it was not found in the 2022 survey. Nine native aquatic plant species were observed in 2022. They were extremely sparse and growing in very shallow areas (less than 2 feet deep) where grass carp would have difficulty reaching. The decline in aquatic plant abundance since the grass carp introductions has caused littoral zone coverage to fall below 20 - 40 percent, the range considered ideal for healthy populations of fish and other aquatic organisms. Returning aquatic vegetation to Taunton Lake will require reducing the number of grass carp either through natural mortality or manual removal. Taunton Lake's water has relatively stable water clarity and surface total phosphorus. Other water chemistry parameters showed the lake to have moderately high pH, alkalinity, and conductivity. This creates conditions favoring invasive curlyleaf pondweed, Eurasian watermilfoil, and minor naiad as well as invasive zebra mussels. Minor naiad and zebra mussels have yet to be observed in Taunton Lake. Continued surveillance at intervals of at least five years are suggested.

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Appendix

Invasive Plant Descriptions

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*


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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

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Trapa natans

Common names:
Water chestnut
European water chestnut

Origin:
Asia and Europe

Key features:
Plants are rooted to substrate and float
Stems: Stem is submersed, flaccid and can be up to 15 feet (5 m) long
Leaves: Leaves 0.8-0.16 inches (2-4 cm) long are triangular and toothed along the front edge with inflated petioles, leaves float in a rosette pattern
Flowers: Flowers are located in the center of the rosette and have four white petals
Fruits/Seeds: Fruit is hard and has four sharp spines
Reproduction: Seeds and fragmentation

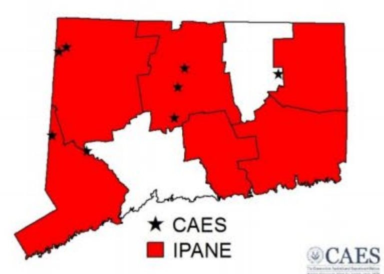
Easily confused species:
None


Photo by CAES IAPP

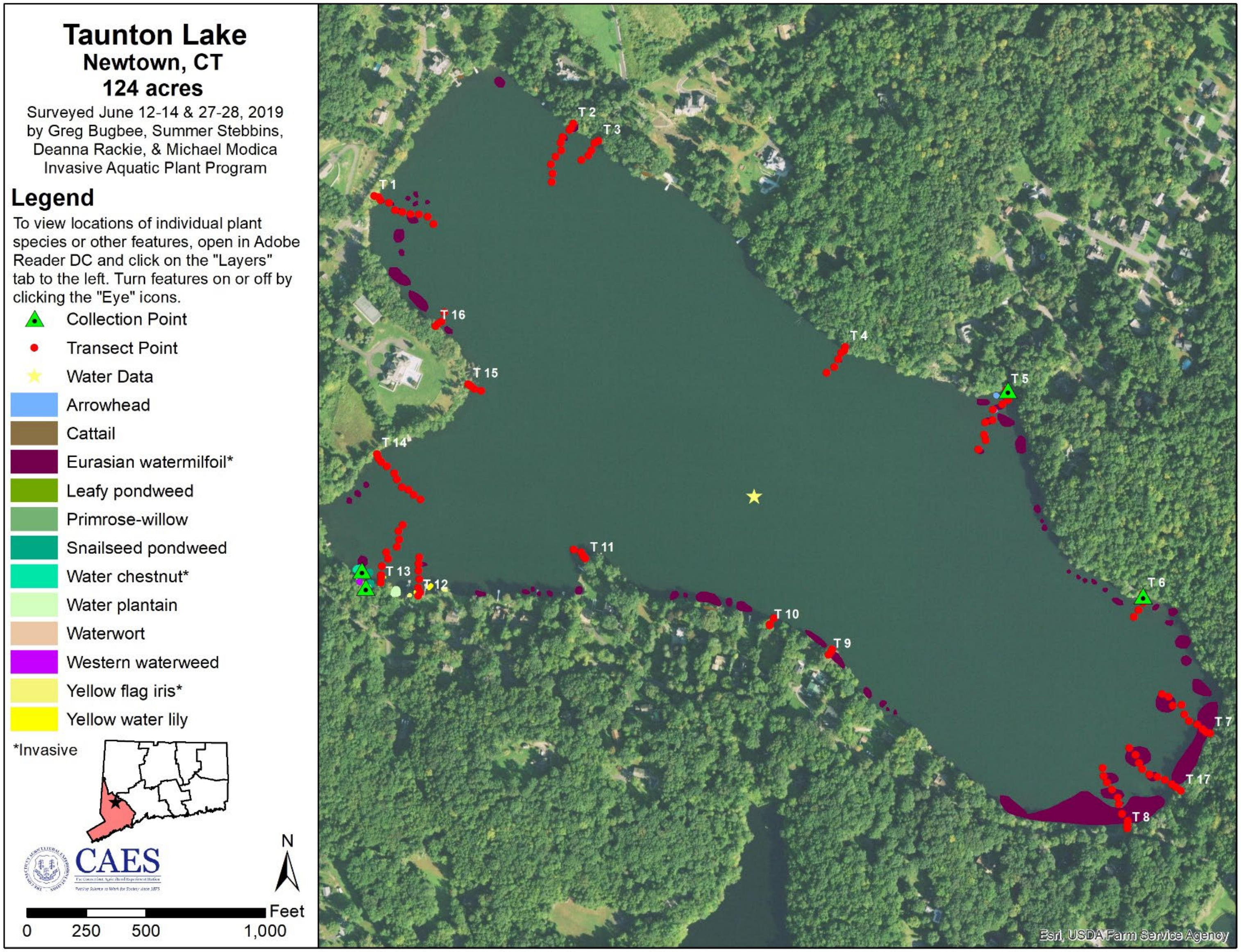

Rosette
Photo by CAES IAPP

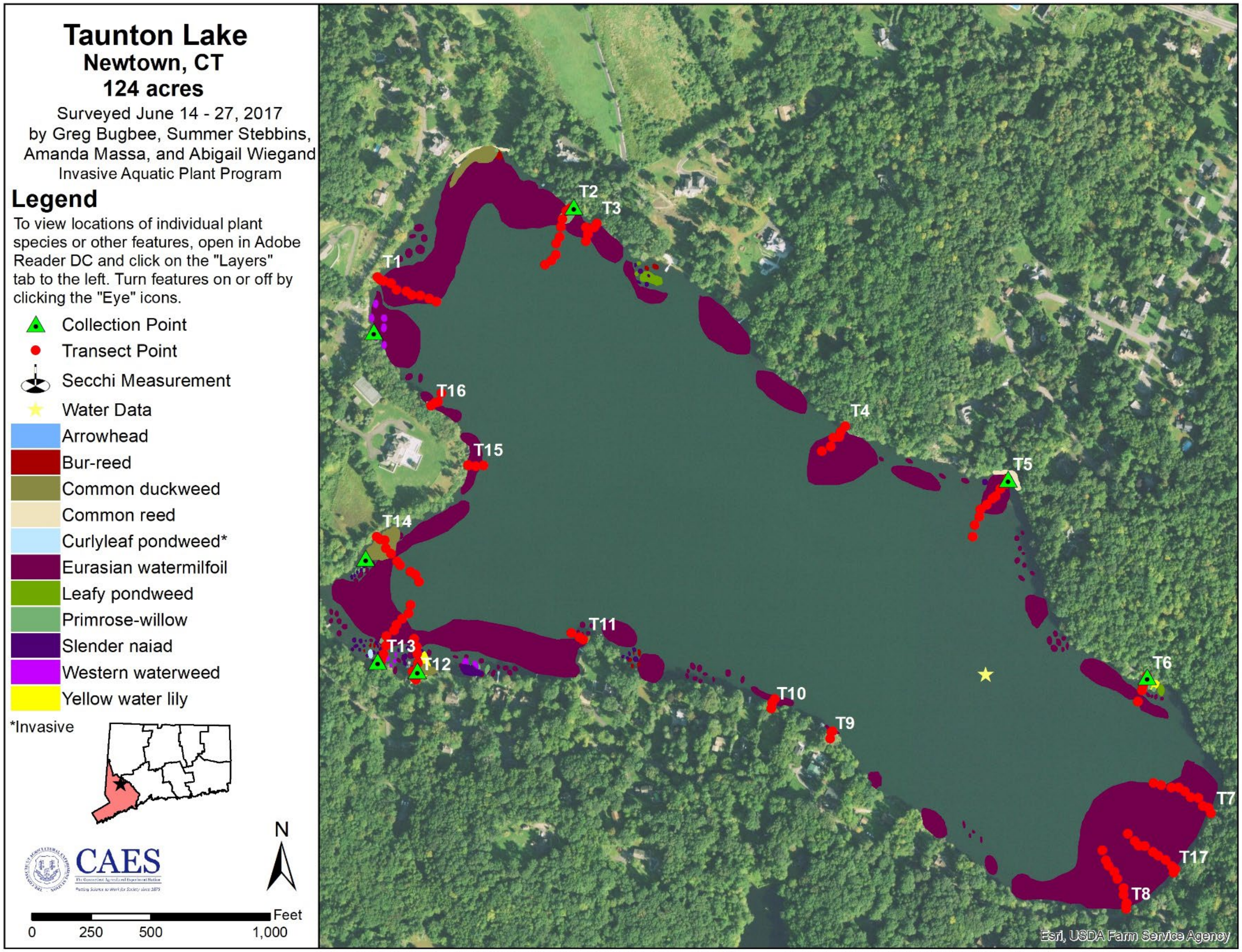

Fruit
Photo by CAES IAPP

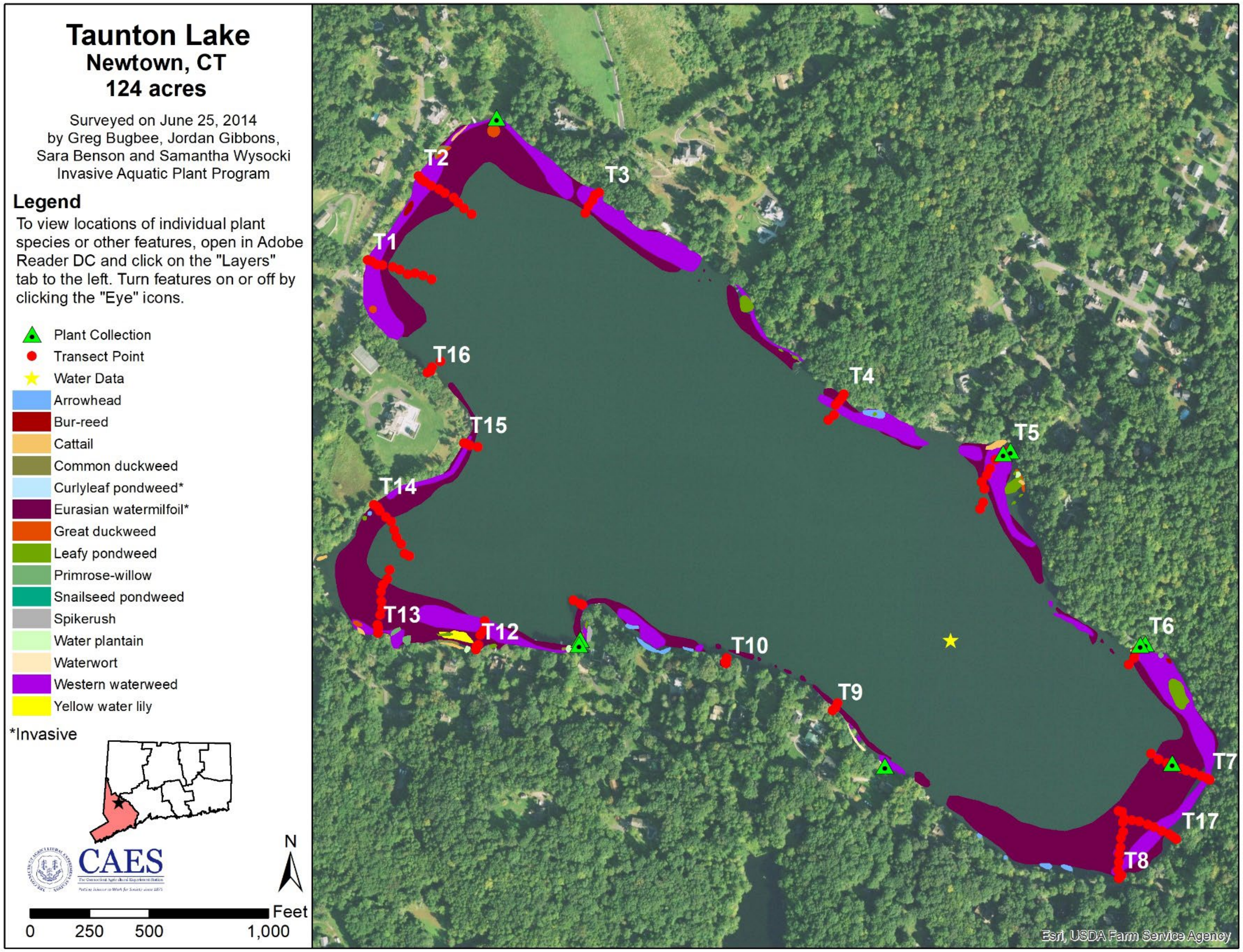

Photo by Leslie J. Mehrhoff

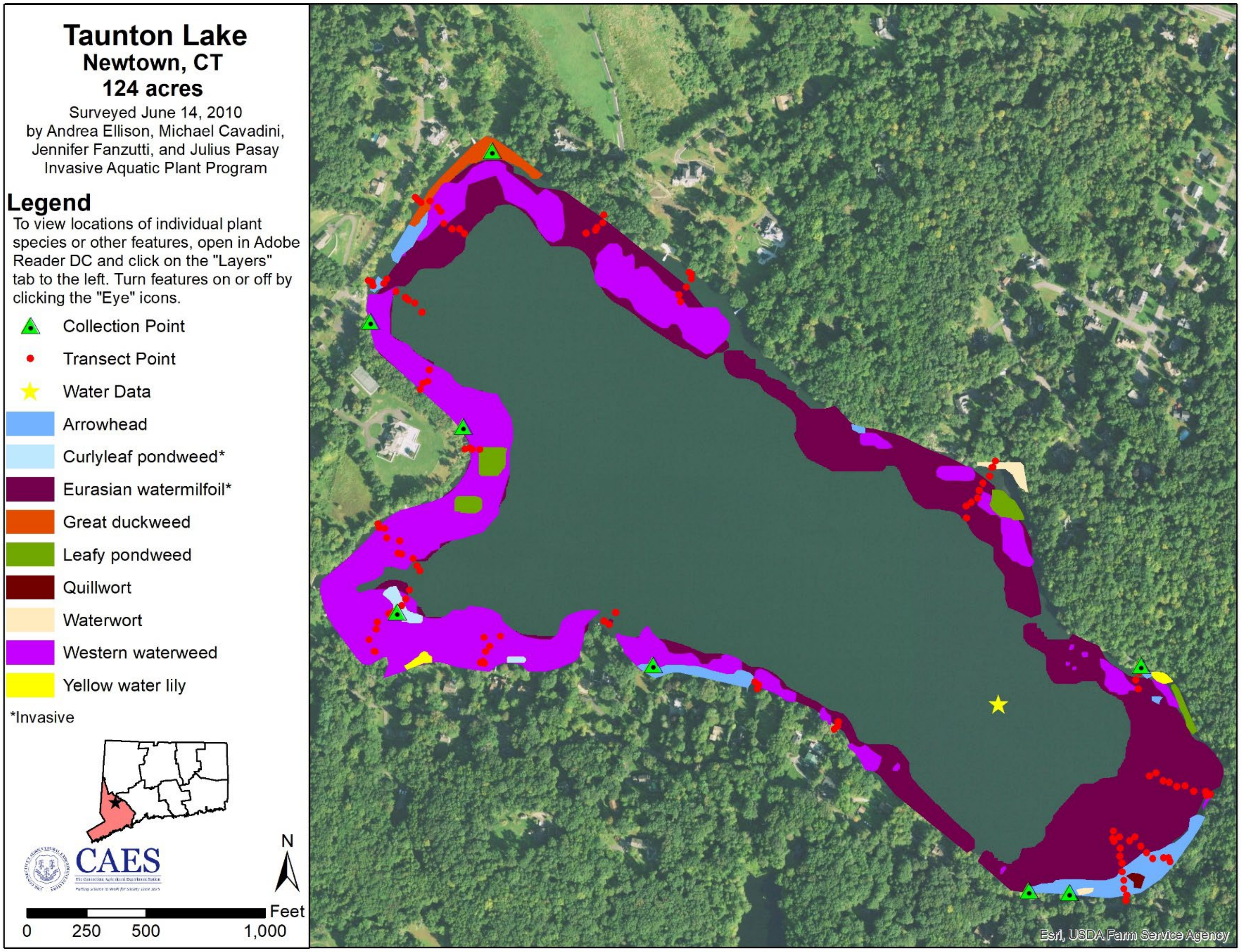


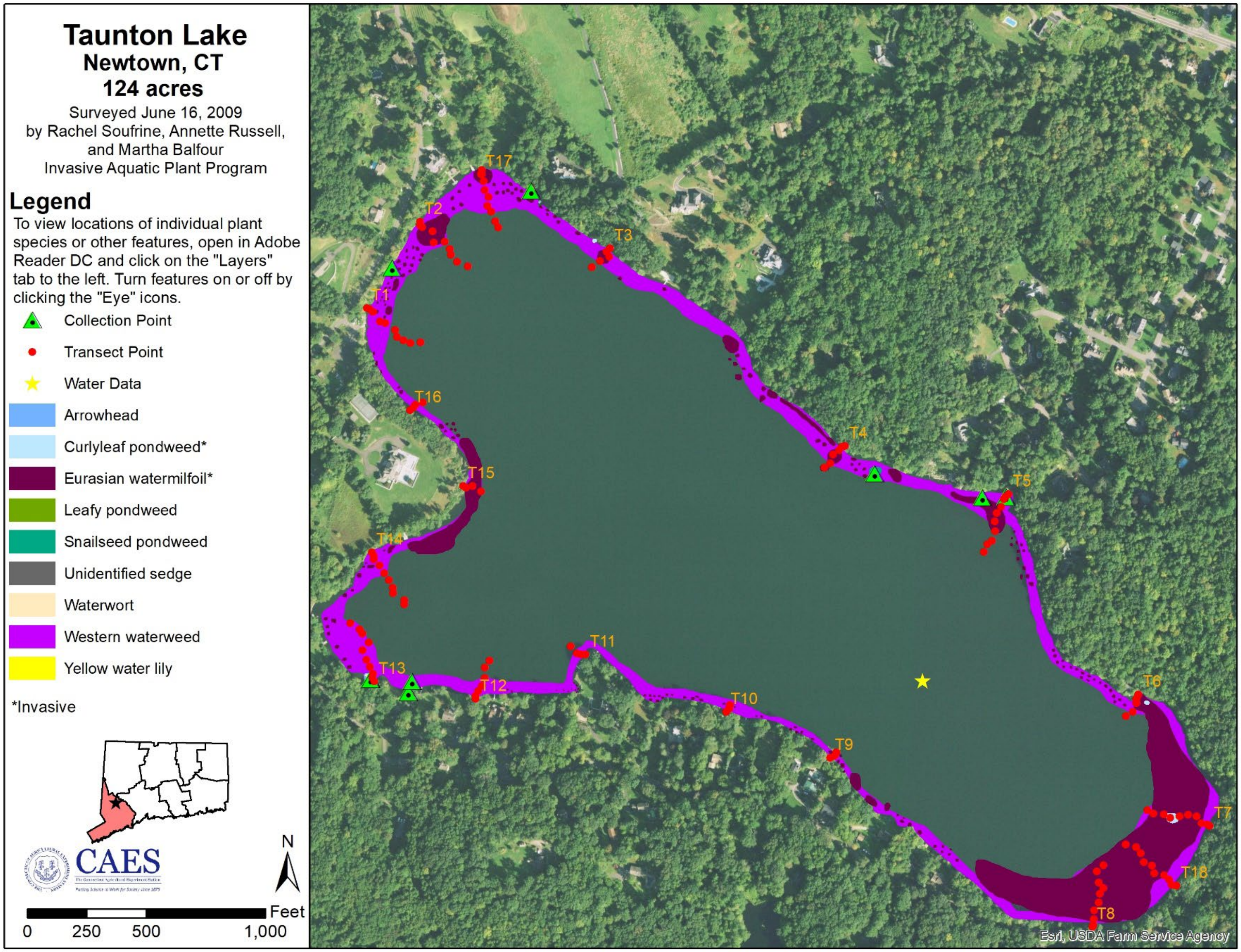
Previous Years' Survey Maps


Taunton Lake
Newtown, CT
124 acres
Surveyed June 12-14 & 27-28, 2019
by Greg Bugbee, Summer Stebbins,
Deanna Rackie, & Michael Modica
Invasive Aquatic Plant Program
Legend
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab to the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
Transect Point
Water Data
Arrowhead
Cattail
Eurasian watermilfoil*
Leafy pondweed
Primrose-willow
Snailseed pondweed
Water chestnut*
Water plantain
Waterwort
Western waterweed
Yellow flag iris*
Yellow water lily
*Invasive
CAES
N
Feet
0 250 500 1,000
T 1
T 2
T 3
T 4
T 5
T 6
T 7
T 8
T 9
T 10
T 11
T 12
T 13
T 14
T 15
T 16
T 17
Esri, USDA Farm Service Agency


Taunton Lake
Newtown, CT
124 acres
Surveyed June 14 - 27, 2017
by Greg Bugbee, Summer Stebbins,
Amanda Massa, and Abigail Wiegand
Invasive Aquatic Plant Program
Legend
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab to the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
Transect Point
Secchi Measurement
Water Data
Arrowhead
Bur-reed
Common duckweed
Common reed
Curlyleaf pondweed*
Eurasian watermilfoil
Leafy pondweed
Primrose-willow
Slender naiad
Western waterweed
Yellow water lily
*Invasive
CAES
N
Feet
0
250
500
1,000
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
T15
T16
T17
Esri, USDA Farm Service Agency


Taunton Lake
Newtown, CT
124 acres
Surveyed on June 25, 2014
by Greg Bugbee, Jordan Gibbons,
Sara Benson and Samantha Wysocki
Invasive Aquatic Plant Program
Legend
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab to the left. Turn features on or off by clicking the "Eye" icons.
Plant Collection
Transect Point
Water Data
Arrowhead
Bur-reed
Cattail
Common duckweed
Curlyleaf pondweed*
Eurasian watermilfoil*
Great duckweed
Leafy pondweed
Primrose-willow
Snailseed pondweed
Spikerush
Water plantain
Waterwort
Western waterweed
Yellow water lily
*Invasive
CAES
N
Feet
0 250 500 1,000
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T12
T13
T14
T15
T16
T17
Esri, USDA Farm Service Agency


Taunton Lake
Newtown, CT
124 acres
Surveyed June 14, 2010
by Andrea Ellison, Michael Cavadini,
Jennifer Fanzutti, and Julius Pasay
Invasive Aquatic Plant Program
Legend
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab to the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
Transect Point
Water Data
Arrowhead
Curlyleaf pondweed*
Eurasian watermilfoil*
Great duckweed
Leafy pondweed
Quillwort
Waterwort
Western waterweed
Yellow water lily
*Invasive
CAES
N
Feet
0
250
500
1,000
Esri, USDA Farm Service Agency


Taunton Lake
Newtown, CT
124 acres
Surveyed June 16, 2009
by Rachel Soufrine, Annette Russell,
and Martha Balfour
Invasive Aquatic Plant Program
Legend
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab to the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
Transect Point
Water Data
Arrowhead
Curlyleaf pondweed*
Eurasian watermilfoil*
Leafy pondweed
Snailseed pondweed
Unidentified sedge
Waterwort
Western waterweed
Yellow water lily
*Invasive
CAES
N
Feet
0
250
500
1,000
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
T15
T16
T17
T18
Esri, USDA Farm Service Agency

Transect Data

Appendix Taunton Lake Transect Data 2022 (1 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	MyrSpi	NupVar	PotBic	PotFol	SpaSpp	TyphaSp	Wolffia Sp
1	1	0.5	Greg Bugbee	41.41443	-73.34023	7/14/2022	0.3	Sand	0	0	0	0	0	0	0
1	2	5	Greg Bugbee	41.41440	-73.34019	7/14/2022	1.2	Muck	0	0	0	0	0	0	0
1	3	10	Greg Bugbee	41.41436	-73.34016	7/14/2022	1.9	Muck	0	0	0	0	0	0	0
1	4	20	Greg Bugbee	41.41432	-73.34001	7/14/2022	2.8	Muck	0	0	0	0	0	0	0
1	5	30	Greg Bugbee	41.41427	-73.33989	7/14/2022	3.0	Muck	0	0	0	0	0	0	0
1	6	40	Greg Bugbee	41.41425	-73.33977	7/14/2022	3.5	Muck	0	0	0	0	0	0	0
1	7	50	Greg Bugbee	41.41420	-73.33966	7/14/2022	3.8	Muck	0	0	0	0	0	0	0
1	8	60	Greg Bugbee	41.41420	-73.33957	7/14/2022	4.1	Muck	0	0	0	0	0	0	0
1	9	70	Greg Bugbee	41.41416	-73.33941	7/14/2022	5.0	Muck	0	0	0	0	0	0	0
1	10	80	Greg Bugbee	41.41412	-73.33931	7/14/2022	6.3	Muck	0	0	0	0	0	0	0
2	1	0.5	Greg Bugbee	41.41525	-73.33723	7/14/2022	0.1	Sand	2	0	0	0	0	0	0
2	2	5	Greg Bugbee	41.41521	-73.33728	7/14/2022	1.5	Gravel	0	0	0	0	0	0	0
2	3	10	Greg Bugbee	41.41519	-73.33731	7/14/2022	2.0	Sand	0	0	0	0	0	0	0
2	4	20	Greg Bugbee	41.41510	-73.33738	7/14/2022	3.2	Sand	0	0	0	0	0	0	0
2	5	30	Greg Bugbee	41.41501	-73.33746	7/14/2022	7.0	Sand	0	0	0	0	0	0	0
2	6	40	Greg Bugbee	41.41491	-73.33749	7/14/2022	7.5	Muck	0	0	0	0	0	0	0
2	7	50	Greg Bugbee	41.41480	-73.33751	7/14/2022	7.8	Muck	0	0	0	0	0	0	0
2	8	60	Greg Bugbee	41.41472	-73.33760	7/14/2022	8.0	Silt	0	0	0	0	0	0	0
2	9	70	Greg Bugbee	41.41462	-73.33763	7/14/2022	8.0	Silt	0	0	0	0	0	0	0
2	10	80	Greg Bugbee	41.41454	-73.33767	7/14/2022	8.2	Silt	0	0	0	0	0	0	0
3	1	0.5	Greg Bugbee	41.41505	-73.33681	7/14/2022	0.1	Sand	0	0	0	0	0	0	0
3	2	5	Greg Bugbee	41.41500	-73.33687	7/14/2022	1.5	Muck	0	0	0	0	0	0	0
3	3	10	Greg Bugbee	41.41495	-73.33693	7/14/2022	1.8	Sand	0	0	0	0	0	0	0
3	4	20	Greg Bugbee	41.41489	-73.33701	7/14/2022	2.5	Gravel	0	0	0	0	0	0	0
3	5	30	Greg Bugbee	41.41483	-73.33706	7/14/2022	5.0	Muck	0	0	0	0	0	0	0
4	1	0.5	Greg Bugbee	41.41273	-73.33306	7/14/2022	0.1	Gravel	0	0	0	0	0	0	0
4	2	5	Greg Bugbee	41.41267	-73.33310	7/14/2022	1.6	Gravel	0	0	0	0	0	0	0
4	3	10	Greg Bugbee	41.41258	-73.33315	7/14/2022	2.1	Gravel	0	0	0	0	0	0	0
4	4	20	Greg Bugbee	41.41253	-73.33318	7/14/2022	3.3	Muck	0	0	0	0	0	0	0
4	5	30	Greg Bugbee	41.41248	-73.33323	7/14/2022	6.0	Muck	0	0	0	0	0	0	0
4	6	40	Greg Bugbee	41.41238	-73.33332	7/14/2022	8.3	Muck	0	0	0	0	0	0	0
5	1	0.5	Greg Bugbee	41.41212	-73.33056	7/12/2022	0.1	Sand	0	0	1	1	2	0	0
5	2	5	Greg Bugbee	41.41207	-73.33061	7/12/2022	0.3	Sand	0	0	0	0	0	0	0
5	3	10	Greg Bugbee	41.41201	-73.33067	7/12/2022	1.0	Muck	0	0	0	0	0	0	0
5	4	20	Greg Bugbee	41.41196	-73.33074	7/12/2022	1.3	Muck	0	0	0	0	0	0	0
5	5	30	Greg Bugbee	41.41190	-73.33082	7/12/2022	1.5	Muck	0	0	0	0	0	0	0
5	6	40	Greg Bugbee	41.41185	-73.33087	7/12/2022	1.8	Muck	0	0	0	0	0	0	0
5	7	50	Greg Bugbee	41.41175	-73.33093	7/12/2022	2.5	Muck	0	0	0	0	0	0	0
5	8	60	Greg Bugbee	41.41171	-73.33101	7/12/2022	3.5	Muck	0	0	0	0	0	0	0
5	9	70	Greg Bugbee	41.41161	-73.33102	7/12/2022	5.0	Muck	0	0	0	0	0	0	0
5	10	80	Greg Bugbee	41.41150	-73.33110	7/12/2022	7.5	Muck	0	0	0	0	0	0	0
6	1	0.5	Greg Bugbee	41.40987	-73.32846	7/12/2022	0.2	Muck	0	2	0	0	0	0	0
6	2	5	Greg Bugbee	41.40984	-73.32848	7/12/2022	1.0	Muck	0	0	0	0	0	0	0
6	3	10	Greg Bugbee	41.40977	-73.32847	7/12/2022	1.0	Muck	0	0	0	0	0	0	0
6	4	20	Greg Bugbee	41.40971	-73.32849	7/12/2022	1.4	Muck	0	0	0	0	0	0	0
6	5	30	Greg Bugbee	41.40961	-73.32852	7/12/2022	4.6	Muck	0	0	0	0	0	0	0
7	1	0.5	Greg Bugbee	41.40831	-73.32740	7/12/2022	0.3	Gravel	0	0	0	0	0	0	0
7	2	5	Greg Bugbee	41.40834	-73.32744	7/12/2022	1.0	Sand	0	0	0	0	0	0	0
7	3	10	Greg Bugbee	41.40836	-73.32751	7/12/2022	1.5	Sand	0	0	0	0	0	0	0
7	4	20	Greg Bugbee	41.40844	-73.32761	7/12/2022	1.8	Muck	0	0	0	0	0	0	0

Appendix Taunton Lake Transect Data 2022 (2 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	MyrSpi	NupVar	PotBic	PotFol	SpaSpp	TyphaSp	Wolffia Sp
7	5	30	Greg Bugbee	41.40849	-73.32769	7/12/2022	1.8	Muck	0	0	0	0	0	0	0
7	6	40	Greg Bugbee	41.40855	-73.32779	7/12/2022	2.0	Muck	0	0	0	0	0	0	0
7	7	50	Greg Bugbee	41.40859	-73.32789	7/12/2022	2.0	Muck	0	0	0	0	0	0	0
7	8	60	Greg Bugbee	41.40860	-73.32799	7/12/2022	2.2	Muck	0	0	0	0	0	0	0
7	9	70	Greg Bugbee	41.40862	-73.32818	7/12/2022	2.6	Muck	0	0	0	0	0	0	0
7	10	80	Greg Bugbee	41.40864	-73.32827	7/12/2022	3.0	Muck	0	0	0	0	0	0	0
8	1	0.5	Greg Bugbee	41.40719	-73.32868	7/12/2022	0.2	Gravel	0	0	0	0	0	0	2
8	2	5	Greg Bugbee	41.40725	-73.32870	7/12/2022	1.0	Gravel	1	0	0	0	0	0	2
8	3	10	Greg Bugbee	41.40732	-73.32873	7/12/2022	1.3	Gravel	0	0	0	0	0	0	0
8	4	20	Greg Bugbee	41.40743	-73.32876	7/12/2022	1.6	Gravel	0	0	0	0	0	0	0
8	5	30	Greg Bugbee	41.40755	-73.32880	7/12/2022	2.0	Gravel	0	0	0	0	0	0	0
8	6	40	Greg Bugbee	41.40763	-73.32890	7/12/2022	2.3	Muck	0	0	0	0	0	0	0
8	7	50	Greg Bugbee	41.40767	-73.32893	7/12/2022	2.6	Muck	0	0	0	0	0	0	0
8	8	60	Greg Bugbee	41.40774	-73.32898	7/12/2022	2.8	Muck	0	0	0	0	0	0	0
8	9	70	Greg Bugbee	41.40787	-73.32906	7/12/2022	3.0	Muck	0	0	0	0	0	0	0
8	10	80	Greg Bugbee	41.40797	-73.32910	7/12/2022	3.2	Muck	0	0	0	0	0	0	0
9	1	0.5	Greg Bugbee	41.40916	-73.33327	7/12/2022	0.2	Gravel	0	0	0	0	0	0	0
9	2	5	Greg Bugbee	41.40920	-73.33325	7/12/2022	1.6	Gravel	0	0	0	0	0	0	0
9	3	10	Greg Bugbee	41.40925	-73.33322	7/12/2022	2.0	Gravel	0	0	0	0	0	0	0
10	1	0.5	Greg Bugbee	41.40950	-73.33412	7/12/2022	0.2	Gravel	0	0	0	0	0	0	0
10	2	5	Greg Bugbee	41.40955	-73.33410	7/12/2022	1.8	Gravel	0	0	0	0	0	0	0
10	3	10	Greg Bugbee	41.40961	-73.33409	7/12/2022	5.0	Gravel	0	0	0	0	0	0	0
11	1	0.5	Greg Bugbee	41.41028	-73.33697	7/12/2022	0.7	Gravel	0	0	0	0	0	0	0
11	2	5	Greg Bugbee	41.41032	-73.33702	7/12/2022	1.5	Gravel	0	0	0	0	0	0	0
11	3	10	Greg Bugbee	41.41040	-73.33717	7/12/2022	7.3	Gravel	0	0	0	0	0	0	0
12	1	0.5	Greg Bugbee	41.40982	-73.33959	7/12/2022	0.2	Gravel	0	4	2	0	0	2	0
12	2	5	Greg Bugbee	41.40985	-73.33959	7/12/2022	1.0	Muck	0	2	0	0	0	0	0
12	3	10	Greg Bugbee	41.40996	-73.33957	7/12/2022	1.5	Muck	0	0	0	0	0	0	0
12	4	20	Greg Bugbee	41.41008	-73.33955	7/12/2022	1.7	Sand	0	0	0	0	0	0	0
12	5	30	Greg Bugbee	41.41016	-73.33953	7/12/2022	2.0	Sand	0	0	0	0	0	0	0
12	6	40	Greg Bugbee	41.41028	-73.33957	7/12/2022	3.3	Sand	0	0	0	0	0	0	0
13	1	0.5	Greg Bugbee	41.40996	-73.34009	7/14/2022	0.1	Sand	0	0	1	2	0	0	0
13	2	5	Greg Bugbee	41.41002	-73.34010	7/14/2022	0.4	Sand	0	0	0	0	0	0	0
13	3	10	Greg Bugbee	41.41008	-73.34010	7/14/2022	0.8	Muck	0	0	0	0	0	0	0
13	4	20	Greg Bugbee	41.41015	-73.34005	7/14/2022	1.2	Muck	0	0	0	0	0	0	0
13	5	30	Greg Bugbee	41.41025	-73.34003	7/14/2022	2.0	Muck	0	0	0	0	0	0	0
13	6	40	Greg Bugbee	41.41033	-73.34003	7/14/2022	2.2	Muck	0	0	0	0	0	0	0
13	7	50	Greg Bugbee	41.41045	-73.33998	7/14/2022	3.0	Muck	0	0	0	0	0	0	0
13	8	60	Greg Bugbee	41.41051	-73.33997	7/14/2022	3.7	Muck	0	0	0	0	0	0	0
13	9	70	Greg Bugbee	41.41055	-73.33985	7/14/2022	5.0	Muck	0	0	0	0	0	0	0
13	10	80	Greg Bugbee	41.41066	-73.33985	7/14/2022	5.4	Muck	0	0	0	0	0	0	0
14	1	0.5	Greg Bugbee	41.41143	-73.34020	7/14/2022	0.4	Muck	0	0	0	0	0	0	0
14	2	5	Greg Bugbee	41.41141	-73.34017	7/14/2022	1.0	Gravel	0	0	0	0	0	0	0
14	3	10	Greg Bugbee	41.41134	-73.34009	7/14/2022	1.2	Gravel	0	0	0	0	0	0	0
14	4	20	Greg Bugbee	41.41129	-73.34004	7/14/2022	1.6	Gravel	0	0	0	0	0	0	0
14	5	30	Greg Bugbee	41.41120	-73.33996	7/14/2022	5.0	Gravel	0	0	0	0	0	0	0
14	6	40	Greg Bugbee	41.41114	-73.33990	7/14/2022	5.5	Gravel	0	0	0	0	0	0	0
14	7	50	Greg Bugbee	41.41110	-73.33981	7/14/2022	5.5	Muck	0	0	0	0	0	0	0
14	8	60	Greg Bugbee	41.41103	-73.33975	7/14/2022	6.8	Muck	0	0	0	0	0	0	0
14	9	70	Greg Bugbee	41.41101	-73.33966	7/14/2022	7.0	Muck	0	0	0	0	0	0	0

Appendix Taunton Lake Transect Data 2022 (3 of 3)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	MyrSpi	NupVar	PotBic	PotFol	SpaSpp	TyphaSp	Wolffia Sp
14	10	80	Greg Bugbee	41.41098	-73.33958	7/14/2022	7.3	Muck	0	0	0	0	0	0	0
15	1	0.5	Greg Bugbee	41.41224	-73.33883	7/14/2022	0.2	Gravel	0	0	0	0	0	0	0
15	2	5	Greg Bugbee	41.41224	-73.33875	7/14/2022	1.2	Gravel	0	0	0	0	0	0	0
15	3	10	Greg Bugbee	41.41225	-73.33860	7/14/2022	2.3	Gravel	0	0	0	0	0	0	0
16	1	0.5	Greg Bugbee	41.41293	-73.33936	7/14/2022	0.2	Gravel	0	0	0	0	0	0	0
16	2	5	Greg Bugbee	41.41296	-73.33932	7/14/2022	0.8	Gravel	0	0	0	0	0	0	0
16	3	10	Greg Bugbee	41.41299	-73.33925	7/14/2022	4.0	Gravel	0	0	0	0	0	0	0
16	4	20	Greg Bugbee	41.41306	-73.33920	7/14/2022	7.0	Gravel	0	0	0	0	0	0	0
17	1	0.5	Greg Bugbee	41.40767	-73.32794	7/12/2022	0.1	Sand	0	0	0	0	0	0	0
17	2	5	Greg Bugbee	41.40771	-73.32797	7/12/2022	1.0	Sand	0	0	0	0	0	0	0
17	3	10	Greg Bugbee	41.40779	-73.32811	7/12/2022	1.2	Gravel	0	0	0	0	0	0	0
17	4	20	Greg Bugbee	41.40782	-73.32819	7/12/2022	1.3	Gravel	0	0	0	0	0	0	0
17	5	30	Greg Bugbee	41.40785	-73.32829	7/12/2022	1.4	Gravel	0	0	0	0	0	0	0
17	6	40	Greg Bugbee	41.40793	-73.32842	7/12/2022	1.8	Gravel	0	0	0	0	0	0	0
17	7	50	Greg Bugbee	41.40794	-73.32849	7/12/2022	2.0	Gravel	0	0	0	0	0	0	0
17	8	60	Greg Bugbee	41.40800	-73.32860	7/12/2022	2.5	Gravel	0	0	0	0	0	0	0
17	9	70	Greg Bugbee	41.40807	-73.32866	7/12/2022	2.6	Gravel	0	0	0	0	0	0	0
17	10	80	Greg Bugbee	41.40812	-73.32874	7/12/2022	2.8	Gravel	0	0	0	0	0	0	0