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Pachaug Pond Aquatic Plant Survey Report 2024

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Office of Aquatic Invasive Species
Department of Environmental Science and Forestry

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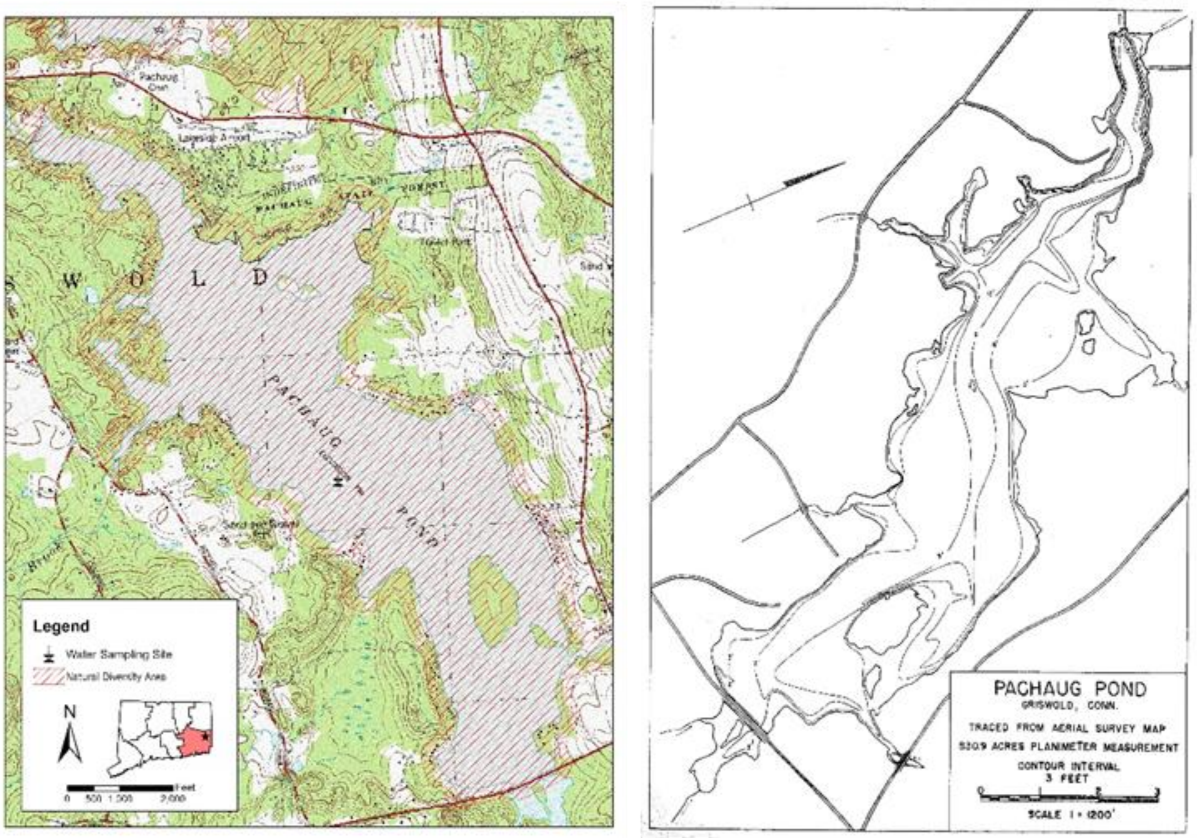

Figure 1. Topographic map of Pachaug Pond including location of state-listed species (Natural Diversity Area) (left) and bathymetry map circa 1959 (right).

INTRODUCTION

Since 2004, the Connecticut Agricultural Experiment Station (CAES) Office of Aquatic Invasive Species (OAIS; formerly the Invasive Aquatic Plant Program) has completed over 400 surveys of aquatic vegetation and water chemistry in Connecticut's lakes, ponds, and rivers. A total of 264 waterbodies have been mapped with many, such as Pachaug Pond, receiving multiple resurveys to monitor change (CAES OAIS, 2025). Of the Connecticut waterbodies recorded in our database, 60% contain one or more invasive, non-native plant species capable of causing rapid deterioration of aquatic ecosystems and recreational value. The presence of invasive species is related to water chemistry, public boat launches, random events, and climate change (Rahel and Olden, 2008). A CAES OAIS data repository is available online where stakeholders can view digitized vegetation maps, detailed transect data,

Figure 2. Water smartweed, fanwort, and various water lilies growing in densely vegetated cove on the western side of the lake (near transect 3).

temperature and dissolved oxygen profiles, and water test results for clarity, pH, alkalinity, conductivity, total phosphorus, and total nitrogen (portal.ct.gov/caes-oais). In addition, the database contains digitized herbarium mounts of each waterbody's plant species. This information allows citizens, government officials, and scientists to view past conditions, compare them with the present, and make informed management decisions.

Pachaug Pond is an 817-acre waterbody located in Griswold, CT. It is Connecticut's largest body of freshwater east of the Connecticut River and offers important wildlife habitat and recreational opportunities such as fishing, swimming, boating, cross-country skiing, and snowmobiling. The pond is home to a marina, a campground, a state boat launch, and a fish and game club. Stocked with northern pike, the pond is the site of many fishing tournaments (PPWCA, 2022). It is a relatively shallow waterbody with a maximum depth of about 16 feet and an average depth of around six feet. This creates a large littoral zone that favors aquatic plant growth. State-listed species are present (Figure 1, left; CT DEEP, 2022) and their protection requires withholding information on species and location without Connecticut Department of Energy and Environmental Protection (CT DEEP) Natural Diversity Database (NDDB) approval. Public access is via a state boat launch on the northern shore. There are no motor restrictions; however, numerous shoals and shallows require caution.

Previous work on Pachaug Pond dates to the 1950's when the State Board of Fisheries and Game (1959) described the lake as being shallow and fertile with abundant emergent and submergent vegetation (Figure 1, right; see appendix for full description). The specific plant species were not mentioned, but the bottom was described as mud, swampy ooze, and sand. A dense algal bloom was observed that reduced the water clarity to two feet. Bass fishing was described as excellent with fish over five pounds common. The 1959 description mentioned frequent severe summer drawdowns that may have been controlling aquatic vegetation. These drawdowns were stated as needed for "industrial" purposes, which was likely power generation. Apparently, drawdowns were lessening as of 1959, and aquatic vegetation was increasing. CAES studied Pachaug Pond in 1979 as part of a statewide investigation into changes in lake water chemistry (Frink and Norvell, 1984). In addition to detailed water chemistry, the study mentions Pachaug Pond as having moderately dense aquatic weeds in shallow areas and watermilfoil near the boat launch. Interestingly, pioneer infestations of invasive species might first be noticed at boat launches if the plant arrived on a boat or trailer. The 1979 CAES water tests found a water clarity of 3.5 m (12 feet), an alkalinity of 15 mg/L $CaCO_3$ and a total phosphorus concentration of 16 µg/L at the surface and 13 µg/L at the bottom. These results suggested an oligo-mesotrophic condition where nutrients were not excessive.

Aquatic plant management is organized by the Pachaug Pond Weed Control Association (PPWCA). In response to growing concerns about nuisance aquatic vegetation, the PPWCA commissioned CAES OAIS to conduct annual aquatic vegetation surveys beginning in 2017. These surveys have documented a diverse plant community, with 27–34 native species and 6–8 invasive species.

In 2024, aquatic vegetation increased for the second consecutive year following an extensive drawdown in 2021–2022, which was required for dam repairs. After the drawdown, the frequency of fanwort, swollen bladderwort, and variable-leaf watermilfoil at survey transect points significantly decreased. However, fanwort has since rebounded to pre-drawdown levels. Large shallow areas often contain nuisance vegetation that reach the surface (Figure 2), while similar areas remain unvegetated or support dense vegetation that does not reach the surface. This variation may be due to limited water transparency, influenced by decaying organic matter that gives the water its brown coloration.

To maintain navigable paths in areas with dense vegetation, such as water lilies, a mechanical harvester was introduced in 2022. While the harvester has been effective in keeping waterways clear for boat traffic, survey observations suggest it may also be contributing to the spread of fanwort in Pachaug Pond. Throughout the survey years, fanwort and Eurasian watermilfoil have remained the most troublesome invasive species. Among native plants, water smartweed, white water lily, and eelgrass have caused the greatest nuisance. The following 2024 report describes the eighth consecutive survey of Pachaug Pond by CAES OAIS.

OBJECTIVES

- Perform an eighth survey of Pachaug Pond for aquatic vegetation and test water chemistry.
- Compare with previous surveys and add vegetation maps and water chemistry information to the CAES OAIS website.
- Update aquatic plant management options.

METHODS

Table 1. Aquatic plant species richness (number of species) in Pachaug Pond from 2017 – 2024.

	2017	2018	2019	2020	2021	2022	2023	2024
Number of Species	33	34	35	36	40	36	39	42
Number of Native Species	27	28	29	30	34	29	32	34
Number of Invasive Species/Non-Native Species	6	6	6	6	6	7	7	8

Aquatic Plant Surveys and Mapping:

CAES OAIS surveyed Pachaug Pond for aquatic vegetation on July 31, August 1, 2, 12 and 13, 2024. The survey utilized methods established by CAES and is consistent with the past surveys of Pachaug Pond. Surveys were conducted from 16 and 18-foot motorized boats traveling over areas that could support aquatic plants. Plant species were recorded based on visual observation or collections with a long-handled rake or grapple. Lowrance® Hook 5 and HDS 5 sonar systems as well as ground-truthing with occasional grapple tosses were used to identify vegetated areas in deep water. Quantitative information on plant abundance was obtained by resurveying 10 transects that were positioned perpendicular to the shoreline in 2017, representing the variety of habitats occurring in the lake. Transect points were located using Trimble® R1 GNSS global positioning systems with sub-meter accuracy. Ten sampling data points were taken along each transect at 0.5, 5, 10, 20, 30, 40, 50, 60, 70, and 80 m from the shore. Depth was measured 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 in the lake was dried and mounted in the CAES OAIS aquatic plant herbarium. Digitized mounts can be viewed online (portal.ct.gov/caes-oais). Plant species are referred to by common name in the text of this report; however, corresponding scientific names can be found in Table 2. Cattail and phragmites are wetland plants included in our survey at the request of the PPWCA. Phragmites is an invasive wetland species and is marked as such in our report. We post-processed the GPS data in Pathfinder® 5.85 (Trimble Navigation Limited, Sunnyvale, CA) and then imported it into ArcGIS® Pro 3.4.0 (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.

Water Analysis:

Water was analyzed from the deepest part of the lake in the same location as the previous seven surveys. Water temperature and dissolved oxygen were measured 0.5 m beneath the surface and at 1 m intervals to the bottom. Water was tested for temperature and dissolved oxygen using a YSI 58® meter. Temperature and dissolved oxygen were measured 0.5 m beneath the surface and at 1 m intervals to the bottom. Water clarity was measured by lowering a six-inch diameter black and white Secchi disk determining to what depth it could be viewed. Water samples (250 mL) for pH, alkalinity, conductivity, and total phosphorus were obtained from 0.5 m beneath the surface and 0.5 m above the bottom. The samples were stored at 38°C until testing. A Fisher AR20® meter determined pH and conductivity. Alkalinity (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

Table 2. Frequency of occurrence on transect points in Pachaug Pond from 2017 – 2024.

Native Species	2017	2018	2019	2020	2021	2022	2023	2024
Arrowhead (*Sagittaria* species)	9%	13%	6%	13%	6%	8%	19%	11%
Berchtold's pondweed (*Potamogeton berchtoldii*)	—[a]	—	—	—	—	—	—	3%
Bur-reed (*Sparganium* species)	12%	—	4%	4%	8%	17%	6%	6%
Cattail (*Typha* species)	0%	0%	0%	0%	0%	2%	0%	1%
Clasping-leaf pondweed (*Potamogeton perfoliatus*)	2%	—	1%	1%	1%	—	2%	1%
Common bladderwort (*Utricularia vulgaris*)	8%	54%	1%	—	—	0%	8%	6%
Common duckweed (*Lemna minor*)	—	—	0%	—	8%	6%	0%	0%
Coontail (*Ceratophyllum demersum*)	17%	17%	16%	10%	7%	6%	9%	14%
Eelgrass (*Vallisneria americana*)	65%	59%	53%	72%	53%	46%	67%	56%
Flat-leaf bladderwort (*Utricularia intermedia*)	—	—	—	—	0%	—	1%	0%
Floating bladderwort (*Utricularia radiata*)	48%	—	32%	1%	10%	4%	19%	0%
Floating-leaf pondweed (*Potamogeton natans*)	3%	1%	0%	2%	1%	5%	3%	1%
Golden hedge-hyssop (*Gratiola aurea*)	5%	1%	—	—	0%	2%	1%	—
Great duckweed (*Spirodela polyrhiza*)	—	4%	9%	7%	5%	—	6%	7%
Humped bladderwort (*Utricularia gibba*)	1%	8%	9%	16%	21%	0%	1%	8%
Large-leaf pondweed (*Potamogeton amplifolius*)	9%	19%	8%	19%	31%	5%	11%	6%
Leafy pondweed (*Potamogeton foliosus*)	1%	3%	1%	2%	—	4%	—	1%
Lesser bladderwort (*Utricularia minor*)	—	1%	—	—	0%	—	—	—
Little floating heart (*Nymphoides cordata*)	—	9%	10%	6%	10%	3%	10%	11%
Low watermilfoil (*Myriophyllum humile*)	8%	4%	—	2%	8%	4%	3%	1%
Pickerelweed (*Pontederia cordata*)	12%	22%	13%	17%	17%	24%	16%	20%
Pondweed (*Potamogeton* species)	—	—	—	7%	—	—	—	—
Primrose-willow (*Ludwigia* species)	2%	5%	4%	1%	3%	32%	4%	5%
Purple bladderwort (*Utricularia purpurea*)	1%	3%	6%	6%	15%	0%	1%	12%
Quillwort (*Isoetes* species)	—	3%	—	0%	0%	—	4%	—
Ribbon-leaf pondweed (*Potamogeton epihydrus*)	35%	13%	14%	29%	21%	0%	12%	19%
Robbins' pondweed (*Potamogeton robbinsii*)	35%	41%	40%	32%	38%	18%	18%	27%
Slender naiad (*Najas flexilis*)	11%	19%	18%	32%	10%	12%	12%	17%
Small pondweed (*Potamogeton pusillus*)	—	—	—	12%	0%	0%	—	3%
Snailseed pondweed (*Potamogeton bicupulatus*)	10%	13%	7%	8%	4%	—	2%	4%
Spikerush (*Eleocharis* species)	8%	11%	14%	16%	19%	23%	25%	9%
Water smartweed (*Polygonum amphibium*)	4%	12%	11%	9%	9%	9%	9%	5%
Water starwort (*Callitriche* species)	—	—	—	—	—	0%	—	0%
Watermeal (*Wolffia* species)	1%	—	—	—	3%	—	—	—
Watershield (*Brasenia schreberi*)	31%	30%	32%	35%	32%	8%	11%	19%
Waterwort (*Elatine* species)	—	7%	1%	3%	0%	1%	1%	4%
Western waterweed (*Elodea nuttallii*)	—	1%	1%	—	5%	—	11%	1%
White water lily (*Nymphaea odorata*)	18%	22%	26%	24%	27%	14%	29%	46%
Yellow water lily (*Nuphar variegata*)	13%	14%	6%	11%	11%	19%	10%	20%

Non-Native Species	2017	2018	2019	2020	2021	2022	2023	2024
Mudmat (*Glossostigma cleistanthum*)	1%	7%	3%	8%	2%	10%	2%	2%

Invasive Species	2017	2018	2019	2020	2021	2022	2023	2024
Eurasian watermilfoil (*Myriophyllum spicatum*)	31%	45%	28%	26%	45%	33%	48%	31%
Fanwort (*Cabomba caroliniana*)	48%	42%	42%	39%	68%	10%	39%	61%
Northern hydrilla (*Hydrilla verticillata* subsp. *lithuanica*)	—	—	—	—	—	—	—	0%
Minor naiad (*Najas minor*)	4%	20%	3%	30%	—	35%	10%	4%
Phragmites (*Phragmites australis*)	1%	2%	0%	3%	1%	3%	3%	4%
Swollen bladderwort (*Utricularia inflata*)[b]	—	—	—	—	43%	3%	37%	25%
Variable-leaf watermilfoil (*Myriophyllum heterophyllum*)	8%	9%	20%	29%	47%	6%	15%	19%

[a] "—" = Species not found in Pachaug Pond; 0% indicates found in the waterbody but not on any transect points

[b] Swollen bladderwort is easily confused with common bladderwort. DNA analysis identified swollen bladderwort in 2021. It is possible common bladderwort plants found in the past were swollen bladderwort.

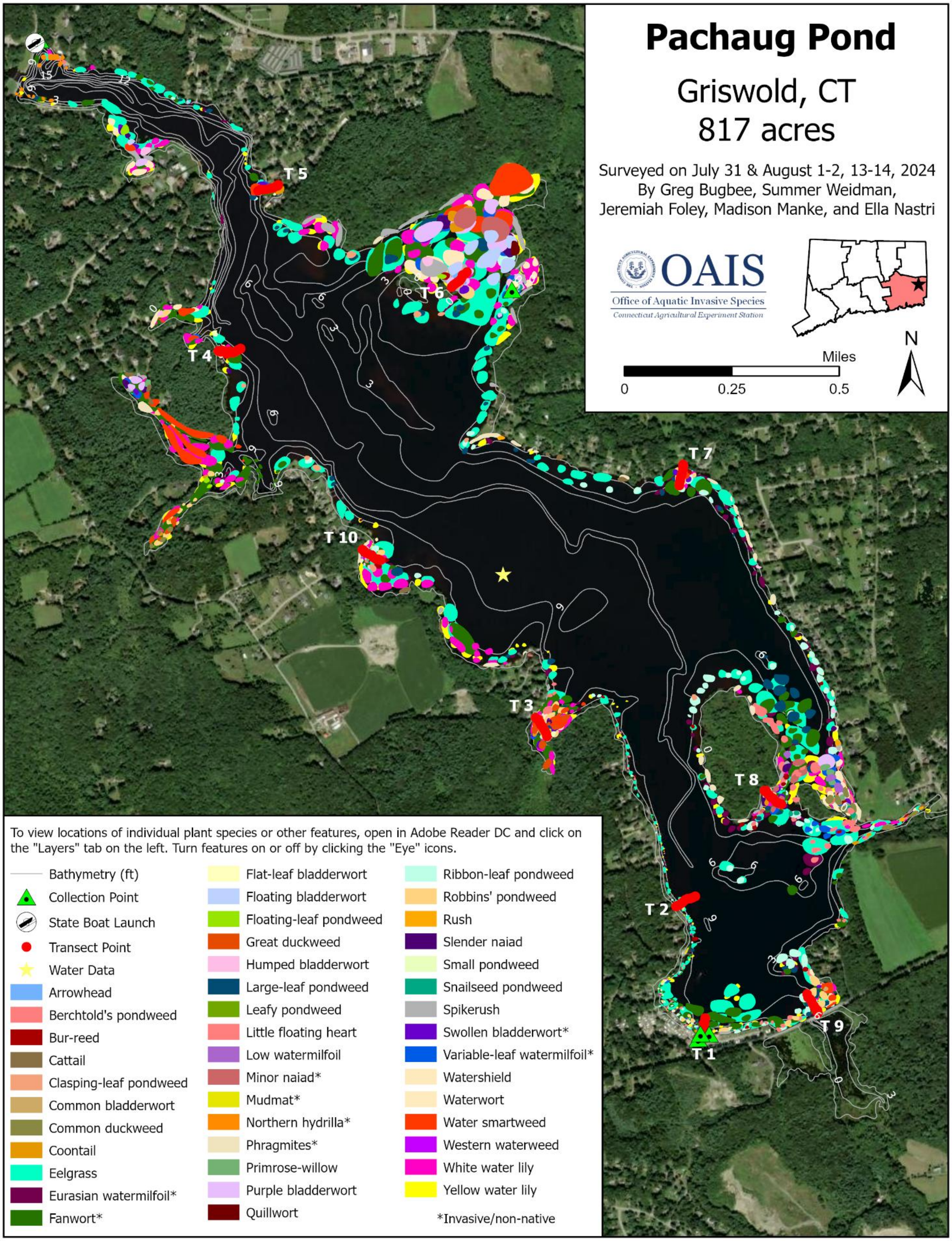

Figure 3. Survey map of aquatic vegetation documented in Pachaug Pond in 2024.

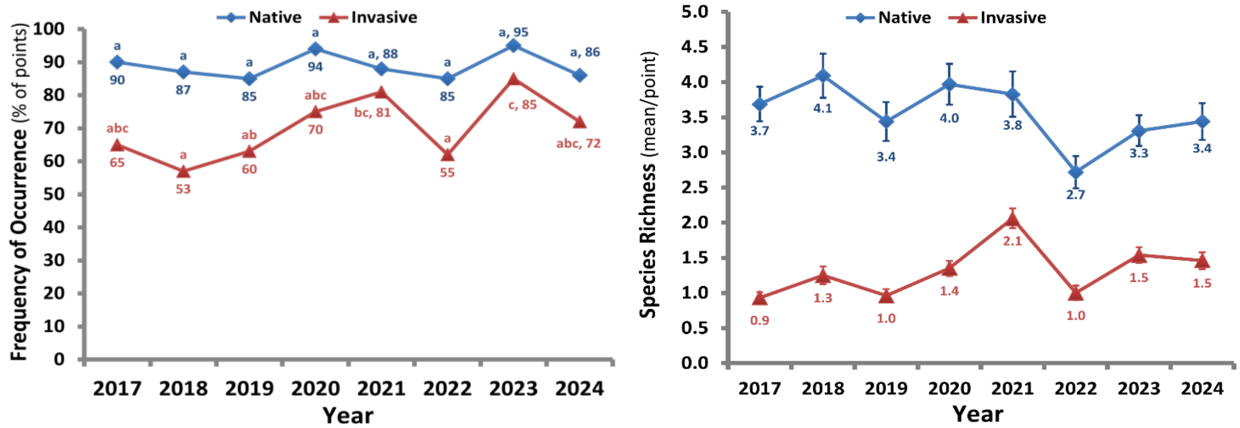

Figure 4 Frequency of occurrence (left) and species richness (right) of native and invasive vegetation at transect points from 2017-2024.

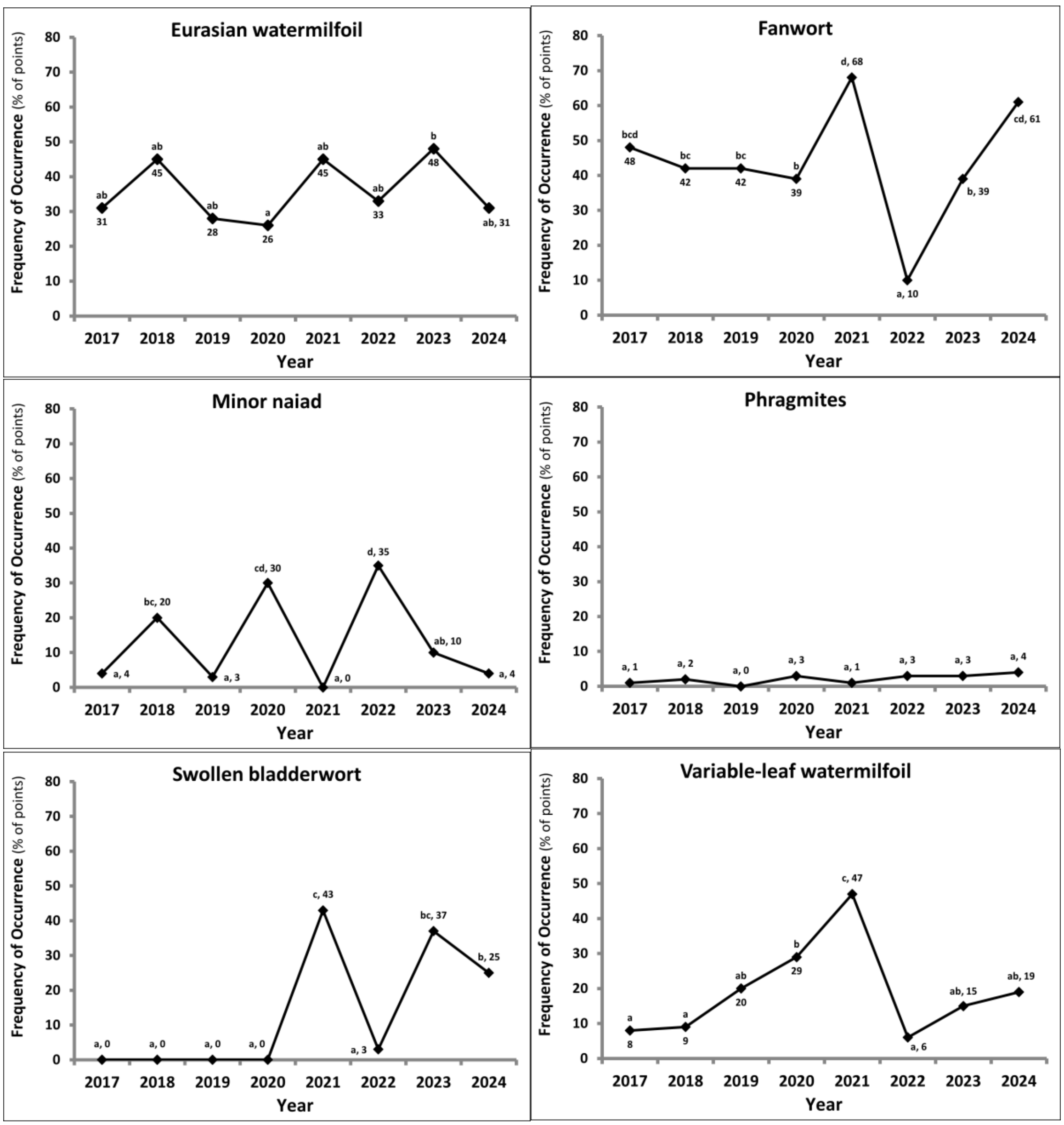

Figure 5. Frequency of occurrence of individual invasive species at transect points in Pachaug Pond from 2017–2024.

Figure 6. Northern hydrilla was found for the first time in the area near the boat ramp.

potassium persulfate (APHA, 1995). Phosphorus was quantified with a Milton Roy Spectronic 20D® spectrometer with a light path of 2 cm and a wavelength of 880 nm.

RESULTS

General Aquatic Plant Surveys and Transects:

CAES OAIS found eight invasive/non-native and 34 native plant species in Pachaug Pond in 2024. This compares to seven invasive/non-native and 32 native species found in 2023 (Table 1). Berchtold's pondweed was found for the first time in 2024. However, this plant looks nearly identical to small pondweed, so the two species may have been misidentified in past years. Only through recent DNA testing have the two been separated. Leafy pondweed, small pondweed, and water starwort were documented in 2024 after not being found in 2023 (Table 2). Golden hedge-hyssop and quillwort were found in 2023 but not in 2024. Although insignificant, there was a small increase in native species richness from 32 species in 2023 to 34 species in 2024 (Figure 4). Pachaug Pond contains among the greatest number of plant species found in any waterbody surveyed by CAES OAIS (2025). Providing details on the specifics of the native plants is beyond the scope of this report; however, information is available at the USDA "About PLANTS" website (plants.usda.gov/home). The CAES OAIS website contains digitized survey maps where individual plant layers can be viewed separately (portal.ct.gov/caes-oais).

Eurasian watermilfoil, fanwort, northern hydrilla, minor naiad, phragmites, swollen bladderwort, and variable-leaf watermilfoil comprise the invasive

Figure 7. Harvester in use during survey.

species found in 2024 (see descriptions in appendix). Northern hydrilla was found for the first time in Pachaug Pond at the northernmost end near the State boat launch (Figure 3, 6). Its introduction to Pachaug Pond was likely due to boat/trailer activity. This plant is highly adaptable, grows quickly, and has the capability for rapid spread in Pachaug Pond. Northern hydrilla was first reported in the Connecticut River in 2016 and was already widespread in the lower Connecticut River, south of Agawam, MA. It is currently known to occur in nine other state waterbodies.

Mudmat is a non-native species originally from New Zealand and Australia (Crow and Hellquist, 2023), which has been documented in Pachaug Pond since 2017. Despite its non-native status, mudmat is not classified as an invasive species in Connecticut. It has not exhibited harmful effects and poses little risk of becoming a nuisance due to its small size.

Eurasian watermilfoil and fanwort were frequently observed throughout the lake's littoral zone. Despite a decline in Eurasian watermilfoil from 48% in 2023 to 31% in 2024, its frequency of occurrence (FOQ) at transect points remained relatively stable. In contrast, fanwort's FOQ significantly increased from 39% to 61%, continuing a sharp upward trend from just 10% in 2022.

Minor naiad is an annual, low-growing plant that appears in summer and senesces each fall. Its occurrence was extremely sparse, and it is not likely to be a nuisance. Phragmites is a semi-aquatic, invasive wetland species that was found in various areas along the shoreline. The FOQ of phragmites at transect points has remained stable throughout all survey years. Swollen bladderwort was first documented in 2021 through genetic confirmation. Due to its resemblance to other native bladderworts, it may have been previously overlooked. It is now found in various areas of the lake, though its decrease in FOQ at transect points from 2023 to 2024 was not statistically significant. Variable-leaf watermilfoil is also found in various areas of the lake with it's FOQ at transect points showing no significant change between 2023 to 2024.

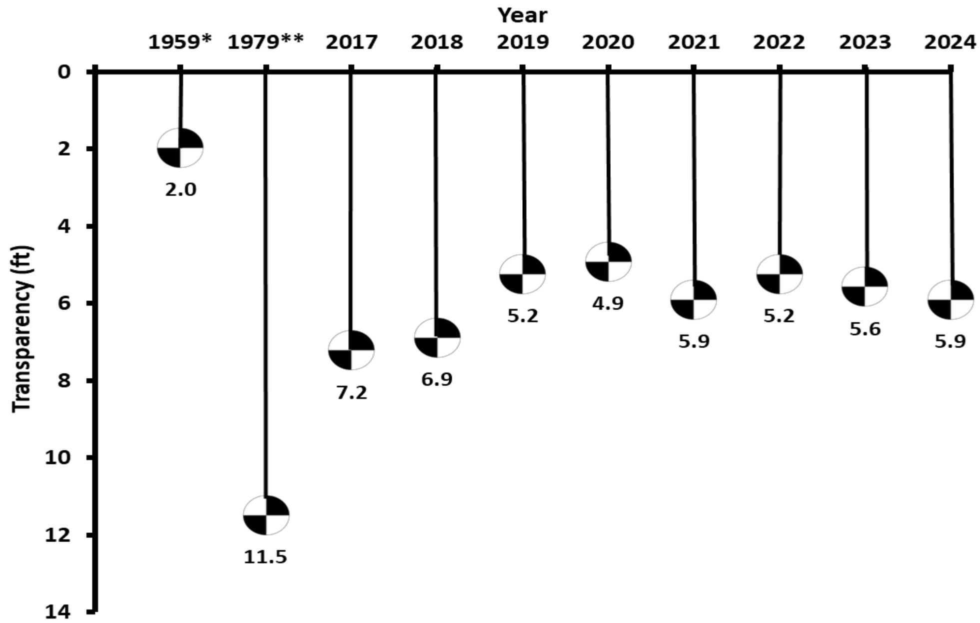

Figure 8. Water clarity measured with a Secchi disk.

The shallow coves were dominated by nuisance vegetation, including fanwort, water smartweed, and various species of water lilies (Figure 2). The FOQ of white-water lily, yellow water lily, and watershield at transect points all showed an increase. Specifically, the FOQ of white-water lily rose from 29% to 46%, yellow water lily rose from 10% to 20%, and watershield rose from 11% to 19%. Surveyors observed the use of the harvester (Figure 7) and noted that some areas seemed more navigable. However, numerous plant fragments were seen floating throughout the lake. Many invasive aquatic plants, such as Eurasian watermilfoil, fanwort, hydrilla, swollen bladderwort, and variable-leaf watermilfoil, spread through fragmentation. In areas where water lilies appeared to have been removed, nuisance submerged vegetation, particularly fanwort, has become well-established. Notably, as mentioned earlier, the FOQ of fanwort on transects saw a significant increase.

Much of the lake did not have problematic vegetation despite it being shallow enough to support luxuriant growth. In these areas, the bottom either had no plant growth or was covered with native eelgrass and/or Robbins' pondweed. Reasons for this may include light limitation caused by tannic, tea-colored water, infertile substrate, previous drawdowns, or factors yet to be determined.

Comparisons of FOQ data for transects from 2017 to 2024 revealed minimal change in native vegetation over the survey years. While there was a slight decrease in native vegetation from 2023 to 2024, the FOQ of native species across transects has remained relatively stable and has never shown a significant change (Figure 4; see appendix for transect data). Similarly, the FOQ of invasive species on transects also decreased from 85% in 2023 to 72% in 2024, though this change was not statistically significant. Species richness for both native and invasive plants at transect points remained relatively consistent from 2023 to 2024 (Figure 4).

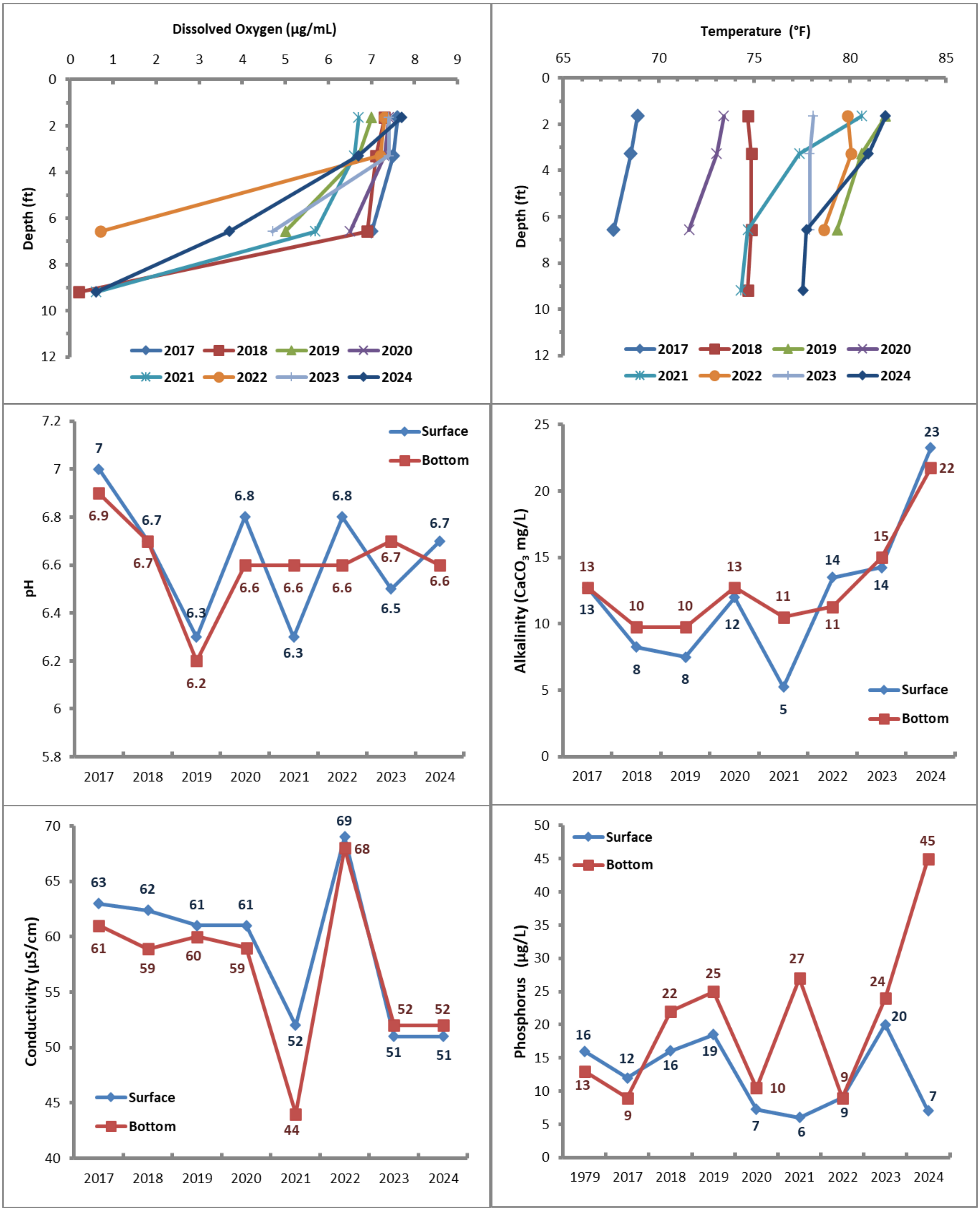

Figure 9. Dissolved oxygen, temperature, pH, alkalinity, conductivity, and phosphorus measurements.

The native plants found most frequently on transect points in 2024 were eelgrass (56%), white water lily (46%), Robbins' pondweed (27%), pickerelweed (20%), yellow water lily (20%), ribbon-leaf pondweed (19%), watershield (19%), and slender naiad (17%) (Table 2). There were 12 native species found less frequently on transect points from 2023 to 2024. These included arrowhead (19% 1%), common bladderwort (8% to 6%), eelgrass (67% to 56%), flat-leaf bladderwort (1% to 0%), floating bladderwort (19% to 0%), floating-leaf pondweed (3% to 1%), large-leaf pondweed (11% to 6%), low watermilfoil (3% to 1%), spikerush (25% to 9%), water smartweed (9% to 5%), and western waterweed (11% to 1%).

The total coverage of aquatic vegetation has increased from roughly 107 acres in 2022 to 129 acres in 2023 to 193 acres in 2024 (see appendix for maps). Most notably, fanwort increased from 7 acres in 2022 to 22 acres in 2023 to 97 acres in 2024. Although we are confident these numbers indicate a trend, they should not be taken as absolute (a more detailed survey would be necessary for this level of accuracy).

Water Chemistry

Water clarity in Connecticut's lakes ranges from 1-33 ft with an average of 7 ft (CAES OAIS, 2025). Pachaug Pond had a water clarity of 5.9 ft (1.8 m) in 2024, which is similar to 2019 – 2023 (4.9 – 5.9 ft or 1.6 – 1.8 m) but lower than 2017 -2018 (6.8- 7.2 ft or 2.1 – 2.2 m) (Figure 8). Measurements in 1979 found a much higher transparency of 12 ft (Frink and Norvell, 1984) while in the 1950's it was only 2.0 ft (State Board of Fisheries and Game, 1959). The poor water clarity in the 1950's was attributed to an algal bloom. This could have been due to the reported industrial use of the water. Our 2024 observation was consistent with previous years, with water clarity not reduced by algal blooms but rather the brown coloration caused by naturally occurring organic derivatives**.**

The shallow nature of Pachaug Pond usually results in no summertime temperature stratification and therefore no thermocline. Because our measurements are taken at 1 m (3.3 ft) intervals and the sampling site depth is slightly less than 3 m (2.8 m or 9.2 ft), in some years our measurements stopped at 2 m (6.5 ft) to avoid the probe penetrating the sediment. This was based on surveyor judgment and resulted in the differences in sampling depth from year to year.

In 2024, there was slight stratification similar to 2021. The water temperature was about 81 - 82 °F near the surface and decreased to about 78 °F around 6.5 ft (2 m) below the surface. In previous years, the temperature was similar throughout the water column ranging from 68 – 82 °F (Figure 9). In 2024, dissolved oxygen levels steadily decreased from 7.7 µg/mL at the surface to 0.6 ug/mL at the bottom. In the previous year's surveys, dissolved oxygen ranged from 7.4 µg/L at the surface to 0.2 µg/L near the bottom (Figure 9). In 2019, 2020, 2022, and 2023, measurements were only recorded to a depth of 2 m (6.5 ft). The only year dissolved oxygen declined to near zero at a depth of 2 m (6.5 ft) was 2022. When dissolved oxygen falls below 5 µg/L, most fish will need to seek more oxygenated areas. In addition, anoxic conditions promote the liberation of sediment phosphorus that if mixed with surface water can promote algal blooms.

Since 2017, water pH has remained near neutral, between 6.2 and 7.0 (Figure 9). Alkalinity has measured between 5 and 23 mg/L $CaCO_3$, with an upward trend in recent years. Alkalinity in Connecticut lakes ranges from near 0 to >170 mg/L $CaCO_3$, therefore Pachaug Pond's

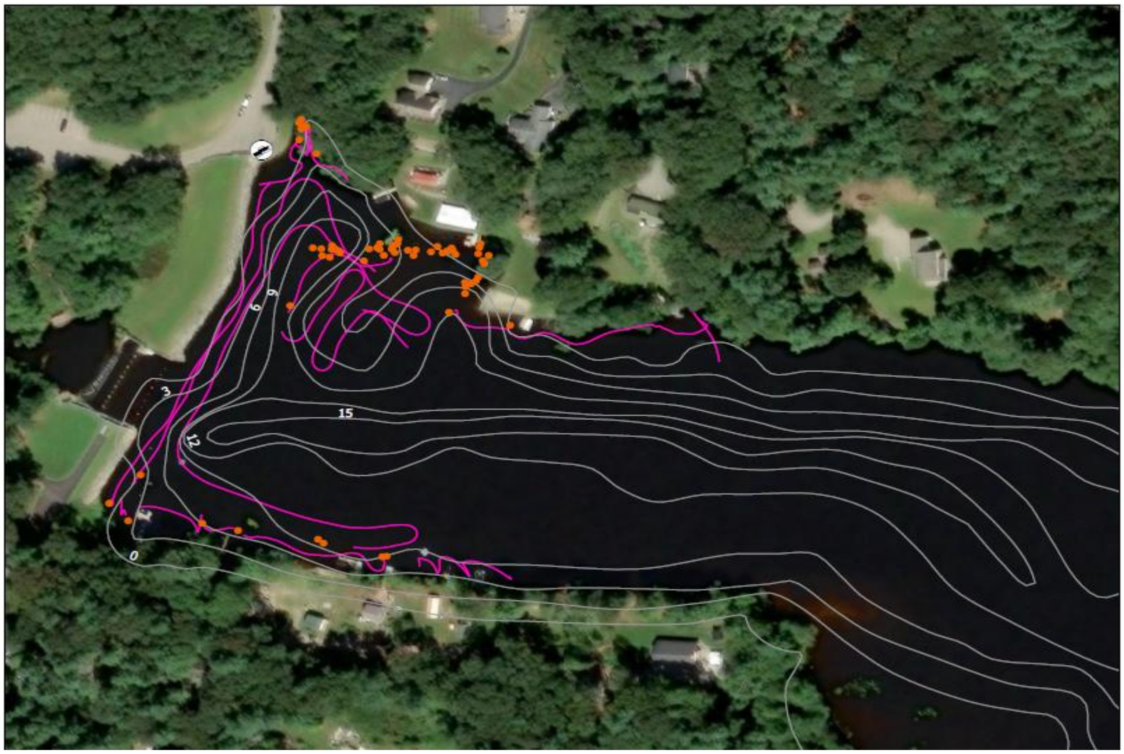

Figure 10. Locations of Connecticut River hydrilla (orange dots) near the State boar launch in Pachaug Pond in 2024. Pink line denote boat path where none was observed.

alkalinity is considered relatively low (CAES OAIS, 2025). Low alkalinity waterbodies are more prone to pH change due to outside influences such as watershed activities and acid rain. 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.). Connecticut waterbodies typically have conductivity measurements ranging from 50 to 250 µS/cm. In 2024, Pachaug Pond recorded a conductivity of 51 µS/cm at the surface and 52 µS/cm at the bottom, maintaining the same levels as in 2023 (Figure 9).

A key parameter used to categorize a lake's trophic state is phosphorus (P) in the water column. High levels of P can lead to nuisance or toxic algal blooms (Frink and Norvell, 1984; Wetzel, 2001). Rooted macrophytes are considered to be less dependent on P from the water column as they obtain a majority of their nutrients from the hydrosoil (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 >50 µg/L are categorized as extremely fertile or hypereutrophic. Pachaug Pond's P concentration in 2024 was 7 µg/L at surface and 45 µg/L near the bottom, which classifies the lake as eutrophic (Figure 9). Analysis of the water by CAES in 1979 (Frink and Norvell, 1984) found P concentrations of 16 µg/L at surface and 13 µg/L near the bottom.

CAES OAIS has found that the occurrence of invasive plants in lakes can be attributed to specific water chemistries (June-Wells et al., 2013). For instance,


Figure 11. Grass carp were introduced into Candlewood Lake in 2015 to control invasive Eurasian watermilfoil (left). After near complete elimination of all aquatic vegetation, CT DEEP began a grass carp removal program in 2023 (right).

lakes with higher alkalinities and conductivities are more likely to support Eurasian watermilfoil, minor naiad, and curlyleaf pondweed while lakes with lower values support fanwort and variable-leaf watermilfoil. Pachaug Pond's water chemistry appears to be an outlier to this trend as its low alkalinity and conductivity suggests Eurasian watermilfoil and minor naiad should be less abundant than observed.

Aquatic Vegetation Management:

Managing nuisance aquatic vegetation in Pachaug Pond will be challenging because the lake has extensive areas of desirable native vegetation, and state-listed species may need protection. In addition, large numbers of residents utilize the lake for recreational activities, particularly fishing, boating, and swimming. The 2024 discovery of northern hydrilla places increased urgency on finding a management option to stop its spread. Options include water level drawdown, harvesting, herbicides, biological controls, and benthic barriers (Cooke et al., 2005). Dredging may also be employed but is usually impractical for large lakes like Pachaug.

Water level drawdown can be an effective and economical means of controlling nuisance vegetation in large shallow lakes like Pachaug Pond. The vegetation reductions reported in 2022 were likely a side effect of the drawdown needed for the 2021/22 dam repairs (Grahn, 2021). Fortunately, the new dam has an outlet suitable for the technique and future utilization for weed management is possible with CT DEEP approval.

In July 2024, the eco-harvester, purchased by the PPWCA in 2022, was used for the third year (Figure 10). Benefits of mechanical harvesting include quick results, the ability to target areas and avoid damage to species needing protection, avoidance of aquatic herbicides, and removal of nutrients contained in the harvested vegetation. Drawbacks include the initial expense of the machine, maintenance costs, regrowth, spread of fragments, and disposal. In addition, if emergent vegetation such as waterlilies are removed, sunlight reaching the bottom could promote the growth of submersed species. This may be occurring in Pachaug Pond and as was mentioned earlier in this report where an increase in fanwort and Eurasian watermilfoil coverage was documented. Results of the Pachaug Pond harvesting program will

Figure 12. CAES OAIS found short-term benthic barriers provide excellent short-term control of nuisance aquatic vegetation in confined areas like public beaches.

provide important information for others considering a similar weed management approach.

Herbicides can be effective in controlling unwanted aquatic vegetation. Aquatic herbicide use requires clearance from the CT DEEP Pesticides Unit and the Natural Diversity Database. Herbicides must be chosen carefully as some have efficacy on certain target species and not others. Also, any desirable plants, including state-listed species, may need to be tolerant. Specifics on the use of aquatic herbicides in Connecticut are found in the CT DEEP publication entitled "Nuisance Aquatic Vegetation Management: A Guidebook" (CTDEP, 2005). In 2018, CAES OAIS tested a new herbicide called ProcellaCOR to control variable-leaf watermilfoil in Bashan Lake with excellent results. Demonstration projects on controlling Connecticut River hydrilla were performed by the United States Army Corp of Engineers in 2024 and results are promising.

Although efforts are underway to find biological controls for nuisance aquatic vegetation, breakthroughs have been limited. To date the only biological control used in Connecticut is sterile grass carp (*Ctenopharyngodon idella*; Figure 11). Grass carp are herbivorous fish that feed on most submersed aquatic plants. The introduction of grass carp into Connecticut lakes requires approval by CT DEEP, and only sterile (triploid) grass carp are permitted. Introducing grass carp in Pachaug Pond could cause damage to non-target plants necessary to maintain the current fishery. Grass carp primarily feed on submergent vegetation, so the water lilies and water smartweed impacting many of the coves would likely be unaffected. Grass carp introductions in Connecticut waterbodies such as Candlewood Lake, Taunton Lake, and Squantz Pond have resulted in an undesirable with total elimination of aquatic vegetation occurred (Figure 11). Grass carp have preference for hydrilla over most other plants. The potential for a very small number of introduced sterile (triploid) grass carp to selectively remove hydrilla is a possible option if approved by CT DEEP. CAES is working with officials from the United States Department of Agriculture to find new aquatic plant biocontrol's. Unfortunately, testing involves many years, and none are likely soon.

Benthic barriers or "bottom blankets" are effective at eliminating nuisance vegetation in small areas such as swim zones, around docks, and pioneer infestations. CAES OAIS has tested short-term placement (<30 days) of the barriers in Lake Quonnipaug, Bashan Lake, and Lake Beseck (Figure 12). Season-long control for Eurasian watermilfoil and fanwort was achieved. Although labor intensive, benthic barriers can be moved from place to place during a season for effective control. They can also be used over multiple years, reducing the cost of materials. Pachaug Pond's hydrilla has spread beyond what can be managed with these barriers.

CONCLUSIONS

The 2024 vegetation survey of Pachaug Pond found an increase in aquatic vegetation from 2023. A total of 42 plant species were documented of which eight were invasive/non-native. This places Pachaug Pond among the most plant species rich lakes in Connecticut. The invasive species found were Eurasian watermilfoil, fanwort, minor naiad, northern hydrilla (CT River), swollen bladderwort, and variable-leaf watermilfoil. Removal of emersed vegetation and fragmentation of plants by harvesting may be promoting submersed vegetation such as fanwort. Many of the coves contained nuisance vegetation such as fanwort, water smartweed, and water lilies. The discovery of northern hydrilla near the State boat launch is very concerning. Much of the remainder of Pachaug Pond, in areas less than six feet deep, contained a mixture of non-nuisance invasive and native species that did not reach the surface. If limiting conditions such as light limitation, infertile substrate, water level, and control from previous drawdowns change nuisance vegetation could expand dramatically.

Aquatic plant management and monitoring is critical to ensure a potential rapid decline in the quality of Pachaug Pond is avoided. Documenting the effects of the mechanical harvester, commissioned into service in 2022, on Pachaug Pond will provide valuable information for others. Water level drawdowns via the new dam's outlet have potential to be a cost-effective means of aquatic plant control. Other management practices with potential include herbicides, benthic barriers, and grass carp. Grass carp introductions may face increased scrutiny from CT DEEP regulators as excessive plant removal has occurred in several Connecticut lakes. This may be lessened by an ultra-low stocking rate aimed at targeting the hydrilla, which is highly preferred by grass carp. Our water tests found Pachaug Pond to be mesotrophic with low alkalinity and minimal stratification. Water clarity was limited by the water's brown coloration. Changes over the course of our surveys have been minimal.

ACKNOWLEDGEMENTS

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APPENDIX

Narrative from State Board of Fisheries and Game Lake and Pond Survey Unit – 1959

Pachaug Pond

Pachaug Pond is a large, artificial impoundment located in New London County in the township of Griswold. This shallow, fertile pond was formed by impounding the Pachaug River. It has a surface area of 830.9 acres, a maximum depth of 18 feet and an average depth of 6.1 feet. Much of the well-wooded shoreline is in the Pachaug State Forest. Submerged and emergent vegetation is abundant, particularly in the shoal areas and shallow areas. The pond bottom is of mud, swampy ooze and sand. A dense algal bloom reduces transparency to two feet. The waters of this pond are not thermally stratified.

Shoreline development is very light and there are only a few cottages present. Boats are available for rental at a livery at the southern end of the pond. There is a state-owned right-of-way present, but this is poorly developed and is unuseable.

Pachaug Pond has been stocked with smallmouth bass and yellow perch.

Largemouth bass are common in abundance and exhibit excellent growth. Yellow perch are common in abundance. This species grows at a rate equal to the state average. Bluegill sunfish are abundant and grow at a rate well above the state average. Chain pickerel are scarce and exhibit an above-average growth rate. Calico bass are common in abundance. The growth rate of this species is equal to the state average. Bullheads are common in abundance and golden shiners are abundant.

This pond has the reputation of producing excellent bass fishing. Bass over five pounds are relatively common. Fishing for panfish such as perch, bluegill sunfish, calico bass and bullheads should be excellent.

In the past, this body of water was subject to severe drawdown during late June, July and August. This drawdown took place after the game species had reproduced and did not destroy their nests or young. As a result of the drawdown, the game fish and panfish were crowded into a smaller area and the panfish were more readily available to the game fish as forage. The resultant increase in predation aided in controlling the numbers of panfish and helped to keep these fish within the limits of the food supply and, at the same time, helped to provide numerous fast-growing game fish. The drawdown process also helped to control aquatic vegetation and this resulted in considerable open water relatively free from water weeds. For the past several years, the water has not been used for industrial purposes and, as a result, the water level has remained fairly stable. Aquatic vegetation is becoming more abundant and the amount of open water more restricted. This increase in the abundance of "water weeds" may provide excessive escape cover for panfish and can well result in stunted populations of yellow perch and bluegill sunfish.

The drawdown and exposure of considerable areas of the pond bottom also allowed smartweed and other semi-terrestrial plants to grow on the exposed shoals. These terrestrial plants furnished excellent food for waterfowl and attracted large numbers of ducks during the fall shooting season.

It is recommended that a control structure be installed in the dam so that the pond can be lowered three to four feet every summer. Such a drawdown should be started in June and the reduced water level should be held until the end of August.

No special regulations are recommended at this time.

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

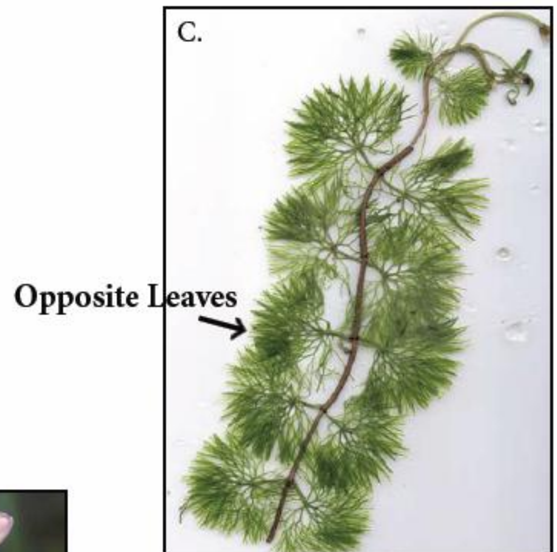
Stems: Can be 6 feet (2 m) long

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

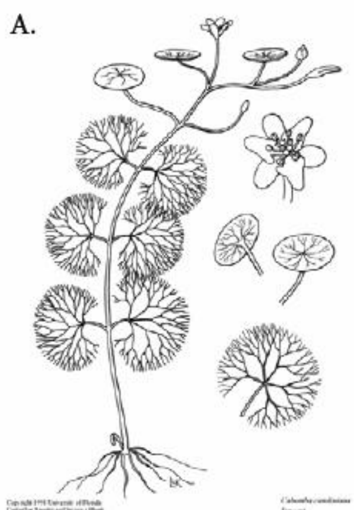
Flowers: Small, solitary flowers are usually white to pinkish

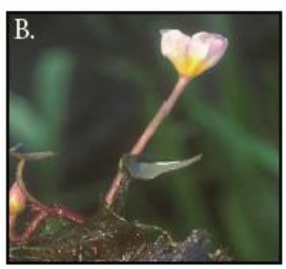
Fruits/Seeds: Flask shaped

Reproduction: Seed and fragmentation

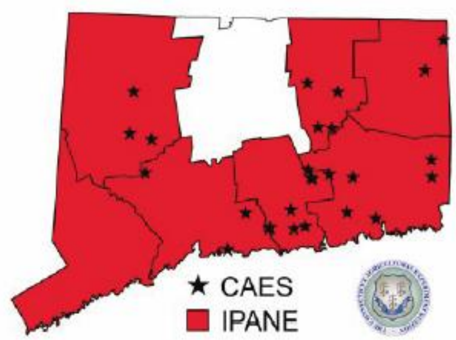


Easily confused species:
Watermilfoils: *Myriophyllum* spp.
White water crowfoot: *Ranunculus longirostris*
Water marigold: *Megalodonta beckii*





A. 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



Hydrilla verticillata

Common name:
Hydrilla

Origin:
Asia

Key features:
Plants are submersed

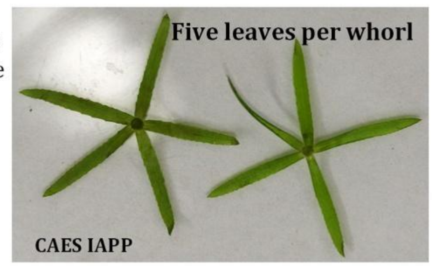
Stems: Slender, branched and up to 25 feet (7.5 m) long

Leaves: Whorled leaves approx. 0.7 inches (1.5 cm) long, whorls often have 5 leaves (range 4-8); leaf margins are visibly toothed

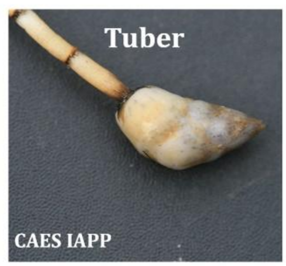
Flowers: Female flowers have three translucent petals that have reddish streaks; male flowers have three petals and can be white to red in color

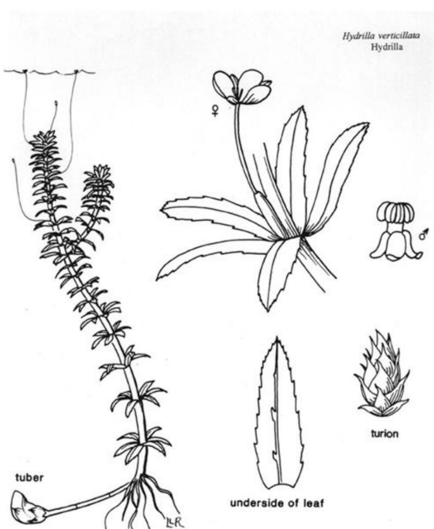
Fruits/Seeds: Small tubers (key feature) can be found in the sediment, turions form along the stem

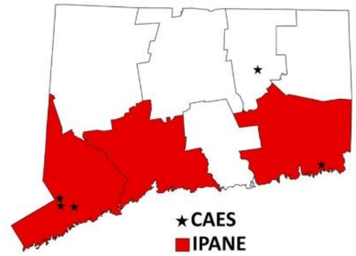
Reproduction: Fragmentation, turions, tubers and seeds



Easily confused species:
Waterweeds (Native): *Elodea nuttallii* and *Elodea canadensis*
Brazilian waterweed: *Egeria densa*







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

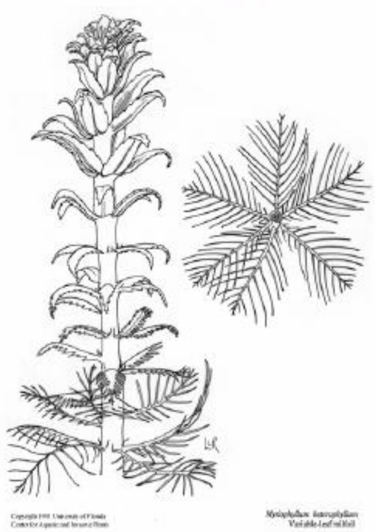
Leaves: Triangular with ≤ 11 pairs of leaflets. Leaves are dissected and whorled (4-6 leaves/whorl) resulting in a feathery appearance with leaf whorls < 1 inch apart giving it a ropy appearance

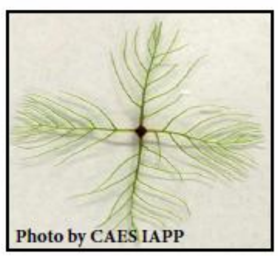
Flowers: Inflorescence spike 2-14 inches (5-35 cm) long extend beyond the water's surface with flowers in whorls of four with reddish petals

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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Center forAquatic and Invasive Plants

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

Najas minor


Photo by CAES IAPP

Common names:
Minor naiad
Brittle waternymph
Spiny leaf naiad
Eutrophic waternymph

Origin:
Europe

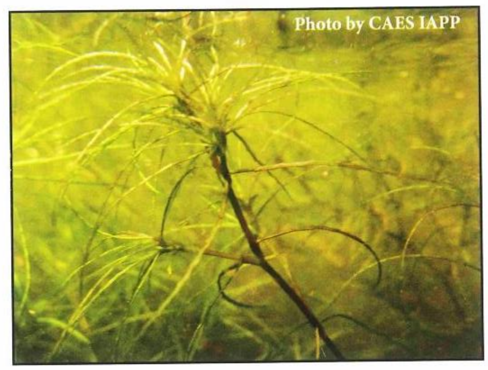


Photo by CAES IAPP

Key features:
Plants are submersed

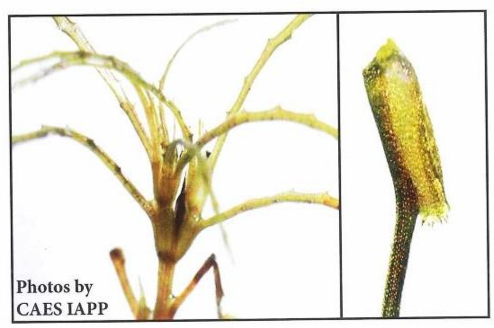
Stems: Branched stems can grow up to 4-8 inches (10-20 cm) long

Leaves: Opposite and lance shaped on branched stems with easily visible toothed leaf edges and leaves appear curled under, basal lobes of leaf are also serrated, 0.01-0.02 inches (0.3-0.5 mm)

Flowers: Monoecious (male and female flowers on same plant)

Fruits/Seeds: Fruits are purple-tinged and seeds measure 0.03-0.06 inches (1.5-3 mm)

Reproduction: Seeds and fragmentation


Photos by CAES IAPP

Easily confused species:
Other naiads (native): *Najas* spp.


Photo by CAES IAPP

Utricularia inflata

Common names:
Swollen bladderwort

Origin:
Southern and Eastern North America

Key features:
Plants floating in water, sometimes appearing anchored

Stems: Stem is submersed, slender and elongated

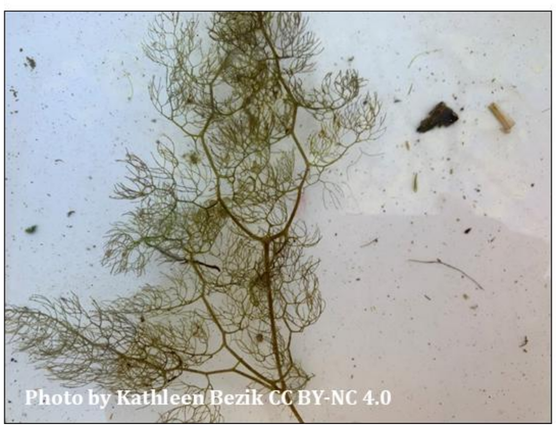
Leaves: Submersed leaves (<18 cm) are alternate, bushy, repeatedly forked with bladders along the sides. Uppermost leaves are whorled and inflated, floating on the water's surface (3-8 cm).

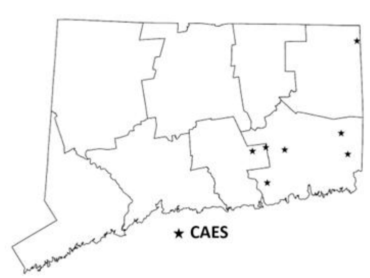
Flowers: Flowers located at the center of inflated leaves and have five bright yellow petals

Fruits/Seeds: Fruit is dry and splits open when dry (3-6 mm)

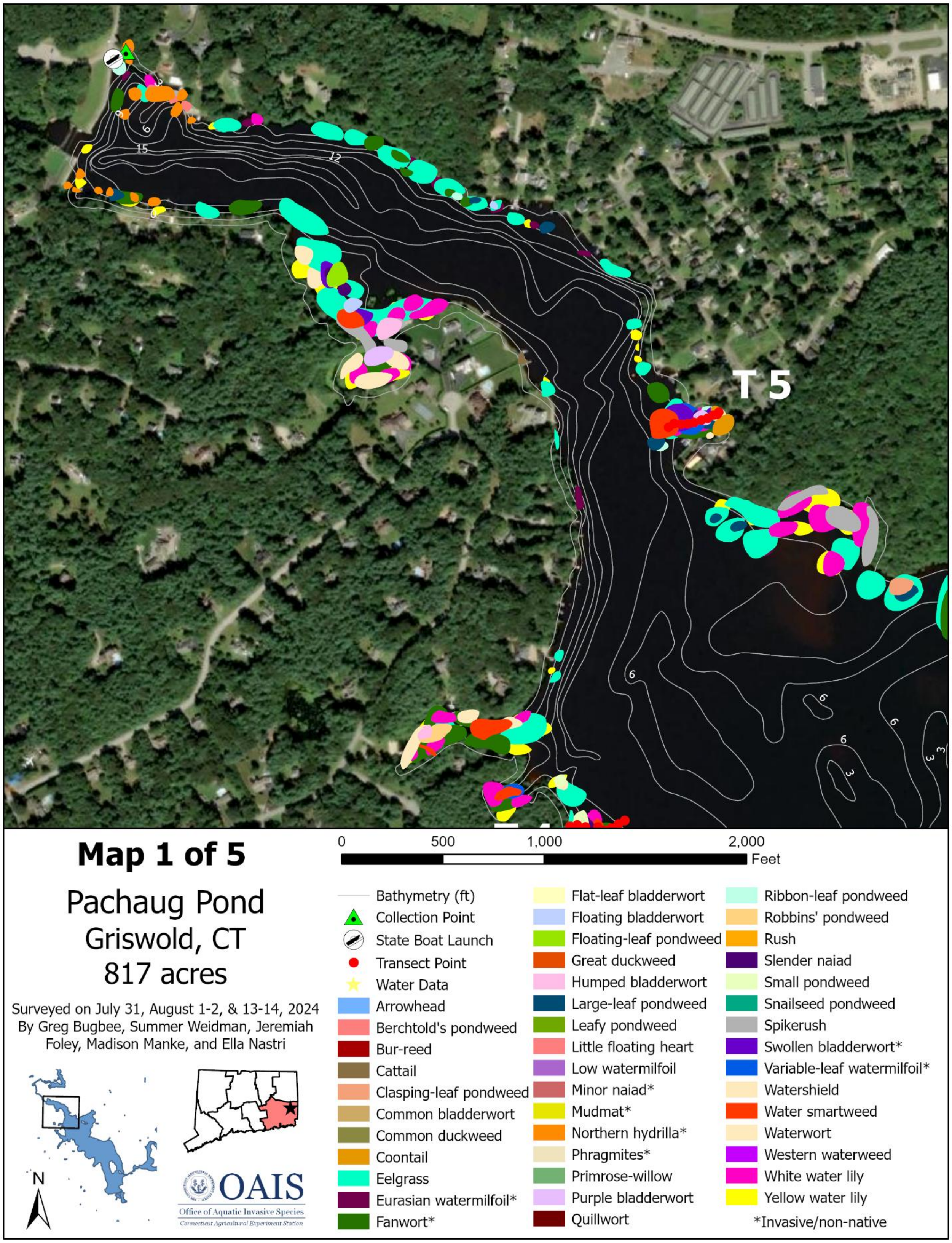
Reproduction: Fragmentation and Tubers

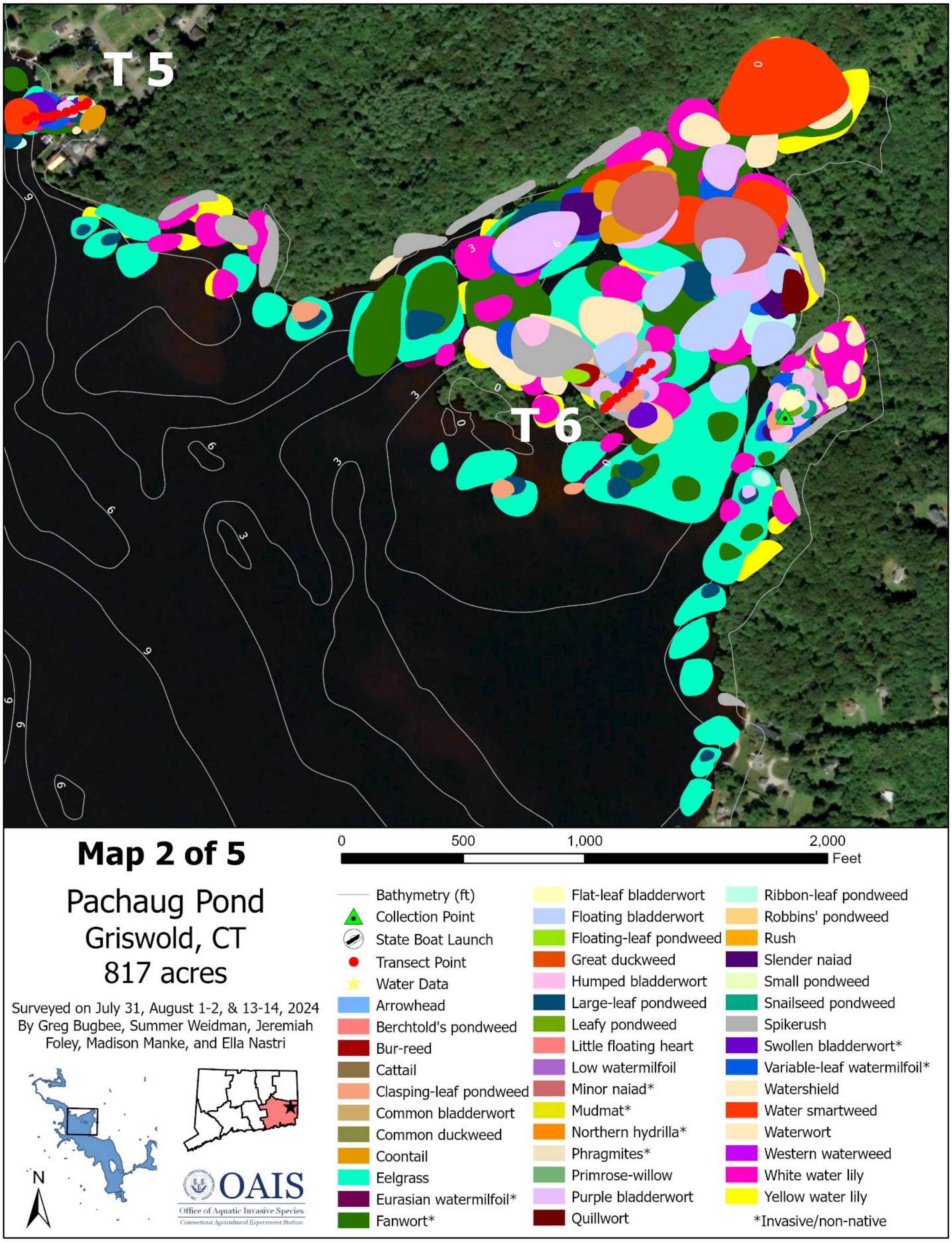
Easily confused species:
Common bladderwort: *Utricularia macrorhiza*
Floating bladderwort: *Utricularia radiata*





Aquatic Plant Survey Maps by Section


T 5
Map 1 of 5
Pachaug Pond
Griswold, CT
817 acres
Surveyed on July 31, August 1-2, & 13-14, 2024
By Greg Bugbee, Summer Weidman, Jeremiah Foley, Madison Manke, and Ella Nastri
0 500 1,000 2,000 Feet
Bathymetry (ft)
Collection Point
State Boat Launch
Transect Point
Water Data
Arrowhead
Berchtold's pondweed
Bur-reed
Cattail
Clasping-leaf pondweed
Common bladderwort
Common duckweed
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Flat-leaf bladderwort
Floating bladderwort
Floating-leaf pondweed
Great duckweed
Humped bladderwort
Large-leaf pondweed
Leafy pondweed
Little floating heart
Low watermilfoil
Minor naiad*
Mudmat*
Northern hydrilla*
Phragmites*
Primrose-willow
Purple bladderwort
Quillwort
Ribbon-leaf pondweed
Robbins' pondweed
Rush
Slender naiad
Small pondweed
Snailseed pondweed
Spikerush
Swollen bladderwort*
Variable-leaf watermilfoil*
Watershield
Water smartweed
Waterwort
Western waterweed
White water lily
Yellow water lily
*Invasive/non-native
N
OAIS
Office of Aquatic Invasive Species
Connecticut Agricultural Experiment Station


T 5
T 6
Map 2 of 5
Pachaug Pond
Griswold, CT
817 acres
Surveyed on July 31, August 1-2, & 13-14, 2024
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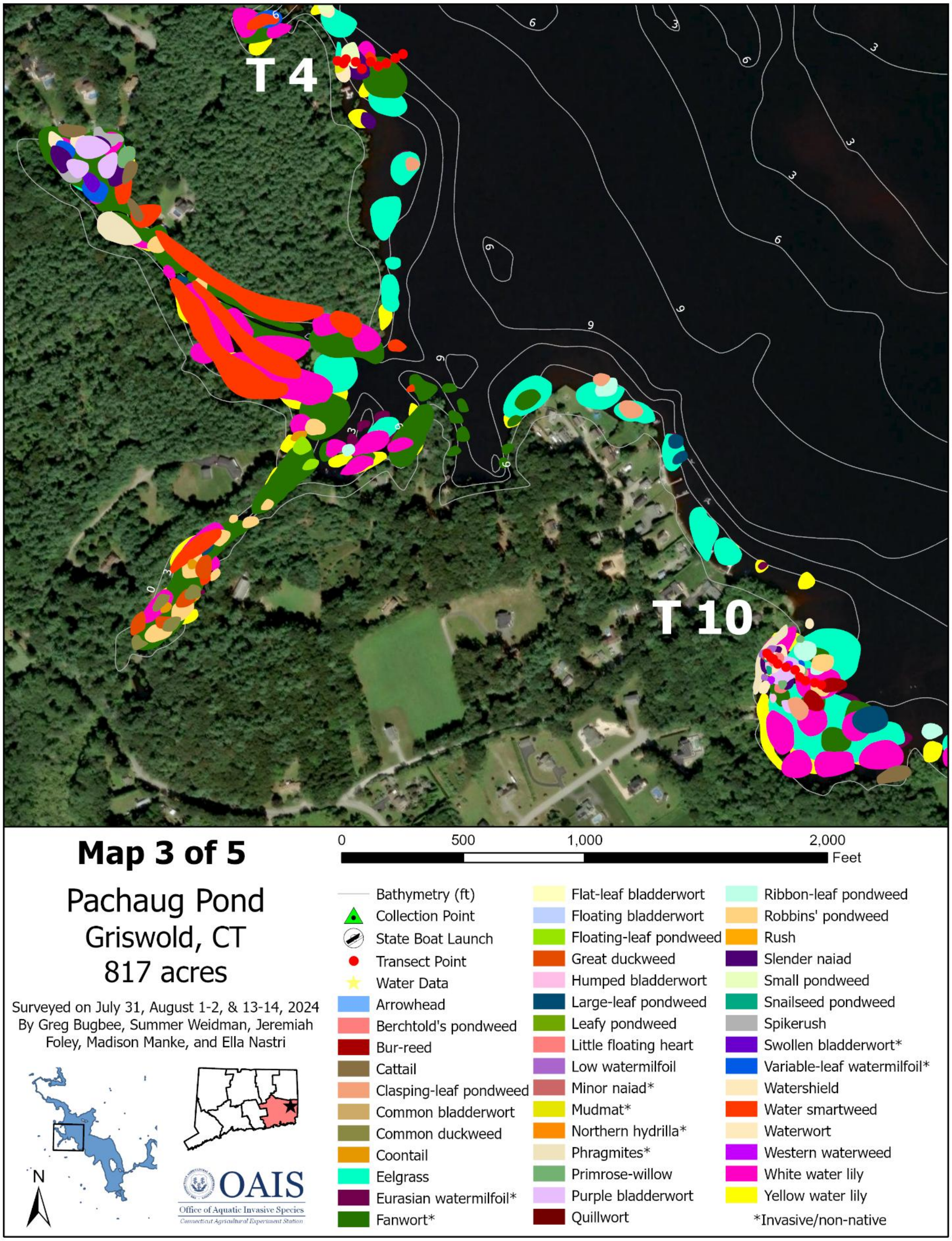
Swollen bladderwort*
Variable-leaf watermilfoil*
Watershield
Water smartweed
Waterwort
Western waterweed
White water lily
Yellow water lily
*Invasive/non-native


T 4
T 10
Map 3 of 5
Pachaug Pond
Griswold, CT
817 acres
Surveyed on July 31, August 1-2, & 13-14, 2024
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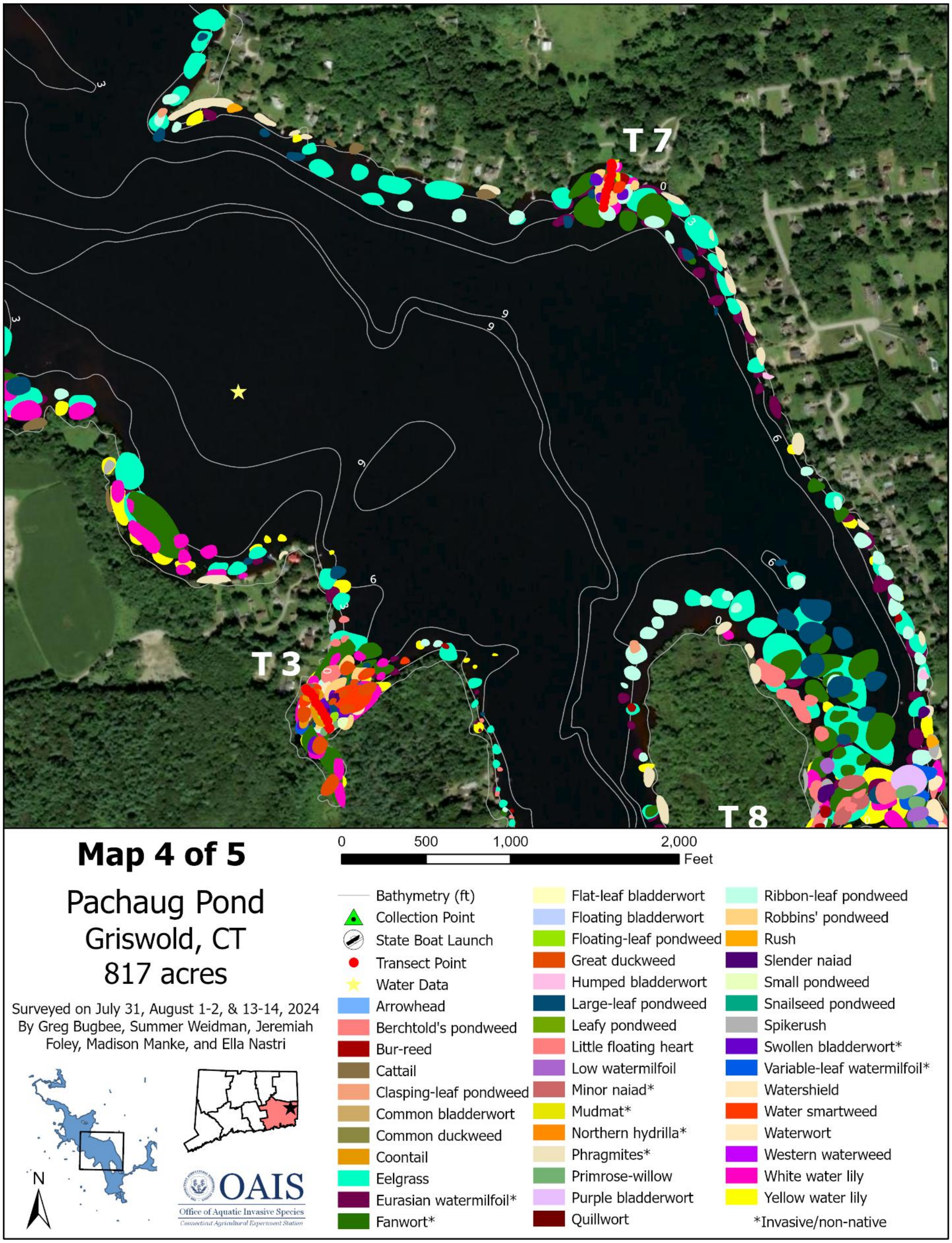
Variable-leaf watermilfoil*
Watershield
Water smartweed
Waterwort
Western waterweed
White water lily
Yellow water lily
*Invasive/non-native


T 7
T 3
T 8
Map 4 of 5
Pachaug Pond
Griswold, CT
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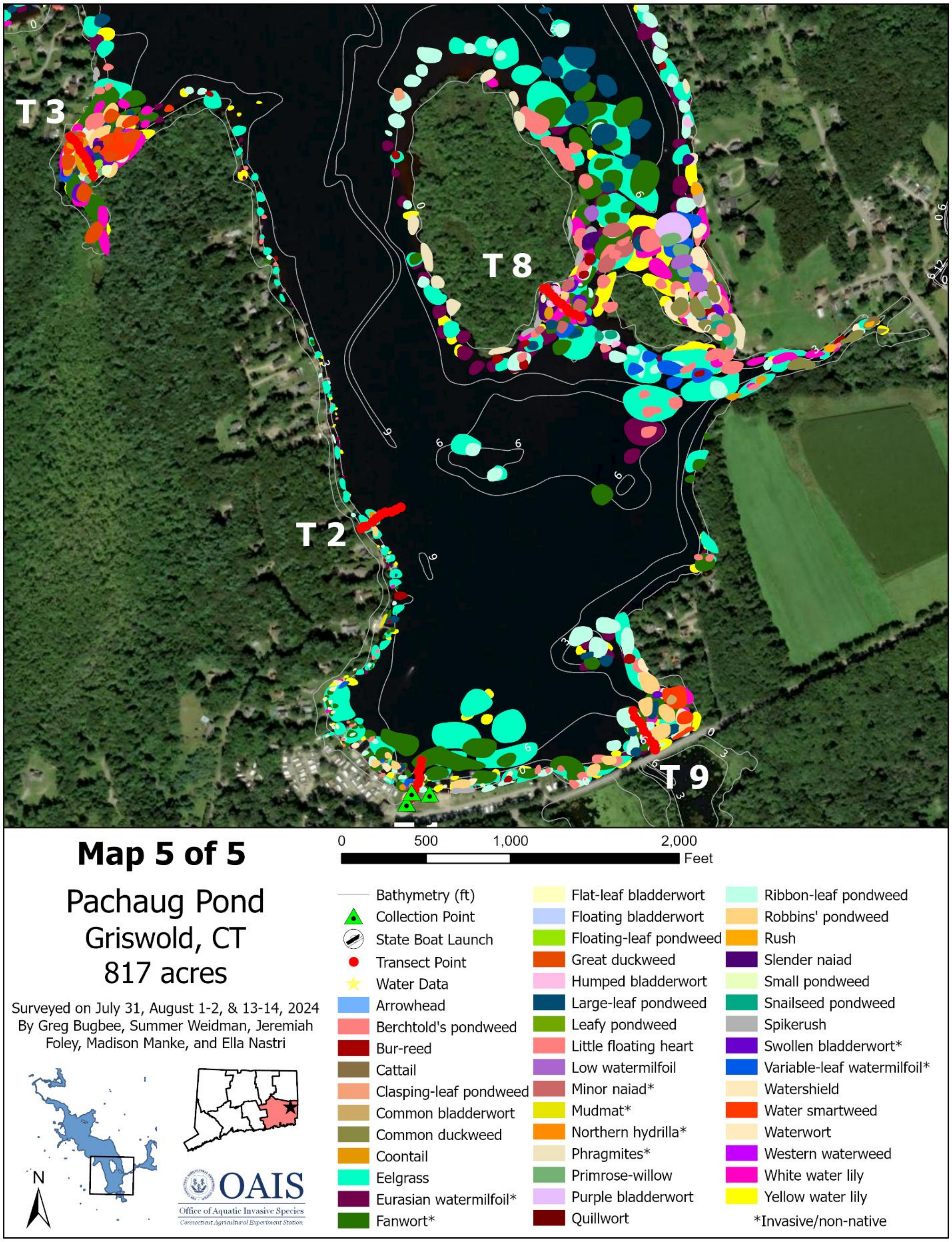
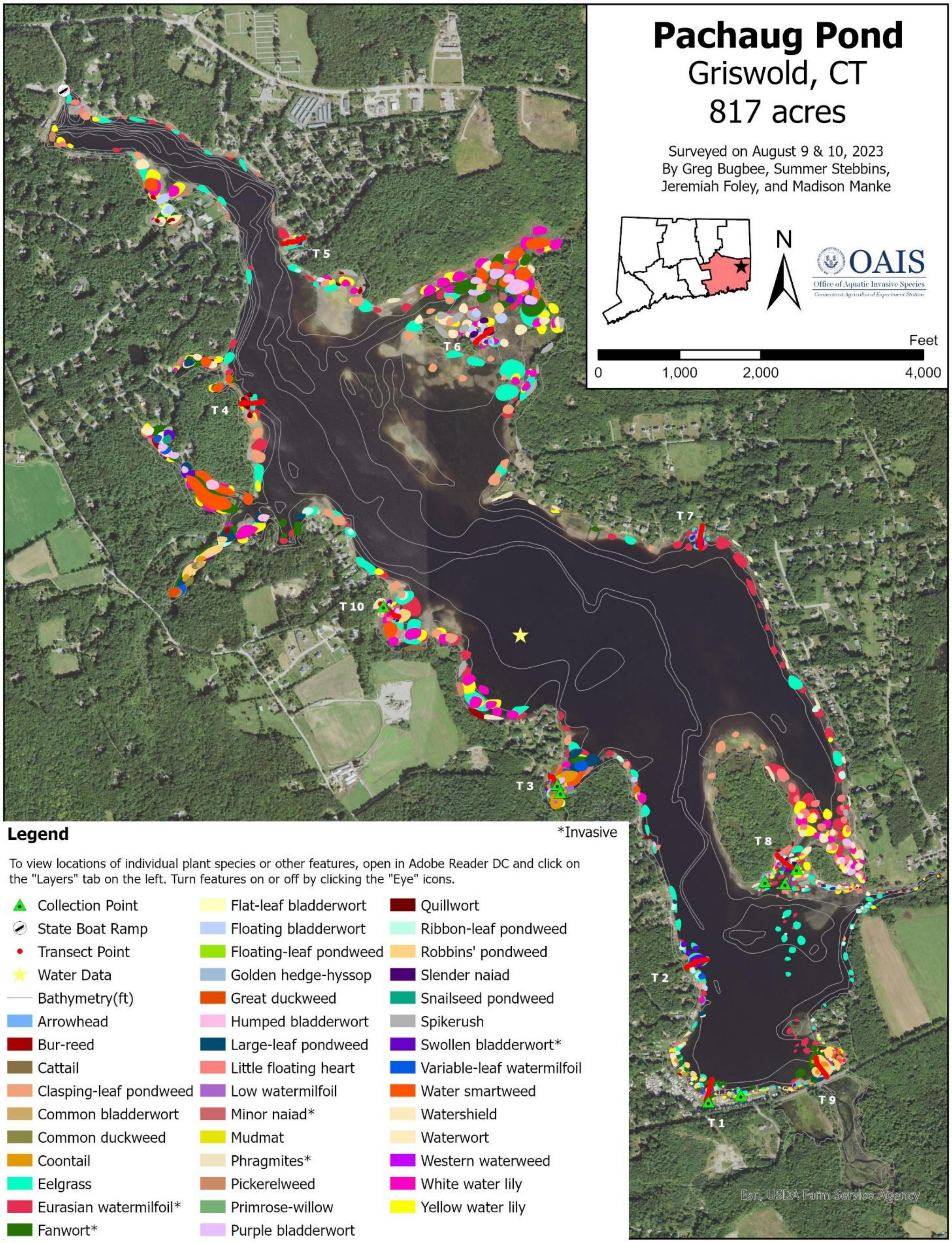
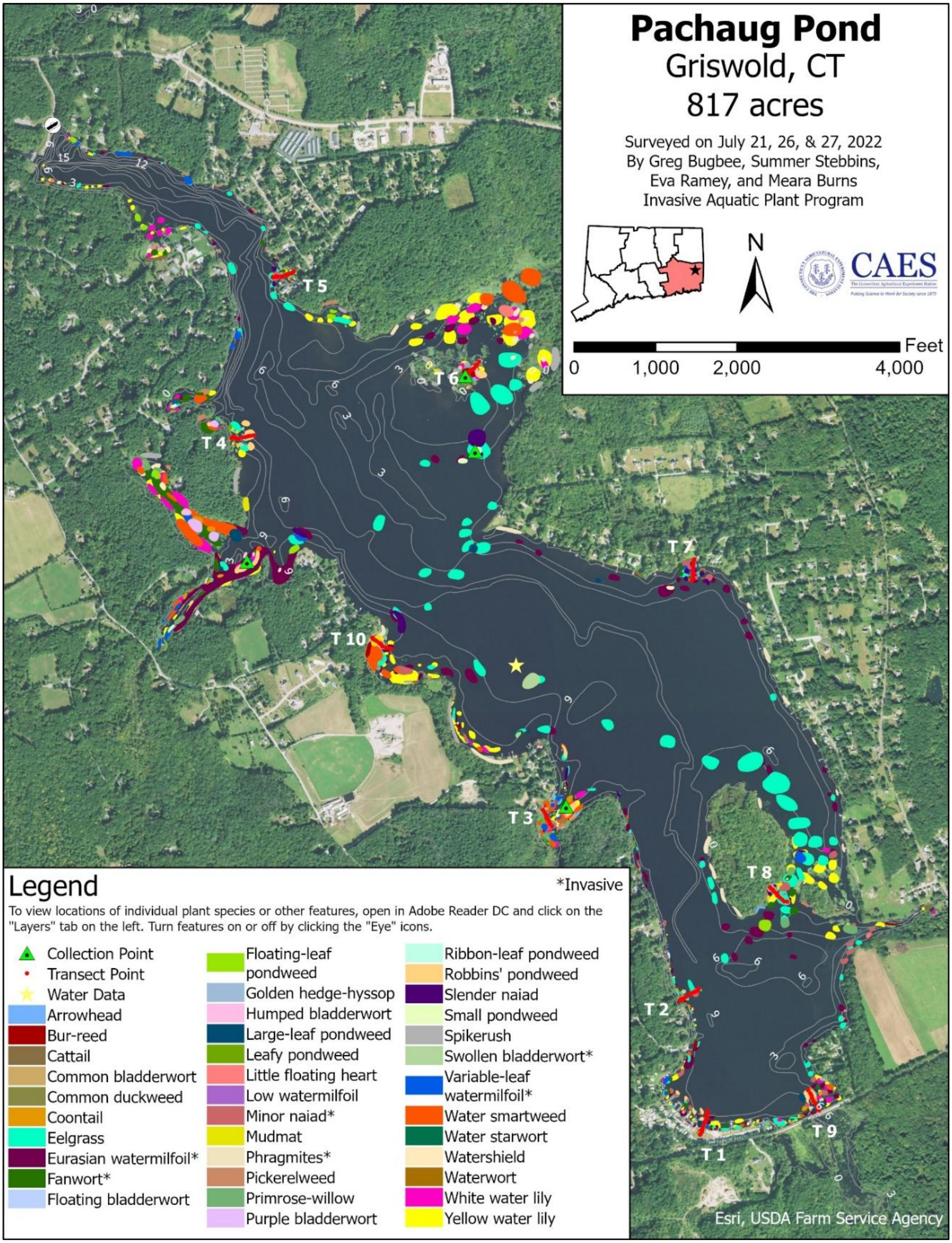
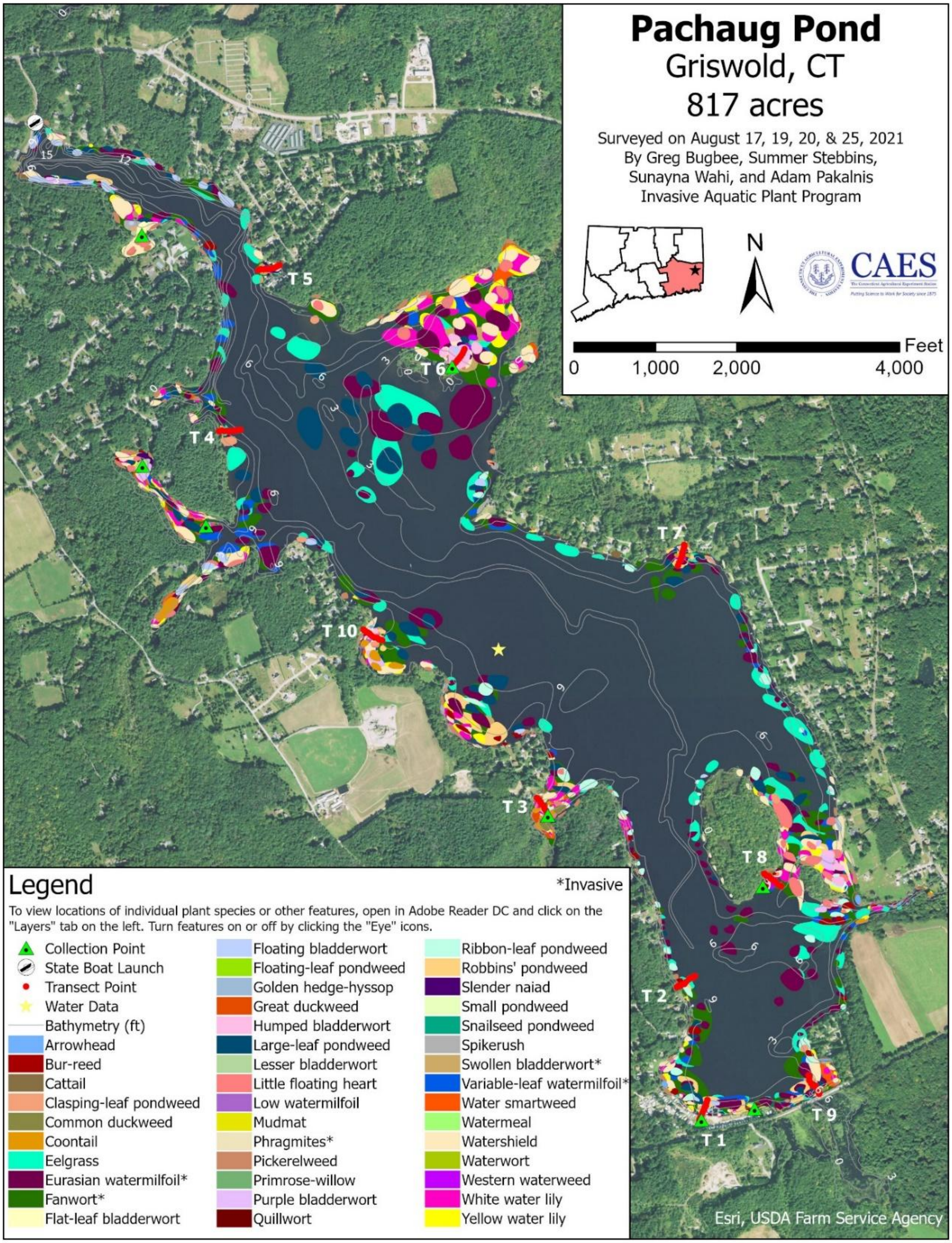
Swollen bladderwort*
Variable-leaf watermilfoil*
Watershield
Water smartweed
Waterwort
Western waterweed
White water lily
Yellow water lily
*Invasive/non-native
N
OAIS
Office of Aquatic Invasive Species
Connecticut Agricultural Experiment Station

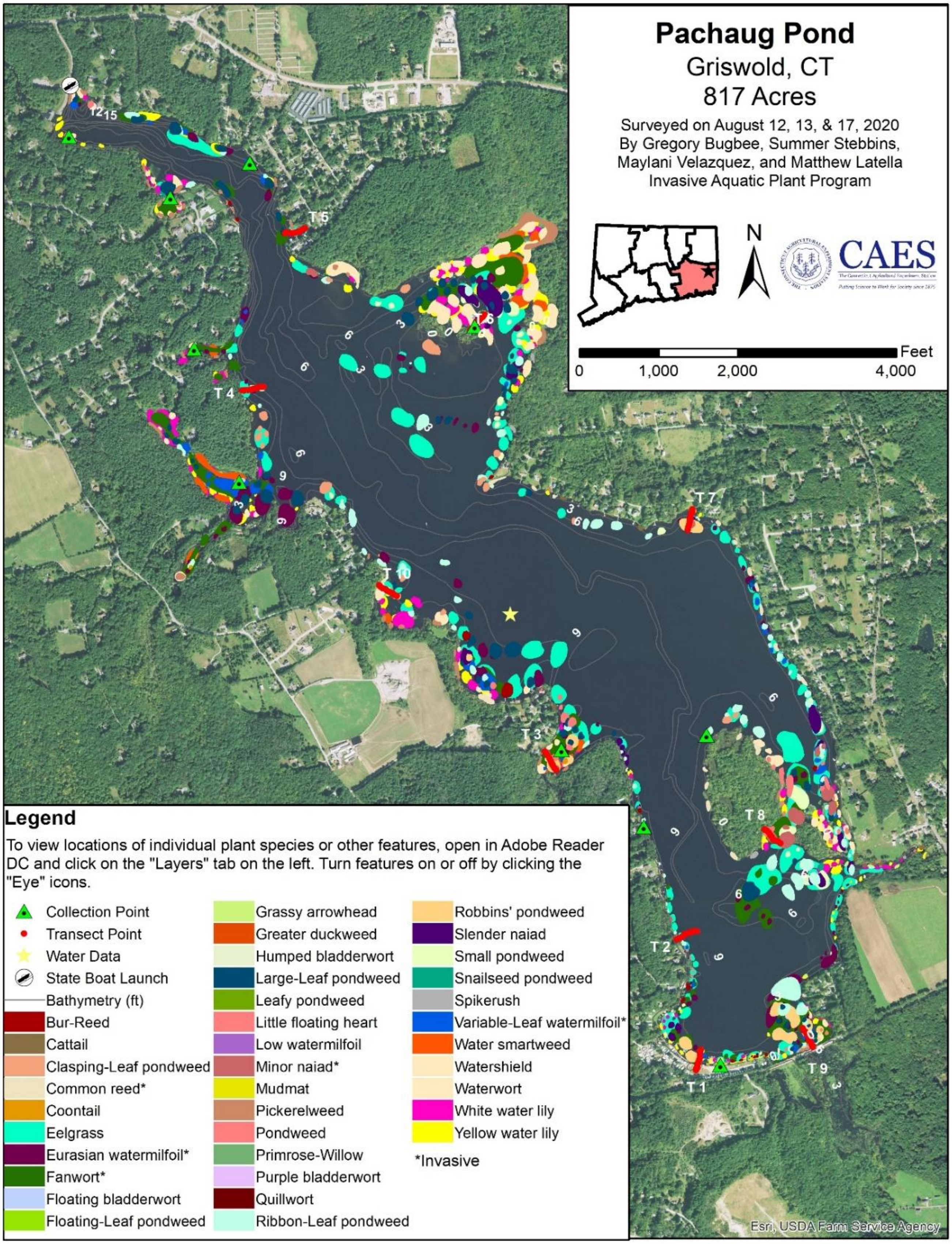

T 3
T 8
T 2
T 9
Map 5 of 5
Pachaug Pond
Griswold, CT
817 acres
Surveyed on July 31, August 1-2, & 13-14, 2024
By Greg Bugbee, Summer Weidman, Jeremiah Foley, Madison Manke, and Ella Nastri
0 500 1,000 2,000
Feet
Bathymetry (ft)
Collection Point
State Boat Launch
Transect Point
Water Data
Arrowhead
Berchtold's pondweed
Bur-reed
Cattail
Clasping-leaf pondweed
Common bladderwort
Common duckweed
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Flat-leaf bladderwort
Floating bladderwort
Floating-leaf pondweed
Great duckweed
Humped bladderwort
Large-leaf pondweed
Leafy pondweed
Little floating heart
Low watermilfoil
Minor naiad*
Mudmat*
Northern hydrilla*
Phragmites*
Primrose-willow
Purple bladderwort
Quillwort
Ribbon-leaf pondweed
Robbins' pondweed
Rush
Slender naiad
Small pondweed
Snailseed pondweed
Spikerush
Swollen bladderwort*
Variable-leaf watermilfoil*
Watershield
Water smartweed
Waterwort
Western waterweed
White water lily
Yellow water lily
*Invasive/non-native
N
OAIS
Office of Aquatic Invasive Species
Connecticut Agricultural Experiment Station

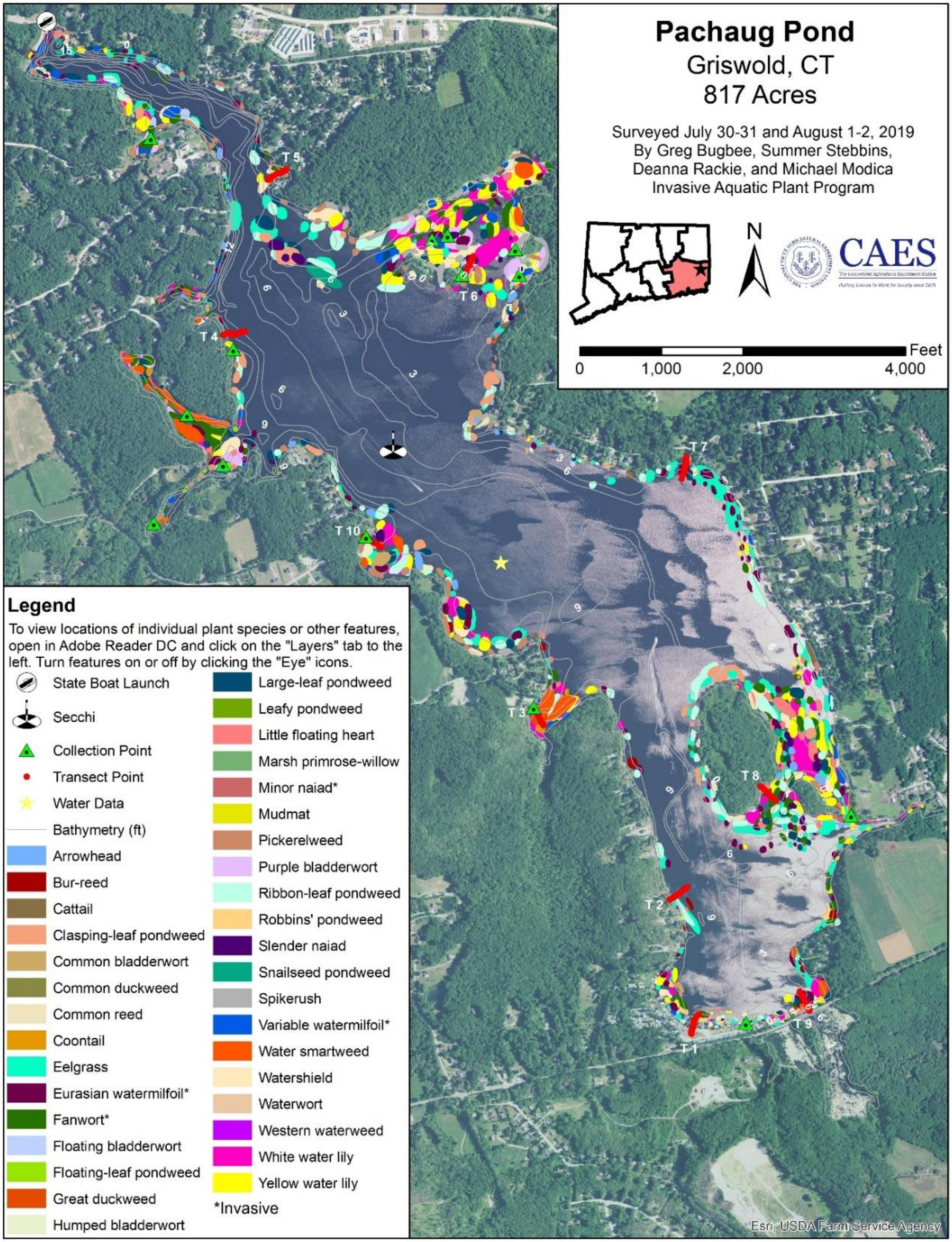
Previous Years Aquatic Plant Survey Maps

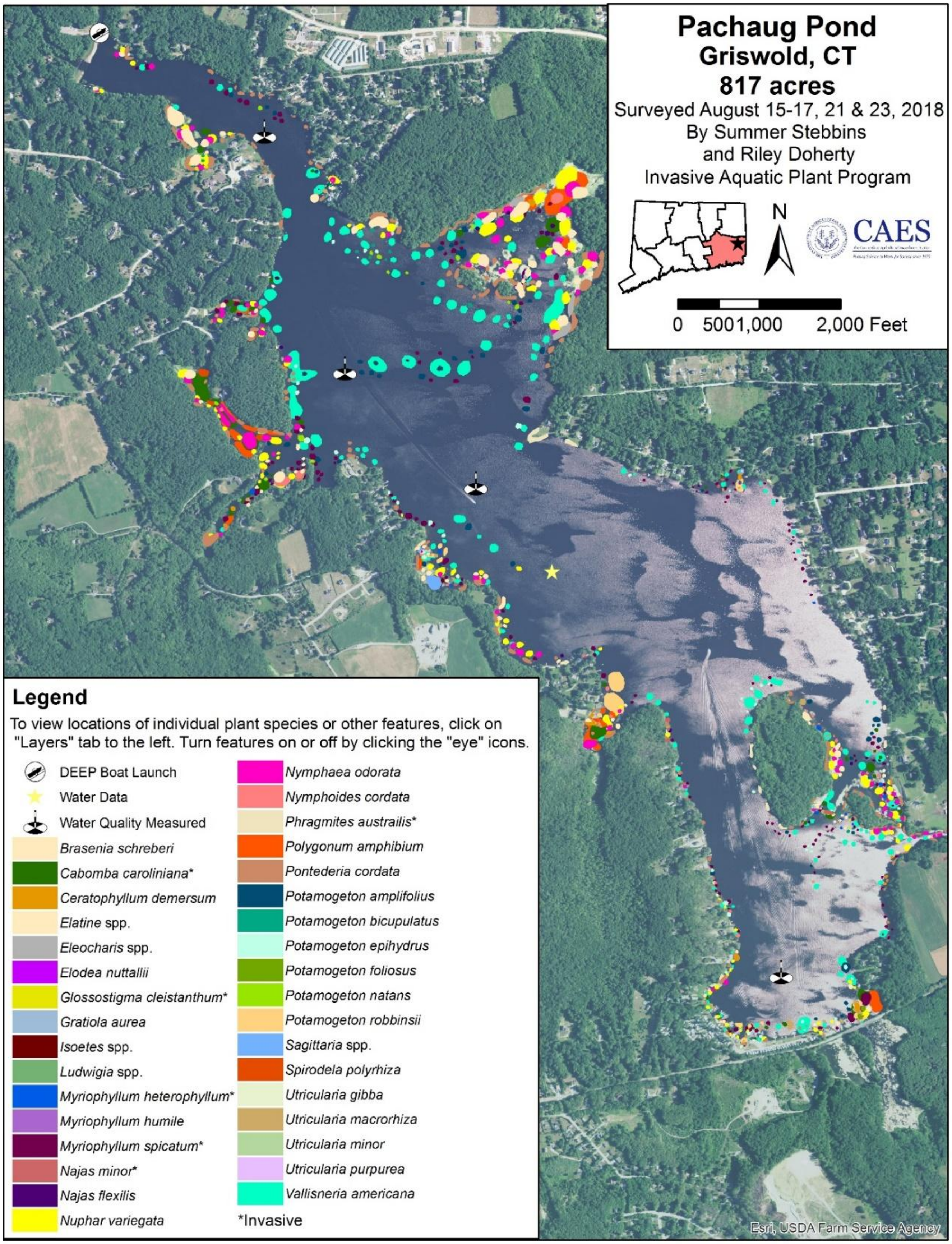

Pachaug Pond
Griswold, CT
817 acres
Surveyed on August 9 & 10, 2023
By Greg Bugbee, Summer Stebbins,
Jeremiah Foley, and Madison Manke
N
OAIS
Office of Aquatic Invasive Species
Feet
0
1,000
2,000
4,000
T 1
T 2
T 3
T 4
T 5
T 6
T 7
T 8
T 9
T 10
Legend
*Invasive
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab on the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
State Boat Ramp
Transect Point
Water Data
Bathymetry(ft)
Arrowhead
Bur-reed
Cattail
Clasping-leaf pondweed
Common bladderwort
Common duckweed
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Flat-leaf bladderwort
Floating bladderwort
Floating-leaf pondweed
Golden hedge-hyssop
Great duckweed
Humped bladderwort
Large-leaf pondweed
Little floating heart
Low watermilfoil
Minor naiad*
Mudmat
Phragmites*
Pickerelweed
Primrose-willow
Purple bladderwort
Quillwort
Ribbon-leaf pondweed
Robbins' pondweed
Slender naiad
Snailseed pondweed
Spikerush
Swollen bladderwort*
Variable-leaf watermilfoil
Water smartweed
Watershield
Waterwort
Western waterweed
White water lily
Yellow water lily
Esri, USDA Farm Service Agency


Pachaug Pond
Griswold, CT
817 acres
Surveyed on July 21, 26, & 27, 2022
By Greg Bugbee, Summer Stebbins,
Eva Ramey, and Meara Burns
Invasive Aquatic Plant Program
N
CAES
Feet
0 1,000 2,000 4,000
T 1
T 2
T 3
T 4
T 5
T 6
T 7
T 8
T 9
T 10
Legend
*Invasive
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab on the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
Transect Point
Water Data
Arrowhead
Bur-reed
Cattail
Common bladderwort
Common duckweed
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Floating bladderwort
Floating-leaf pondweed
Golden hedge-hyssop
Humped bladderwort
Large-leaf pondweed
Leafy pondweed
Little floating heart
Low watermilfoil
Minor naiad*
Mudmat
Phragmites*
Pickerelweed
Primrose-willow
Purple bladderwort
Ribbon-leaf pondweed
Robbins' pondweed
Slender naiad
Small pondweed
Spikerush
Swollen bladderwort*
Variable-leaf watermilfoil*
Water smartweed
Water starwort
Watershield
Waterwort
White water lily
Yellow water lily
Esri, USDA Farm Service Agency

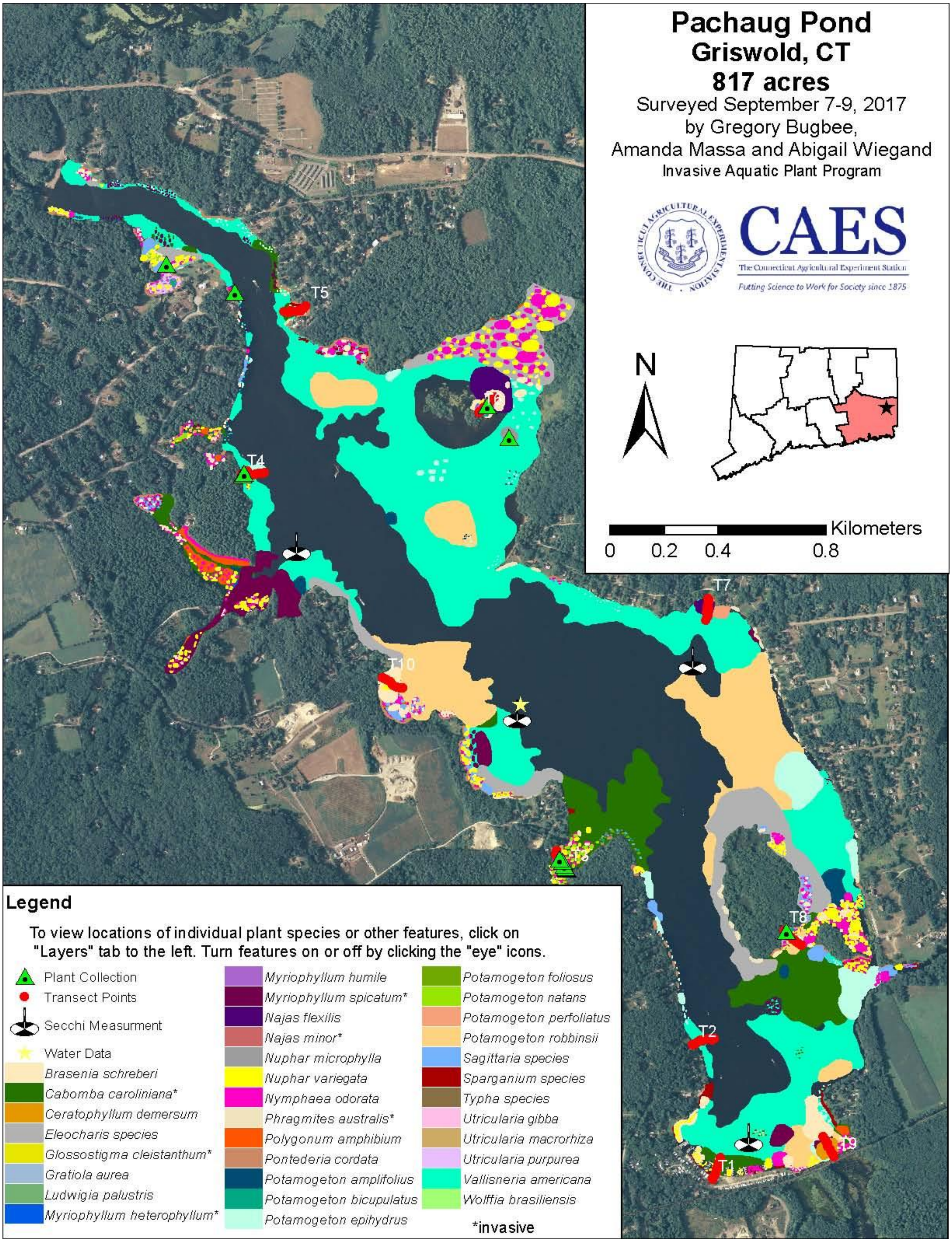

Pachaug Pond
Griswold, CT
817 acres
Surveyed on August 17, 19, 20, & 25, 2021
By Greg Bugbee, Summer Stebbins, Sunayna Wahi, and Adam Pakalnis
Invasive Aquatic Plant Program
N
CAES
Feet
0 1,000 2,000 4,000
T 1
T 2
T 3
T 4
T 5
T 6
T 7
T 8
T 9
T 10
Legend
*Invasive
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab on the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
State Boat Launch
Transect Point
Water Data
Bathymetry (ft)
Arrowhead
Bur-reed
Cattail
Clasping-leaf pondweed
Common duckweed
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Flat-leaf bladderwort
Floating bladderwort
Floating-leaf pondweed
Golden hedge-hyssop
Great duckweed
Humped bladderwort
Large-leaf pondweed
Lesser bladderwort
Little floating heart
Low watermilfoil
Mudmat
Phragmites*
Pickerelweed
Primrose-willow
Purple bladderwort
Quillwort
Ribbon-leaf pondweed
Robbins' pondweed
Slender naiad
Small pondweed
Snailseed pondweed
Spikerush
Swollen bladderwort*
Variable-leaf watermilfoil*
Water smartweed
Watermeal
Watershield
Waterwort
Western waterweed
White water lily
Yellow water lily
Esri, USDA Farm Service Agency


Pachaug Pond
Griswold, CT
817 Acres
Surveyed on August 12, 13, & 17, 2020
By Gregory Bugbee, Summer Stebbins,
Maylani Velazquez, and Matthew Latella
Invasive Aquatic Plant Program
N
CAES
Feet
0
1,000
2,000
4,000
Legend
To view locations of individual plant species or other features, open in Adobe Reader DC and click on the "Layers" tab on the left. Turn features on or off by clicking the "Eye" icons.
Collection Point
Transect Point
Water Data
State Boat Launch
Bathymetry (ft)
Bur-Reed
Cattail
Clasping-Leaf pondweed
Common reed*
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Floating bladderwort
Floating-Leaf pondweed
Grassy arrowhead
Greater duckweed
Humped bladderwort
Large-Leaf pondweed
Leafy pondweed
Little floating heart
Low watermilfoil
Minor naiad*
Mudmat
Pickerelweed
Pondweed
Primrose-Willow
Purple bladderwort
Quillwort
Ribbon-Leaf pondweed
Robbins' pondweed
Slender naiad
Small pondweed
Snailseed pondweed
Spikerush
Variable-Leaf watermilfoil*
Water smartweed
Watershield
Waterwort
White water lily
Yellow water lily
*Invasive
T 1
T 2
T 3
T 4
T 5
T 7
T 8
T 9
T 10
Esri, USDA Farm Service Agency


Pachaug Pond
Griswold, CT
817 Acres
Surveyed July 30-31 and August 1-2, 2019
By Greg Bugbee, Summer Stebbins,
Deanna Rackie, and Michael Modica
Invasive Aquatic Plant Program
N
CAES
Feet
0
1,000
2,000
4,000
T 1
T 2
T 3
T 4
T 5
T 6
T 7
T 8
T 9
T 10
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.
State Boat Launch
Secchi
Collection Point
Transect Point
Water Data
Bathymetry (ft)
Arrowhead
Bur-reed
Cattail
Clasping-leaf pondweed
Common bladderwort
Common duckweed
Common reed
Coontail
Eelgrass
Eurasian watermilfoil*
Fanwort*
Floating bladderwort
Floating-leaf pondweed
Great duckweed
Humped bladderwort
Large-leaf pondweed
Leafy pondweed
Little floating heart
Marsh primrose-willow
Minor naiad*
Mudmat
Pickerelweed
Purple bladderwort
Ribbon-leaf pondweed
Robbins' pondweed
Slender naiad
Snailseed pondweed
Spikerush
Variable watermilfoil*
Water smartweed
Watershield
Waterwort
Western waterweed
White water lily
Yellow water lily
*Invasive
Esri, USDA Farm Service Agency



Pachaug Pond
Griswold, CT
817 acres
Surveyed August 15-17, 21 & 23, 2018
By Summer Stebbins
and Riley Doherty
Invasive Aquatic Plant Program
N
CAES
0 500 1,000 2,000 Feet
Legend
To view locations of individual plant species or other features, click on "Layers" tab to the left. Turn features on or off by clicking the "eye" icons.
DEEP Boat Launch
Water Data
Water Quality Measured
Brasenia schreberi
Cabomba caroliniana*
Ceratophyllum demersum
Elatine spp.
Eleocharis spp.
Elodea nuttallii
Glossostigma cleistanthum*
Gratiola aurea
Isoetes spp.
Ludwigia spp.
Myriophyllum heterophyllum*
Myriophyllum humile
Myriophyllum spicatum*
Najas minor*
Najas flexilis
Nuphar variegata
Nymphaea odorata
Nymphoides cordata
Phragmites austrailis*
Polygonum amphibium
Pontederia cordata
Potamogeton amplifolius
Potamogeton bicupulatus
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton natans
Potamogeton robbinsii
Sagittaria spp.
Spirodela polyrhiza
Utricularia gibba
Utricularia macrorhiza
Utricularia minor
Utricularia purpurea
Vallisneria americana
*Invasive
Esri, USDA Farm Service Agency


Pachaug Pond
Griswold, CT
817 acres
Surveyed September 7-9, 2017
by Gregory Bugbee,
Amanda Massa and Abigail Wiegand
Invasive Aquatic Plant Program
CAES
The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875
N
Kilometers
0 0.2 0.4 0.8
T1
T2
T4
T5
T7
T8
T10
Legend
To view locations of individual plant species or other features, click on "Layers" tab to the left. Turn features on or off by clicking the "eye" icons.
Plant Collection
Transect Points
Secchi Measurment
Water Data
Brasenia schreberi
Cabomba caroliniana*
Ceratophyllum demersum
Eleocharis species
Glossostigma cleistanthum*
Gratiola aurea
Ludwigia palustris
Myriophyllum heterophyllum*
Myriophyllum humile
Myriophyllum spicatum*
Najas flexilis
Najas minor*
Nuphar microphylla
Nuphar variegata
Nymphaea odorata
Phragmites australis*
Polygonum amphibium
Pontederia cordata
Potamogeton amplifolius
Potamogeton bicupulatus
Potamogeton epihydrus
Potamogeton foliosus
Potamogeton natans
Potamogeton perfoliatus
Potamogeton robbinsii
Sagittaria species
Sparganium species
Typha species
Utricularia gibba
Utricularia macrorhiza
Utricularia purpurea
Vallisneria americana
Wolffia brasiliensis
*invasive

Transect Data

Appendix Pachaug Pond Transect Data (1 of 2)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BraSch	CabCar	CerDem	ElaSpp	EleSpp	EloNut	GloCle	LudSpp	MyrHet	MyrHum	MyrSpi	NajFle	NajMin	NupVar	NymOdo	NymCor	Phrag	PolAmp	PonCor	PotAmp	PotBer	PotBic	PotEpi	PotFol	PotNat	PotPer	PotPus	PotRob	SagSpp	SpaSpp	SpiPol	Typha	UtrGib	UtrInf	UtrPur	UtrVul	ValAme
1	1	0.5	Greg Bugbee	41.54864	-71.90056	7/31/2024	0.3	Gravel	0	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	2	5	Greg Bugbee	41.54868	-71.90053	7/31/2024	1.3	Muck	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2
1	3	10	Greg Bugbee	41.54872	-71.90048	7/31/2024	1.8	Organic	0	3	0	0	0	0	0	0	0	0	2	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
1	4	20	Greg Bugbee	41.54879	-71.90043	7/31/2024	1.7	Gravel	0	3	0	0	0	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3
1	5	30	Greg Bugbee	41.54887	-71.90038	7/31/2024	1.8	Organic	0	3	2	0	0	0	0	0	0	0	2	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	3
1	6	40	Greg Bugbee	41.54896	-71.90030	7/31/2024	2.0	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
1	7	50	Greg Bugbee	41.54905	-71.90026	7/31/2024	2.0	Organic	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1	8	60	Greg Bugbee	41.54915	-71.90029	7/31/2024	1.9	Organic	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	0	0	0	0	0	0	0	0	0	0
1	9	70	Greg Bugbee	41.54922	-71.90024	7/31/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	10	80	Greg Bugbee	41.54933	-71.90021	7/31/2024	1.9	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	0	0	0	0	0	0	0	0	0	0
2	1	0.5	Greg Bugbee	41.55314	-71.90136	7/31/2024	0.2	Sand	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	0	0	0	0	0	0	0	0	0	0
2	2	5	Greg Bugbee	41.55317	-71.90131	7/31/2024	1.0	Sand	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	0	0	0	0	0	0	0	0	0	0
2	3	10	Greg Bugbee	41.55317	-71.90126	7/31/2024	1.1	Sand	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	0	0	0	0	0	0	0	0	0	2
2	4	20	Greg Bugbee	41.55324	-71.90112	7/31/2024	1.1	Sand	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	0	0	0	0	0	0	0	0	0	2
2	5	30	Greg Bugbee	41.55330	-71.90103	7/31/2024	2.2	Sand	0	0	2	0	0	0	0	0	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	0	2
2	6	40	Greg Bugbee	41.55336	-71.90094	7/31/2024	2.5	Organic	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	0	0	0	0	0	0	0	0	0	0
2	7	50	Greg Bugbee	41.55339	-71.90083	7/31/2024	2.7	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	0	0	0	0	0	0	0	0	0	0
2	8	60	Greg Bugbee	41.55339	-71.90070	7/31/2024	2.7	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	0	0	0	0	0	0	0	0	0	0
2	9	70	Greg Bugbee	41.55343	-71.90060	7/31/2024	4.1	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	0	0	0	0	0	0	0	0	0	0
2	10	80	Greg Bugbee	41.55346	-71.90049	7/31/2024	4.8	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	0	0	0	0	0	0	0	0	0	0
3	1	0.5	Greg Bugbee	41.55966	-71.90741	8/1/2024	0.2	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2	0	0	2	0	0	0
3	2	5	Greg Bugbee	41.55962	-71.90737	8/1/2024	0.5	Muck	2	3	2	0	0	0	0	0	2	0	0	0	0	0	2	2	0	0	2	0	0	0	2	0	0	0	0	0	0	2	2	1	0	2	0	0	0
3	3	10	Greg Bugbee	41.55959	-71.90731	8/1/2024	1.3	Muck	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0
3	4	20	Greg Bugbee	41.55951	-71.90724	8/1/2024	1.7	Muck	0	3	2	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0
3	5	30	Greg Bugbee	41.55943	-71.90720	8/1/2024	1.7	Muck	2	3	2	0	0	0	0	0	2	0	2	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	6	40	Greg Bugbee	41.55936	-71.90713	8/1/2024	1.7	Muck	0	4	2	0	0	0	0	0	2	0	0	0	0	2	3	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0
3	7	50	Greg Bugbee	41.55928	-71.90707	8/1/2024	1.7	Muck	0	3	2	0	0	0	0	0	2	0	0	2	0	0	4	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0
3	8	60	Greg Bugbee	41.55920	-71.90701	8/1/2024	1.2	Bedrock	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	0	0	2	0	2	0	0	0	0	0	2	0	0	2	0	0	0
3	9	70	Greg Bugbee	41.55913	-71.90696	8/1/2024	0.7	Bedrock	2	4	2	0	0	0	0	1	3	0	2	0	0	0	3	2	0	0	2	0	0	0	2	0	0	0	2	2	0	0	2	0	0	2	0	0	0
3	10	80	Greg Bugbee	41.55901	-71.90693	8/1/2024	0.5	Bedrock	0	2	0	0	0	0	0	0	0	0	2	0	0	0	2	2	2	0	2	0	0	0	2	0	0	0	0	2	0	2	0	0	0	0	0	2	0
4	1	0.5	Greg Bugbee	41.57236	-71.92115	8/1/2024	0.3	Sand	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	0	0	0	0	0	0	0	0	0	0
4	2	5	Greg Bugbee	41.57233	-71.92106	8/1/2024	0.8	Sand	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	3	10	Greg Bugbee	41.57237	-71.92102	8/1/2024	1.1	Sand	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
4	4	20	Greg Bugbee	41.57234	-71.92087	8/1/2024	1.7	Sand	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
4	5	30	Greg Bugbee	41.57226	-71.92078	8/1/2024	1.7	Sand	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4	6	40	Greg Bugbee	41.57233	-71.92065	8/1/2024	2.6	Sand	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4	7	50	Greg Bugbee	41.57228	-71.92054	8/1/2024	3.0	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	0	0	0	0	0	0	0	0	0	0
4	8	60	Greg Bugbee	41.57231	-71.92041	8/1/2024	3.4	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	0	0	0	0	0	0	0	0	0	0
4	9	70	Greg Bugbee	41.57237	-71.92028	8/1/2024	3.6	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	0	0	0	0	0	0	0	0	0	0
4	10	80	Greg Bugbee	41.57241	-71.92016	8/1/2024	3.6	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	0	0	0	0	0	0	0	0	0	0
5	1	0.5	Greg Bugbee	41.57790	-71.91824	8/1/2024	0.2	Sand	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	5	Greg Bugbee	41.57787	-71.91827	8/1/2024	1.0	Sand	2	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	3
5	3	10	Greg Bugbee	41.57786	-71.91834	8/1/2024	1.3	Muck	1	4	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3
5	4	20	Greg Bugbee	41.57782	-71.91845	8/1/2024	1.6	Organic	0	3	0	0	0	0	0	0	2	0	2	0	0	2	2	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	4
5	5	30	Greg Bugbee	41.57780	-71.91856	8/1/2024	1.7	Organic	0	2	0	0	0	0	0	0	2	0	0	2	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
5	6	40	Greg Bugbee	41.57777	-71.91869	8/1/2024	1.7	Organic	0	2	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
5	7	50	Greg Bugbee	41.57776	-71.91880	8/1/2024	1.7	Organic	0	2	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
5	8	60	Greg Bugbee	41.57775	-71.91892	8/1/2024	1.8	Organic	0	2	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
5	9	70	Greg Bugbee	41.57777	-71.91905	8/1/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
5	10	80	Greg Bugbee	41.57772	-71.91915	8/1/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
6	1	0.5	Greg Bugbee	41.57427	-71.91059	8/1/2024	0.2	Organic	2	2	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0
6	2	5	Greg Bugbee	41.57430	-71.91054	8/1/2024	0.3	Organic	0	2	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2	0	2
6	3	10	Greg Bugbee	41.57434	-71.91051	8/1/2024	0.7	Organic	0	2	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	3	0	0
6	4	20	Greg Bugbee	41.57438	-71.91041	8/1/2024	1.8	Organic	2	0	0	0	2	0	0	0	0	0	0	0	0	3	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
6	5	30	Greg Bugbee	41.57444	-71.91031	8/1/2024	1.8	Organic	3	1	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
6	6	40	Greg Bugbee	41.57449	-71.91021	8/1/2024	1.2	Organic	3	0	0	0	3	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	0	2	0	0	3
6	7	50	Greg Bugbee	41.57456	-71.91014	8/1/2024	1.4	Organic	2	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	2	0	0

Appendix Pachaug Pond Transect Data (2 of 2)

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	BraSch	CabCar	CerDem	ElaSpp	EleSpp	EloNut	GloCle	LudSpp	MyrHet	MyrHum	MyrSpi	NajFle	NajMin	NupVar	NymOdo	NymCor	Phrag	PolAmp	PonCor	PotAmp	PotBer	PotBic	PotEpi	PotFol	PotNat	PotPer	PotPus	PotRob	SagSpp	SpaSpp	SpiPol	Typha	UtrGib	UtrInf	UtrPur	UtrVul	ValAme
6	8	60	Greg Bugbee	41.57466	-71.91009	8/1/2024	1.4	Organic	0	0	0	0	2	0	0	0	0	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	3
6	9	70	Greg Bugbee	41.57469	-71.90998	8/1/2024	1.6	Organic	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	0	0	3	0	0	0	0	0	0	0	4
6	10	80	Greg Bugbee	41.57476	-71.90988	8/1/2024	1.6	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	3
7	1	0.5	Greg Bugbee	41.56805	-71.90044	8/2/2024	0.2	Gravel	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
7	2	5	Greg Bugbee	41.56800	-71.90042	8/2/2024	1.0	Sand	0	1	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	3
7	3	10	Greg Bugbee	41.56796	-71.90045	8/2/2024	1.3	Sand	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
7	4	20	Greg Bugbee	41.56786	-71.90045	8/2/2024	1.6	Sand	0	1	0	0	0	0	0	0	0	0	2	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	3
7	5	30	Greg Bugbee	41.56777	-71.90050	8/2/2024	1.8	Sand	0	1	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
7	6	40	Greg Bugbee	41.56768	-71.90053	8/2/2024	1.8	Sand	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	2
7	7	50	Greg Bugbee	41.56760	-71.90057	8/2/2024	1.8	Sand	0	2	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
7	8	60	Greg Bugbee	41.56751	-71.90060	8/2/2024	1.8	Organic	0	3	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0	0
7	9	70	Greg Bugbee	41.56743	-71.90062	8/2/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	2
7	10	80	Greg Bugbee	41.56734	-71.90064	8/2/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8	1	0.5	Greg Bugbee	41.55695	-71.89725	7/31/2024	0.2	Sand	2	0	0	0	2	0	0	2	0	0	0	2	2	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0
8	2	5	Greg Bugbee	41.55695	-71.89718	7/31/2024	0.8	Sand	2	2	0	0	0	0	0	2	0	0	3	2	2	0	0	3	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	0	2	2	0	0	0
8	3	10	Greg Bugbee	41.55687	-71.89713	7/31/2024	0.9	Organic	2	2	2	0	0	0	0	0	0	0	2	2	0	0	2	4	0	0	0	0	0	2	2	0	0	0	0	0	2	0	0	0	2	2	0	0	0
8	4	20	Greg Bugbee	41.55680	-71.89704	7/31/2024	1.3	Sand	3	2	2	0	0	0	0	0	2	0	2	2	0	2	2	3	0	0	2	0	0	2	2	0	0	0	0	2	2	3	0	0	2	2	0	0	0
8	5	30	Greg Bugbee	41.55674	-71.89698	7/31/2024	1.6	Organic	0	3	2	0	0	0	0	0	2	0	2	2	0	2	2	2	0	0	0	0	0	0	2	0	0	0	0	2	0	2	0	0	2	2	0	0	3
8	6	40	Greg Bugbee	41.55669	-71.89688	7/31/2024	1.8	Organic	0	3	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3
8	7	50	Greg Bugbee	41.55661	-71.89677	7/31/2024	1.8	Organic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8	8	60	Greg Bugbee	41.55655	-71.89672	7/31/2024	1.9	Organic	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	0	0	0	0	0	0	0	0	0	2
8	9	70	Greg Bugbee	41.55651	-71.89660	7/31/2024	1.7	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
8	10	80	Greg Bugbee	41.55647	-71.89648	7/31/2024	1.7	Organic	0	2	0	0	0	0	0	0	0	0	2	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
9	1	0.5	Greg Bugbee	41.54939	-71.89515	7/31/2024	0.2	Gravel	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
9	2	5	Greg Bugbee	41.54944	-71.89517	7/31/2024	1.8	Gravel	0	2	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	3	0	0	0	0	0	0	0	0	2
9	3	10	Greg Bugbee	41.54948	-71.89517	7/31/2024	1.8	Organic	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	0	0	0	0	0	0	0	0	0
9	4	20	Greg Bugbee	41.54954	-71.89525	7/31/2024	1.8	Organic	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	0	0	0	0	0	0	0	0	0
9	5	30	Greg Bugbee	41.54963	-71.89531	7/31/2024	1.8	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
9	6	40	Greg Bugbee	41.54972	-71.89538	7/31/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
9	7	50	Greg Bugbee	41.54980	-71.89542	7/31/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2
9	8	60	Greg Bugbee	41.54987	-71.89548	7/31/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
9	9	70	Greg Bugbee	41.54993	-71.89557	7/31/2024	1.9	Organic	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
9	10	80	Greg Bugbee	41.55004	-71.89560	7/31/2024	2.0	Organic	0	2	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	2	0	0	0	0	0	0	0	0	0