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123 Huntington Street

New Haven, CT 06511

November 28, 2018

The Connecticut Agricultural Experiment Station

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Pachaug Pond

Griswold, CT

Aquatic vegetation survey

Water chemistry

Aquatic plant management options

2018

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Table of Contents

1. Introduction **4**

2. Objectives **6**

3. Materials and Methods **7**

4. Results and Discussion **9**

A) General Aquatic Plant Survey and Transects 9

B) Water Chemistry 13

C) Aquatic Vegetation Management Options 16

5. Conclusions **18**

6. Acknowledgements **19**

7. Funding **19**

7. References **19**

8. Appendix **21**

A) State Board of Fisheries and Game - Narrative 22

B) Aquatic Plant Survey Maps by Section 23

C) Invasive Plant Descriptions 30

D) Transect Data 34

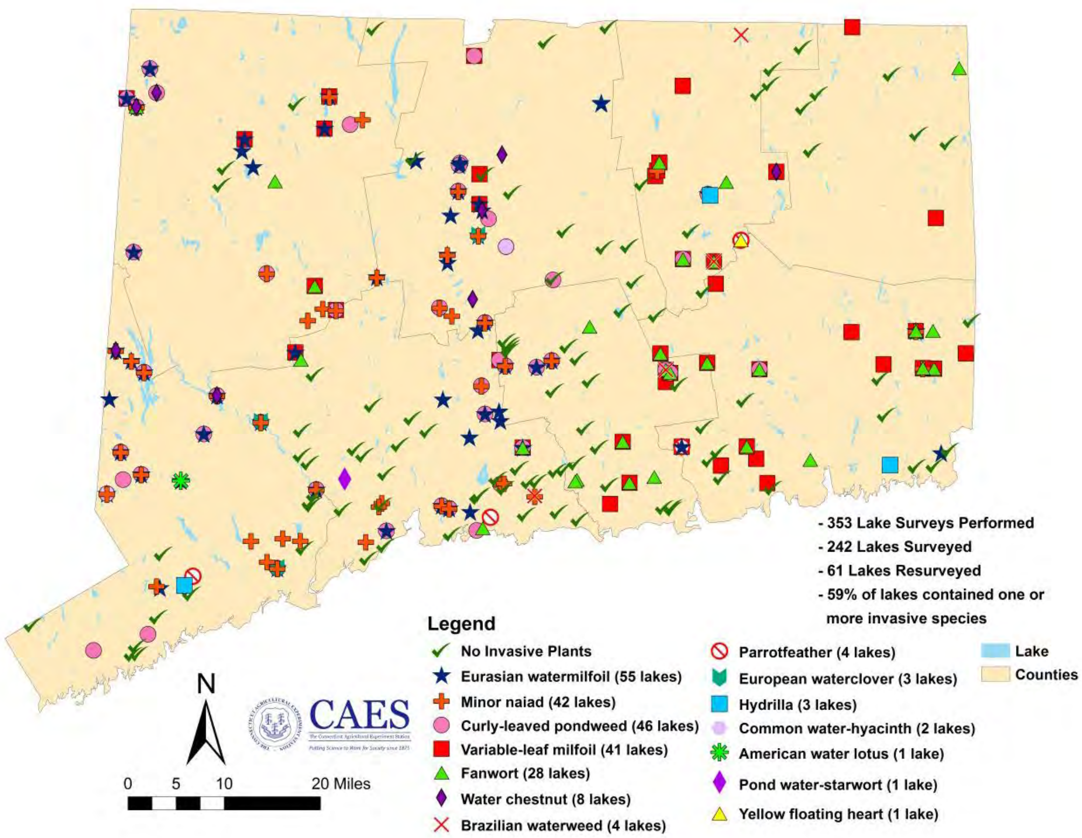
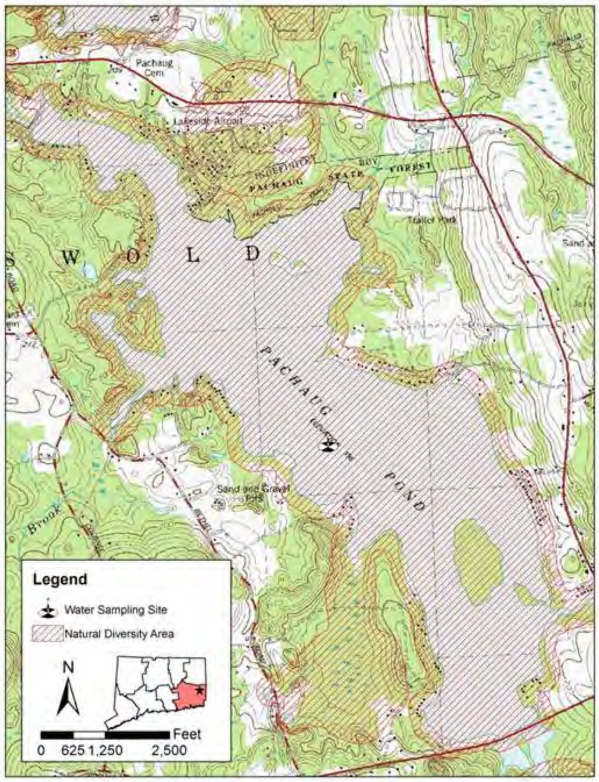


Figure 1. Locations of invasive aquatic plants found by CAES IAPP from 2004 to 2018.

Introduction

Since 2004, the Connecticut Agricultural Experiment Station (CAES) Invasive Aquatic Plant Program (IAPP) has surveyed or resurveyed aquatic vegetation and monitored water chemistry in over 350 Connecticut lakes and ponds (Figure 1). Approximately 59% of the lakes and ponds contain invasive (non-native) plant species that are capable of causing rapid deterioration of aquatic ecosystems and recreation value. The presence of invasive species appears related to water chemistry, public boat launches and random events. The CAES IAPP information is stored on the website www.ct.gov/caes/iapp where stakeholders can view digitized vegetation maps, detailed transect data, temperature and dissolved oxygen profiles as well as water tests for clarity, pH, alkalinity, conductivity, and total phosphorus. This information allows citizens, government officials and scientists to view past conditions, compare them with current conditions and make educated management decisions.



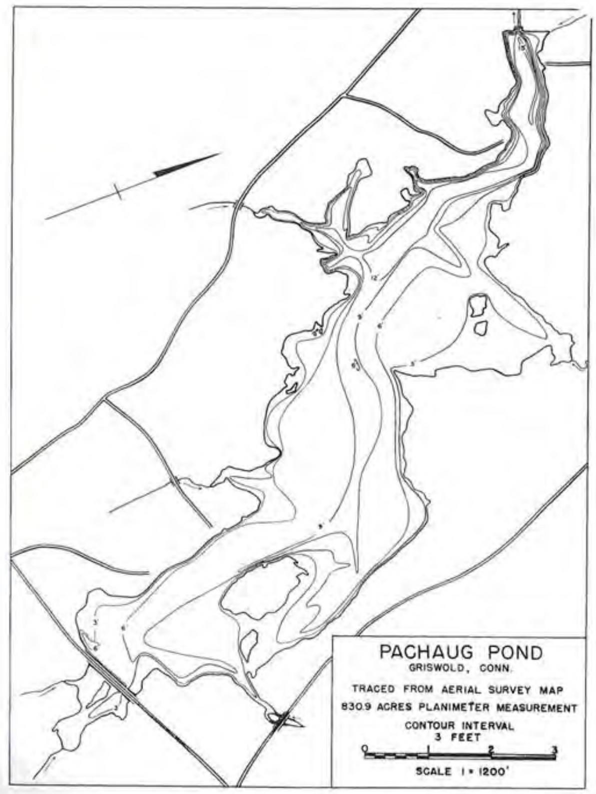


Figure 2. Topographic map of Pachaug Pond including location of State listed species (Natural Diversity Area) and CAES IAPP water sampling site (left) and bathymetry map circa 1959 (right).

This is the second CAES IAPP survey of Pachaug Pond for aquatic vegetation and water chemistry. Pachaug Pond is an 817 acre waterbody located in Griswold, CT (Figure 2). It has a maximum depth of approximately 16 feet and an average depth of six feet. The shallow nature of the lake allows a large littoral zone where aquatic plant growth is favored. State listed species may be present throughout the entire lake (Figure 2, left) (CTDEEP, 2017). Protection of these species requires withholding details from the public without special request forms. Public access is via a state boat launch on the northern shore. There are no motor restrictions. Previous work on Pachaug Pond dates back 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 2, right) (see appendix for full description). The specific plant species were not mentioned, but the bottom was described as being 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 information mentioned frequent severe summer drawdowns that may be controlling aquatic vegetation. These drawdowns were stated as being due to utilization of the water for "industrial" purposes which was likely power generation (personnel communication). 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 (species not identified) near the boat launch. Interestingly, pioneer infestations of invasive species might first be noticed at the 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 suggest an oligo-mesotrophic condition where nutrients are not excessive.

Objectives:

- Perform a second survey of Pachaug Pond for aquatic vegetation and test water to quantify water chemistry.
- Compare with 2017 survey and add vegetation maps and water chemistry information to the CAES IAPP website.
- Update aquatic plant management options.

Materials and Methods:

Aquatic plant surveys and mapping:

We surveyed Pachaug Pond for aquatic vegetation in 2018 on August 15, 16, 17, 21, 23. The survey utilized methods established by CAES IAPP with the exception of fewer transects and less detail due to funding restrictions. Surveys were conducted from a 16 foot motorized boat traveling over areas shallow enough to support aquatic plants. Plant species were recorded based on visual observation or collections with a long-handled rake or grapple. A Lowrance Hook 5® sonar system, with structure scan technology, was used to determine vegetated areas in deep water and eliminate the need for time-consuming grapple tosses. Quantitative information on plant abundance was obtained from 10 transects that were positioned perpendicular to the shoreline. Transects were set using a Trimble® global positioning system with sub-meter accuracy. Transect locations represented the variety of habitats occurring in the lake. Sampling locations were along each transect at points 0, 5, 10, 20, 30, 40, 50, 60, 70, and 80 m from the shore. We measured depth with a rake handle, drop line or digital depth finder and sediment type was estimated. Plant samples were obtained in shallow water with a rake and with a grapple in deeper water. 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 = extremely abundant). When field identifications of plants were questionable, we brought samples 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 aquatic plant herbarium, and digitized mounts can be viewed online (www.ct.gov/caes/iapp). We post-processed the GPS data in Pathfinder® 5.85 (Trimble Navigation Limited, Sunnyvale, CA) and then imported it into ArcGIS® 10.6.1 (ESRI, Redlands, CA), where it was geo-corrected. Data were then overlaid onto 2010 United States Department of Agriculture - National Agricultural Inventory Program aerial imagery with 1 m resolution.

Figure 3. Charaphyte found along western shore (left) and an algae-covered patch of fanwort and water smartweed in a cove on the western side of the pond (right).

Water Analysis:

Water was analyzed from the deepest part of the lake. Water temperature and dissolved oxygen were measured 0.5 m beneath the surface at 1 m intervals to the bottom. Water sample (250 mL) for pH, alkalinity, conductivity, and total phosphorus testing were obtained from 0.5 m beneath the surface and 0.5 m above the bottom. All samples were stored at 38°C 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 H_2SO_4 to an end point of pH 4.5. We determined total phosphorus using the ascorbic acid method preceded by digestion with potassium persulfate (APHA, 1995). Phosphorus was quantified using a Milton Roy Spectronic 20D® spectrometer with a light path of 2 cm and a wave length of 880 nm. Water was tested for temperature and dissolved oxygen using an YSI 58® meter. Water clarity was measured by lowering a six-inch diameter black and white Secchi disk into the water and determining to what depth it could be viewed.

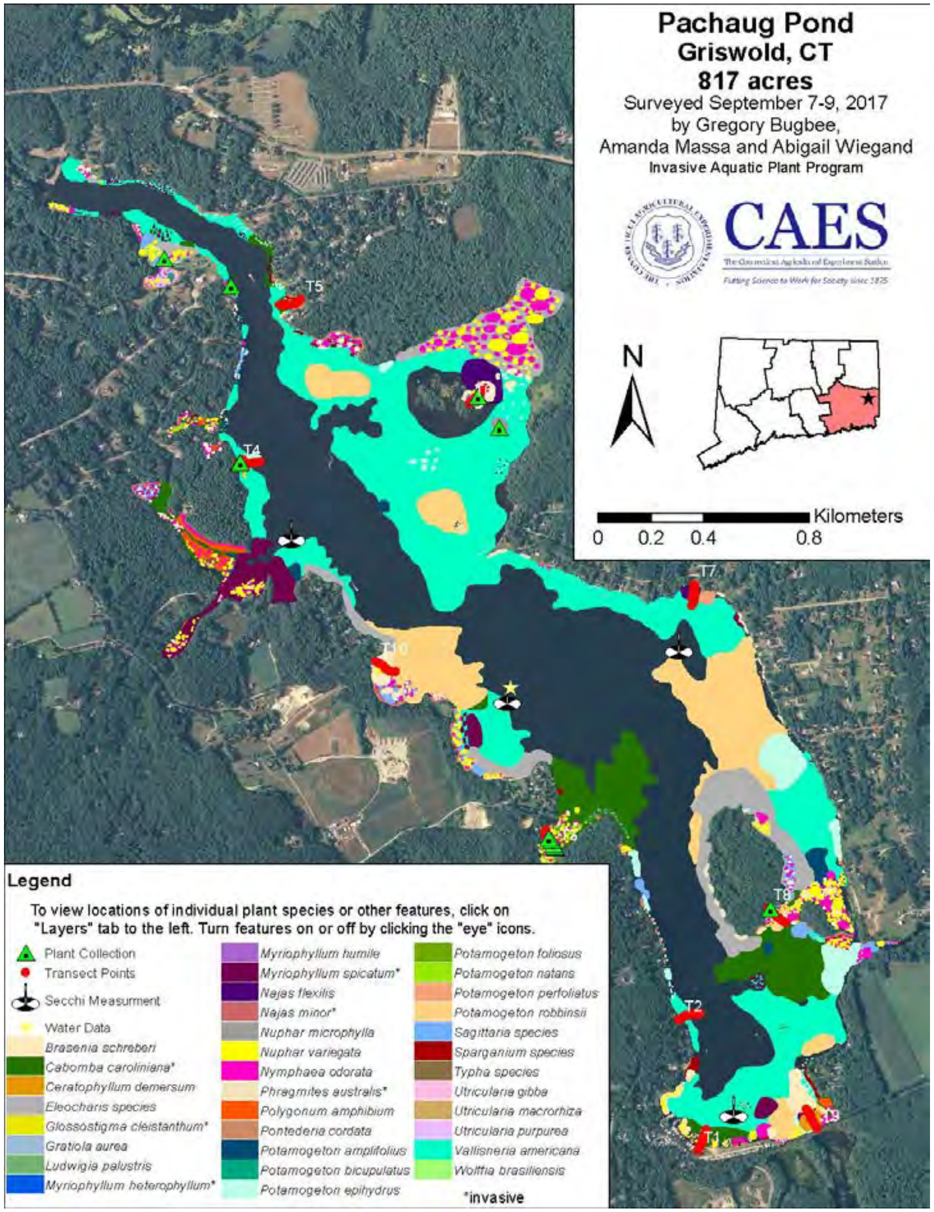
Table 1. Plants present in Pachaug Pond in 2017 and 2018. Present indicates the species presence in the lake while Frequency of Occurrence indicates presence of a species on transects.

Pachaug Pond					
Species (*invasives in bold)		2017		2018	
Common Name	Scientific Name	Present	Frequency of Occurrence (%/point)	Present	Frequency of Occurrence (%/point)
watershield	*Brasenia schreberi*	X	31	X	30
fanwort*	***Cabomba caroliniana***	**X**	**48**	**X**	**42**
coontail	*Ceratophyllum demersum*	X	17	X	17
waterwort	*Elatine* species		0	X	7
spikerush	*Eleocharis* species	X	8	X	11
western waterweed	*Elodea nuttallii*		0	X	1
mudmat	***Glossostigma cleistanthum***	**X**	**1**	**X**	**7**
golden hedge-hyssop	*Gratiola aurea*	X	5	X	1
quillwort	*Isoetes* species		0	X	3
marsh primrose-willow	*Ludwigia palustris*	X	2	X	5
variable-leaf watermilfoil	***Myriophyllum heterophyllum***	**X**	**8**	**X**	**9**
low watermilfoil	*Myriophyllum humile*	X	8	X	4
Eurasian watermilfoil	***Myriophyllum spicatum***	**X**	**31**	**X**	**45**
nodding waternymph	*Najas flexilis*	X	11	X	19
brittle waternymph	***Najas minor***	**X**	**4**	**X**	**20**
small-leaved pond-lily	*Nuphar microphylla*	X	0	X	9
yellow water lily	*Nuphar variegata*	X	13	X	14
white water lily	*Nymphaea odorata*	X	18	X	22
common reed	***Phragmites australis***	**X**	**1**	**X**	**2**
water smartweed	*Polygonum amphibium*	X	4	X	12
pickerelweed	*Pontederia cordata*	X	12	X	22
large-leaf pondweed	*Potamogeton amplifolius*	X	9	X	19
snailseed pondweed	*Potamogeton bicupulatus*	X	10	X	13
ribbon-leaf pondweed	*Potamogeton epihydrus*	X	35	X	13
leafy pondweed	*Potamogeton foliosus*	X	1	X	3
floating-leaf pondweed	*Potamogeton natans*	X	3	X	1
clasping-leaf pondweed	*Potamogeton perfoliatus*	X	2		0
Robbins' pondweed	*Potamogeton robbinsii*	X	35	X	41
arrowhead	*Sagittaria* species	X	9	X	13
bur-reed	*Sparganium* species	X	12		0
great duckweed	*Spirodela polyrhiza*		0	X	4
cattail	*Typha* species	X	0		0
humped bladderwort	*Utricularia gibba*	X	1	X	8
common bladderwort	*Utricularia macrorhiza*	X	8	X	54
lesser bladderwort	*Utricularia minor*		0	X	1
purple bladderwort	*Utricularia purpurea*	X	1	X	3
floating bladderwort	*Utricularia radiata*	X	48		0
tapegrass	*Vallisneria americana*	X	65	X	59
Brazilian watermeal	*Wolffia brasiliensis*	X	1		0
Total Species Richness	39	34	32	34	34
Total native Species Richness	33	28	26	28	28
Total Invasive Species Richness	**6**	**6**	**6**	**6**	**6**

Results and Discussion

General Aquatic Plant Surveys and Transects

Our 2018 survey of Pachaug Pond found 34 plant species of which 28 were native and six were invasive (Table 1). The invasive species were fanwort, mudmat, variable-leaf watermilfoil, Eurasian watermilfoil, brittle waternymph and phragmites; the native species included a wide diversity of emergent and submergent macrophytes. Pachaug Pond contains among the greatest number of plant species found in any CAES IAPP survey with only Gardner Lake (38 species) and Upper Moodus Reservoir (37 species) supporting more. Descriptions of the invasive species are in the appendix of this report while information



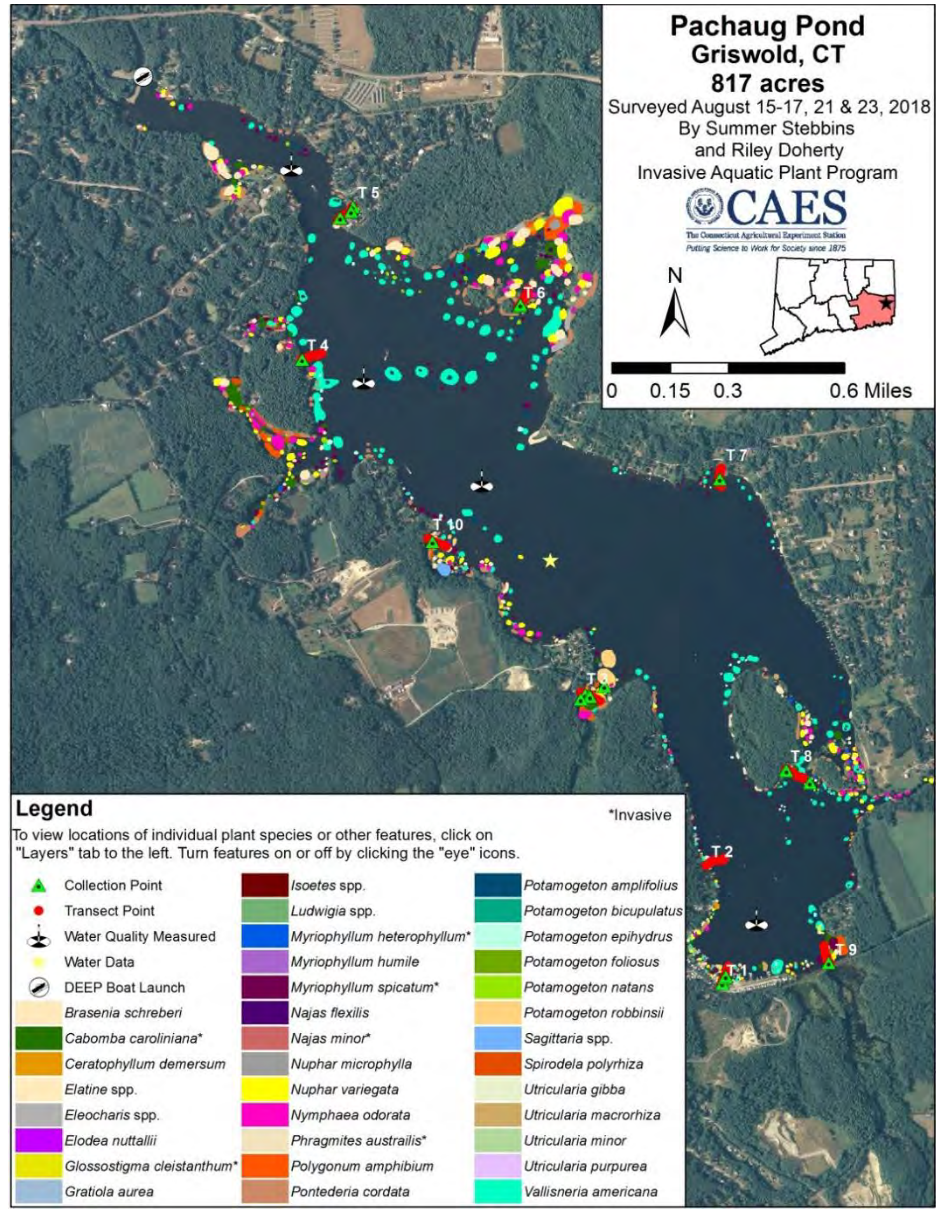


Figure 4. Aquatic plant survey of Pachaug Pond in 2017 (left) and 2018 (right).

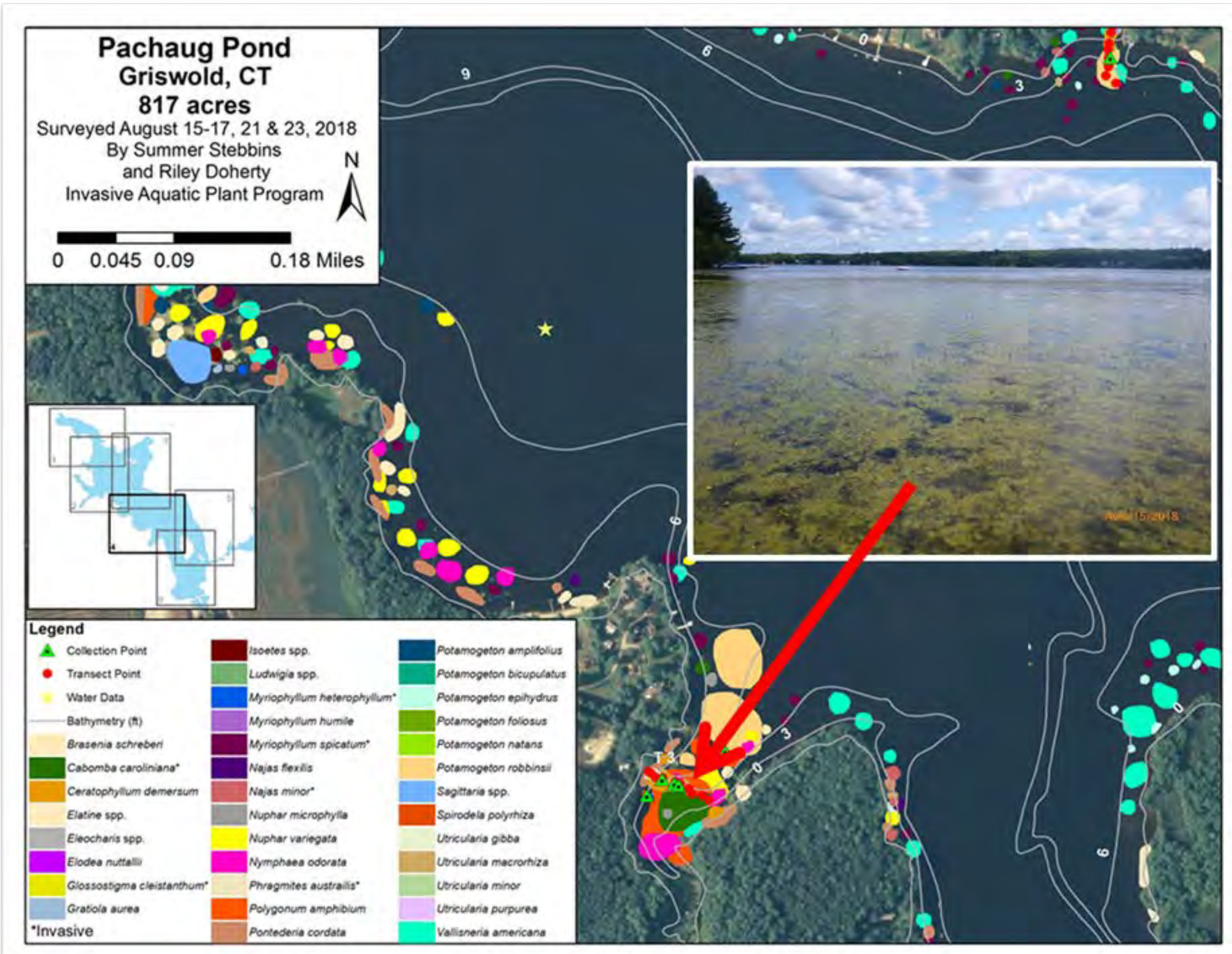


Figure 5. Nuisance aquatic plants in Pachaug Pond.

on the native species can be found at the USDA “About PLANTS” website (https://plants.usda.gov/about_plants.html). Although monostands of invasive species covered areas of the lake, areas covered by native species or invasive species mixed with native species were more common. Many of the shallow coves contained nuisance vegetation such as fanwort, water smartweed and water lilies that reached the surface. Most of the lake, however, did not have problematic vegetation reaching the surface even though it was shallow enough to support luxuriant growth. In these areas the bottom was often covered with non-nuisance eel grass and Robbin’s pondweed. Reasons for this may include the brown water coloration that limits light, infertile substrate and previous drawdowns.

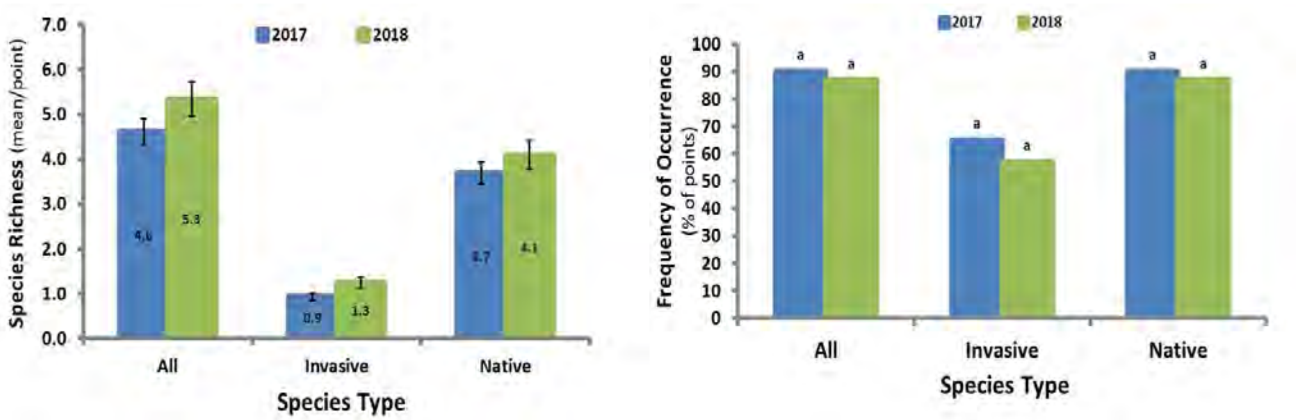


Figure 6. Species richness (left) and frequency of occurrence (right) of invasive and native plants in Pachaug Pond in 2017 and 2018.

Compared to 2017, vegetation decreased dramatically throughout the majority of the lake (Figure 4). This decrease may be a result of a lengthy winter drawdown. Specifically, large swaths of tapegrass, Robbin's pondweed, and fanwort almost disappeared completely. Vegetation was less dense in coves than in 2017, however plants still impeded recreational use. Occasionally, areas that were previously abundant with plants only had low-lying algae, charaphyte, which was found using grapple tosses and sonar (Figure 3, left).

Comparisons of our frequency of occurrence data, taken from transects points (Table1), found the most common invasive plants in 2018 were Eurasian watermilfoil (45%, 31% in 2017), fanwort (42%, 40% in 2017) and brittle waternymph (20%, 4% in 2017). The large increase of brittle waternymph is not unusual in lakes with drawdowns as the plant is an annual that reproduces drawdown resistant seeds each year. The most commonly found native plants were tapegrass (59%), common bladderwort (54%), Robbins' pondweed (41%), and watershield (30%). Our survey found a few instances where stands of aquatic plants were covered with filamentous algae, but no planktonic algal blooms were observed.

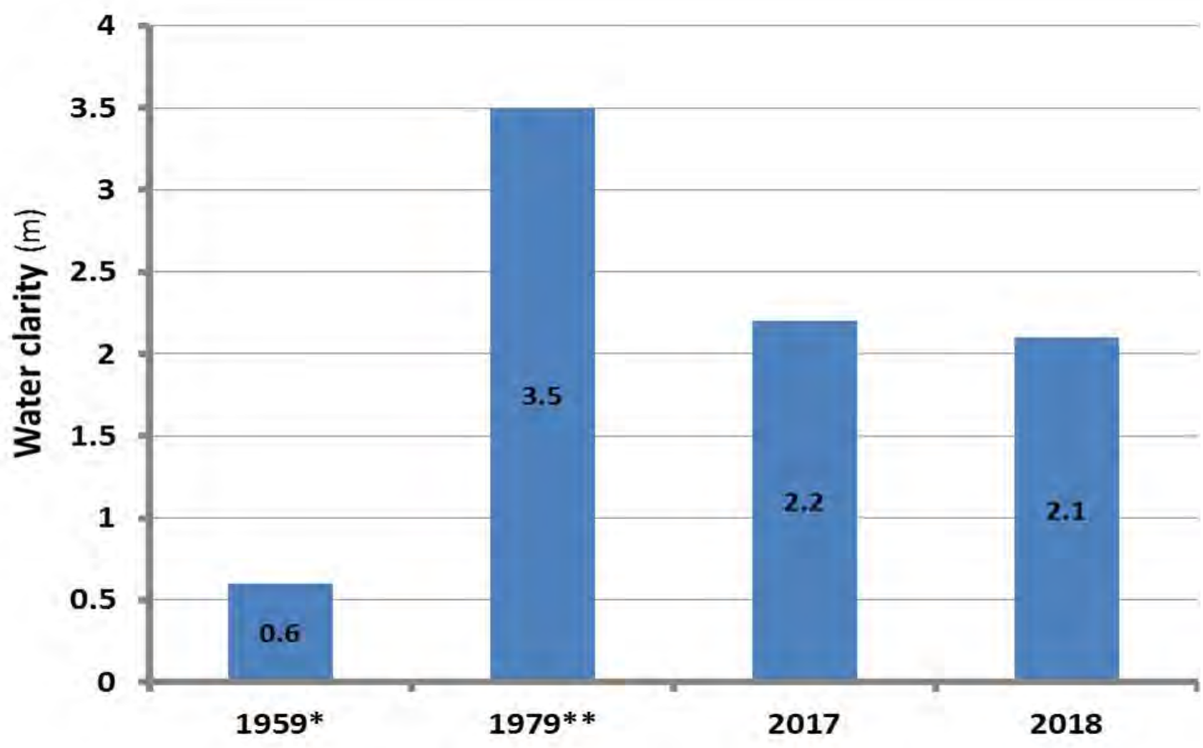


Figure 7. Water clarity in Pachaug Pond in 1959(*State Board of Fisheries and Game), 1979 (**CAES), 2017 and 2018 (CAES IAPP).

Despite our visual survey showing a large decrease in plant abundance, most of this happened in the center portion of the pond where we have no transect data. In the areas where our transects were located, much remained unchanged. Species richness as well as the frequency of occurrence remained relatively unchanged for all species, invasive species, and native species alike (Figure 6). There was no statistical difference recorded between 2017 and 2018.

Water Chemistry

Pachaug Pond had water clarity as measured with a Secchi disk of 2.1 m (7 feet) in our 2018 survey, similar to the 2.2 m recorded in 2017 (Figure 7). Measurements in 1979 found clarity to be 3.5 m (12 feet) (Frink and Norvell, 1984) while in the 1950's it was only 0.6 m (2 feet) (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

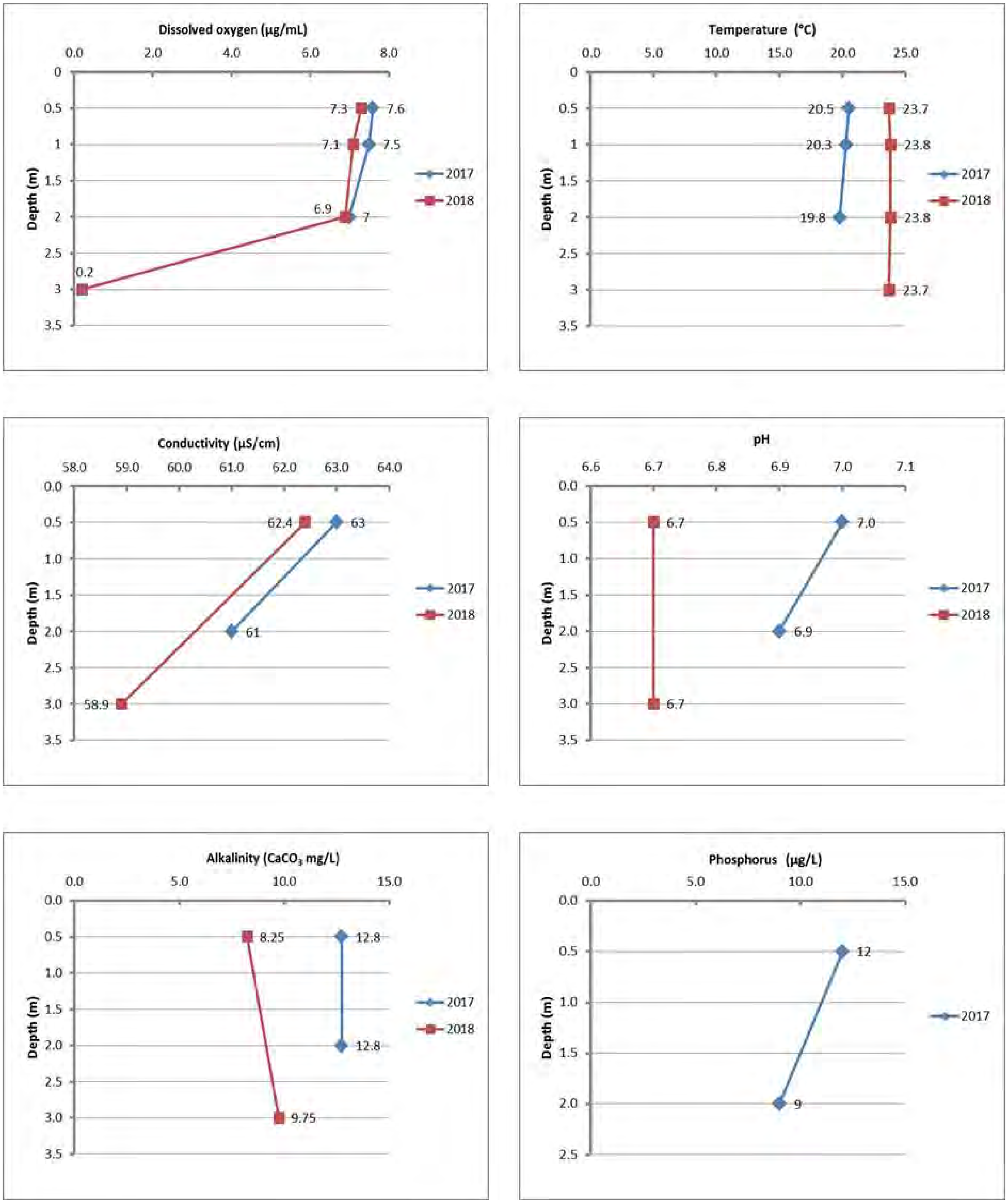


Figure 8. Water chemistry in Pachaug Pond in 2017 and 2018.

water, but these historical uses are beyond the scope of this report. Our 2018 observation was that water clarity was most limited by its brown coloration from naturally occurring organic derivatives, consistent with 2017. Water clarities in Connecticut's lakes ranged from 0.3 - 10 m (1-33 feet) with an average of 2.3 m (7 feet) (CAES IAPP, 2017). Thus, the current water clarity of Pachaug Pond is near average.

The shallow nature of Pachaug Pond resulted in little stratification in 2017 or 2018 (Figure 8). Only minor changes in the tested water parameters occurred with depth. Dissolved oxygen concentrations were high throughout the water column, and the pH was near neutral. The alkalinity of 8-13 mg/L $CaCO_3$ was low for Connecticut lakes which range from near 0 to >170 (CAES IAPP, 2017). 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 have conductivities that range from 50 -250 µS/cm. Pachaug Pond's conductivity of near 63 µS/cm ranks it among the lowest.

A key parameter used to categorize a lake's trophic state is the concentration of 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 2017 was 13 µg/L at surface and 9 µg/L near the bottom, which classifies the lake as oligo-mesotrophic. The 2018 P test had not been performed at the time of this writing.

Figure 9. Wetland plant proliferation following a winter drawdown in Candlewood Lake, Connecticut.

Analysis of the water in by CAES 1979 (Frink and Norvell, 1984) found similar P concentrations of 16 µg/L at surface and 13 µg/L near the bottom.

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, minor naiad and curlyleaf pondweed while lakes with lower values support fanwort (*Cabomba caroliniana*) and variable watermilfoil (*Myriophyllum heterophyllum*). Invasive zebra mussels (*Dreissena polymorpha*), are becoming a problem in several lakes in in western Connecticut and have similar preferences.

Aquatic vegetation management options:

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,

Figure 10. CAES IAPP preliminary testing of short-term benthic barriers in Lake Quonnipaug (left) and Bashan Lake (right).

particularly fishing, boating and swimming. Options include: water level drawdown, harvesting, herbicides, biological controls, and bottom 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. Fortunately, the lake has a dam with an outlet suitable for the technique, and it has already been employed with some possible success. Proposed dam repairs will likely cause long term drawdowns such as occurred at Bashan Lake, Moodus Reservoir and Lake Beseck. Because the lake usually remains low during the growing season, significant changes occur in the plant community with wetland plants proliferating in the former sediment and aquatic plants inhabiting areas normally too deep (Figure 9). Often these plants are invasive such as phragmites, milfoil and fanwort or often nuisance native species such as cattails and lily pads.

Herbicides can be effective in controlling unwanted aquatic vegetation. Aquatic herbicide use requires permits from the Connecticut Department of Energy and Environmental Protection (CTDEEP). Specifics on the use of aquatic herbicides in Connecticut are found in the

CTDEEP publication entitled “Nuisance Aquatic Vegetation Management: A Guidebook” (CTDEP, 2005). CAES IAPP is currently testing a new herbicide called ProcellaCOR that has the potential for improved control of watermilfoil compared to existing products.

Although efforts are underway to find biological controls for nuisance aquatic vegetation, breakthroughs have been limited. Plant eating fish, called grass carp (*Ctenopharyngodon idella*), can effectively reduce the populations of certain aquatic weeds. The introduction of grass carp into Connecticut lakes requires approval by the CTDEEP. In Connecticut, only sterile grass carp (triploid) are permitted. Introducing grass carp in Pachaug Pond could cause damage to non-target plants necessary to maintain the current fishery. CAES has worked with officials from the United Sates Department of Agriculture to find new plant pathogens and insects that control nuisance aquatic plants with little success.

Benthic barriers or “bottom blankets” are effective at eliminating nuisance vegetation in small areas such as swim zones, around docks and pioneer infestations. CAES IAPP has tested short-term placement (<30 days) of the barriers in Lake Quonnipaug and Bashan Lake (Figure 10). Season long control for Eurasian watermilfoil and fanwort was achieved. Thus, although labor intensive, benthic barriers may be able to be moved from place to place during a season for effective control.

Conclusions

Compared to 2017, Pachaug Pond showed an overall reduction in aquatic plant coverage and abundance in 2018. Thirty-four species of plants were found in each year with six being invasive. Many of the shallow coves contained nuisance vegetation such as fanwort and water smartweed that reached the surface. Most of the lake, however, did not have problematic vegetation reaching the surface even though it was shallow enough to support it. In these areas the bottom was often covered with non-nuisance eel grass and Robbin’s pondweed. Reasons for this may include brown coloration to the water that limits light, infertile substrate and previous drawdowns. Our water tests found Pachaug Pond to be relatively low in alkalinity with minimal stratification. Water clarity was limited by the water's brown coloration. The most promising aquatic plant management option is continuation of the winter drawdown. Proposed dam repairs will likely result in a long term drawdown with considerable change in the plant community.

Acknowledgments

The technical assistance of Amanda Massa, Riley Doherty, and Abigail Wiegand is gratefully acknowledged.

Funding:

This project was funded through a grant from the Pachaug Pond Weed Control Association and the United States Department of Agriculture under Hatch CONH00783.

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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.

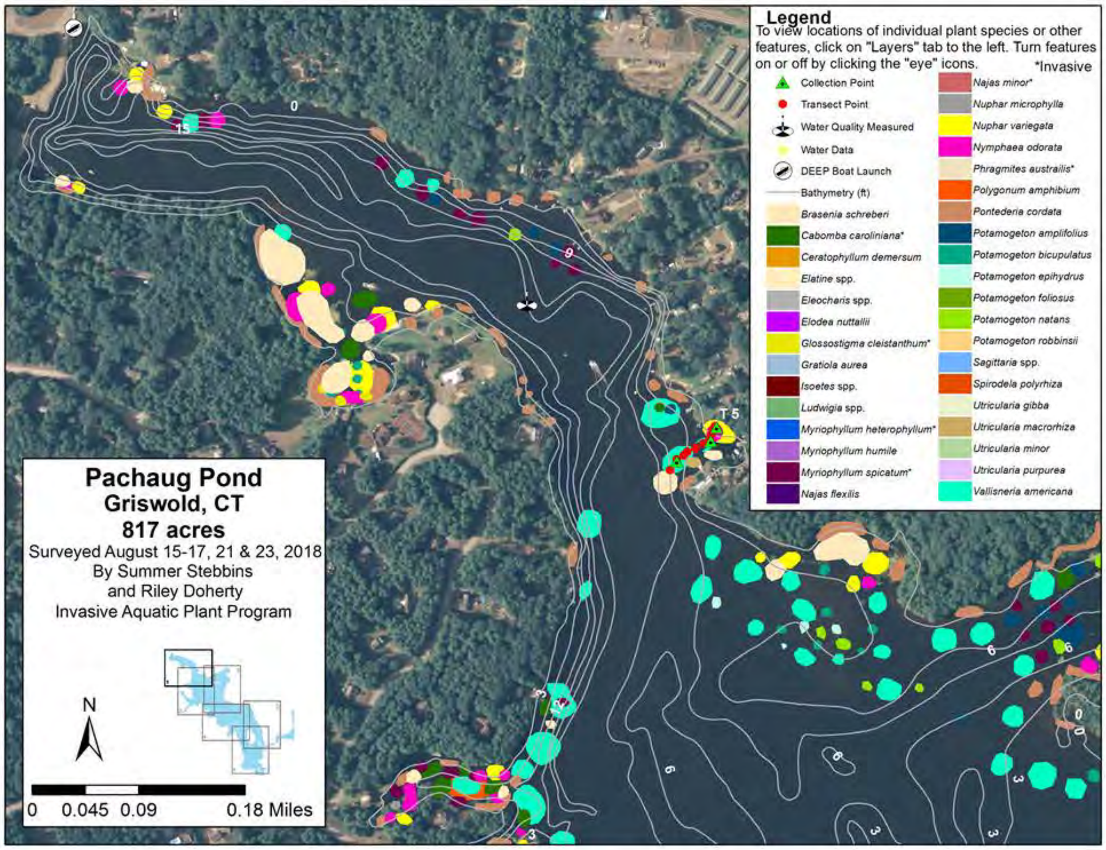
In the past, this body of water was subject to severe drawdown during late June, July and August. This drawdown took place after the game species had reproduced and did not destroy their nests or young. As a result of the drawdown, the game fish and panfish were crowded into a smaller area and the panfish 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.

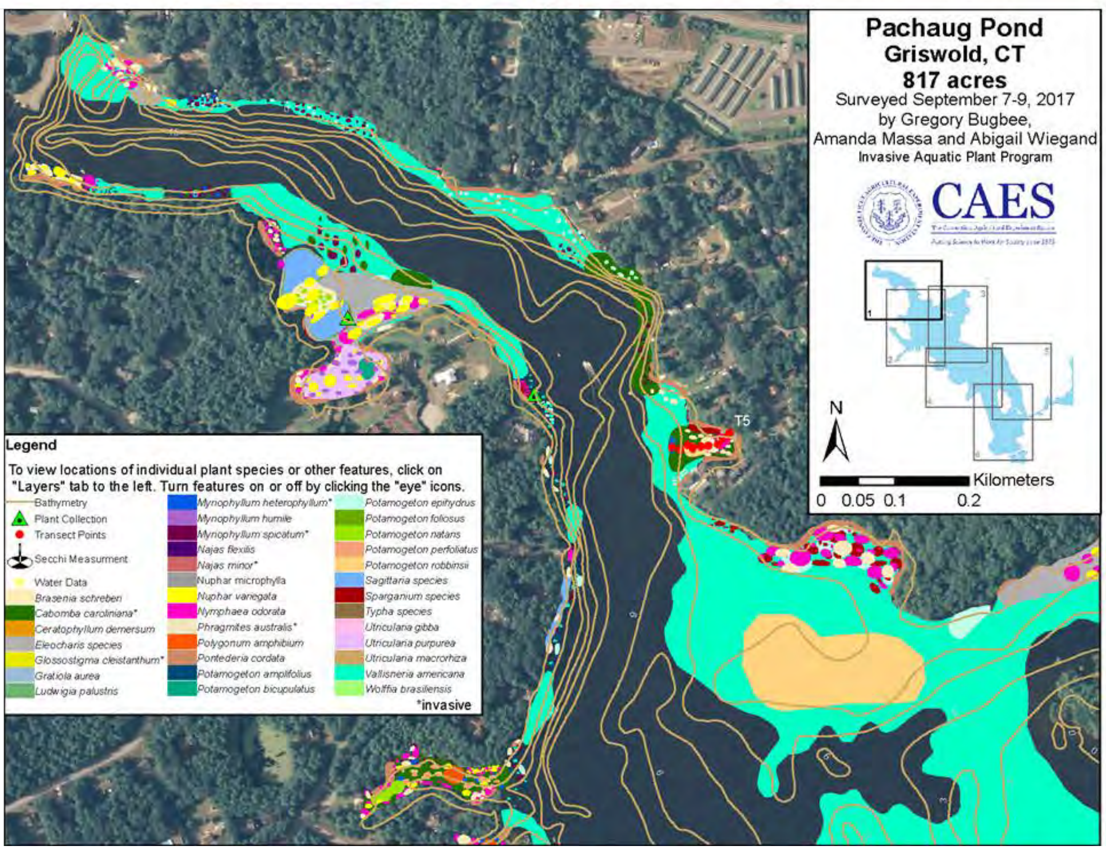
The drawdown and exposure of considerable areas of the pond bottom also allowed smartweed and other semi-terrestrial plants to grow on the exposed shoals. These terrestrial plants furnished excellent food for waterfowl and attracted large numbers of ducks during the fall shooting season.

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.

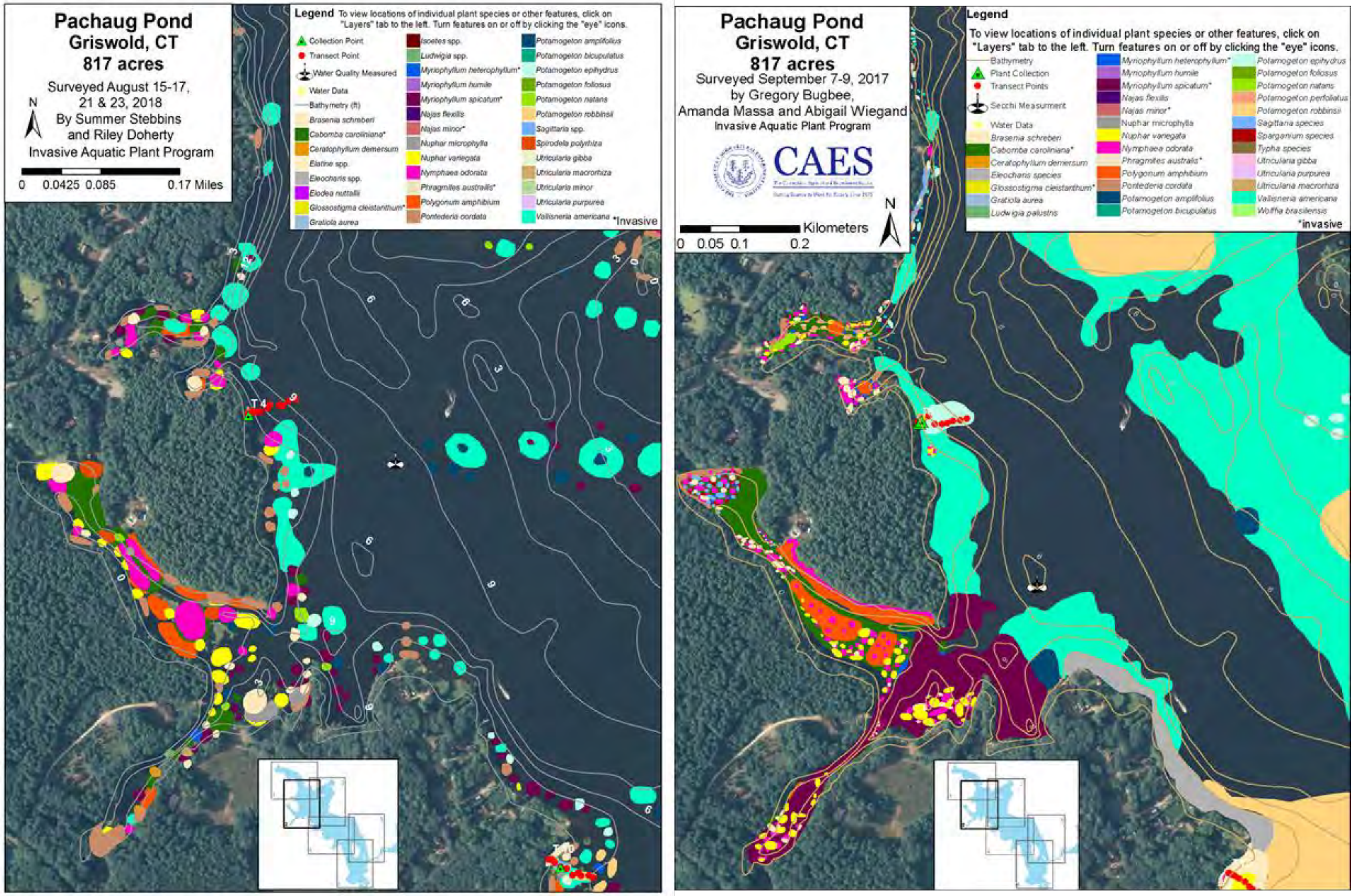
No special regulations are recommended at this time.

Aquatic Plant Survey Maps by Section

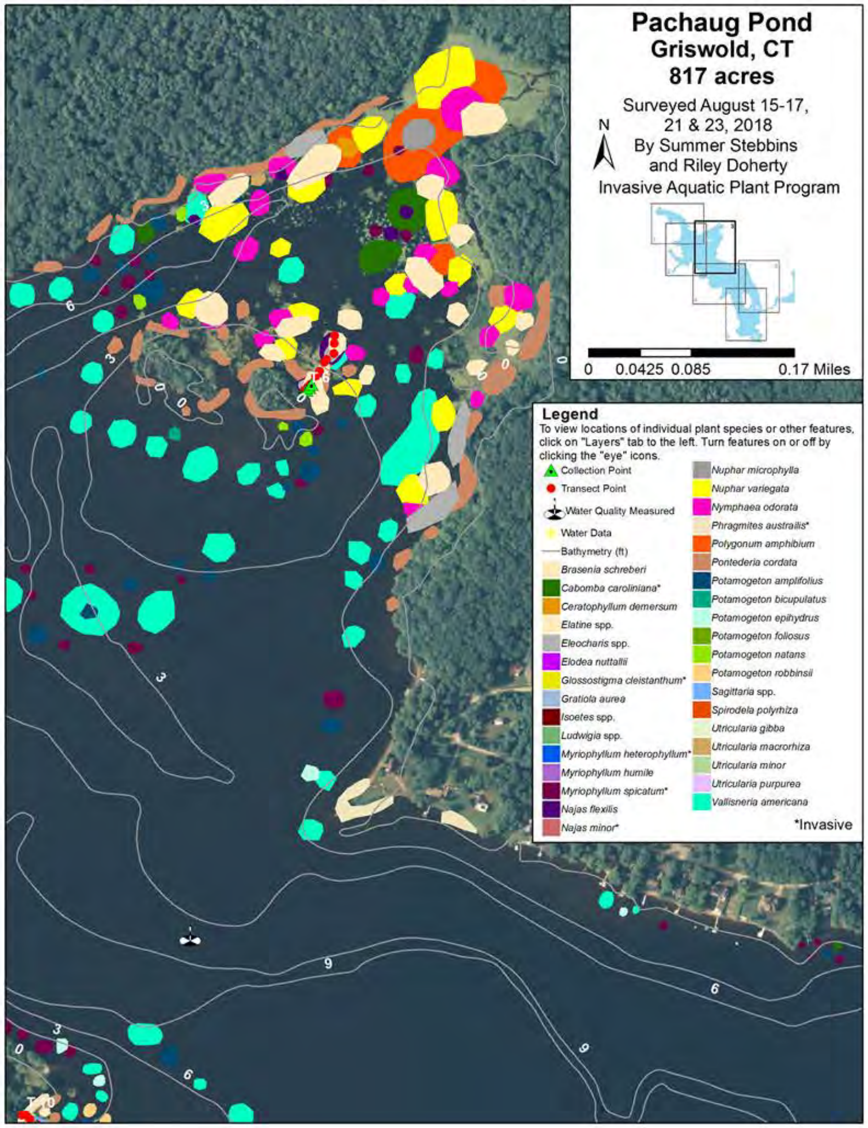


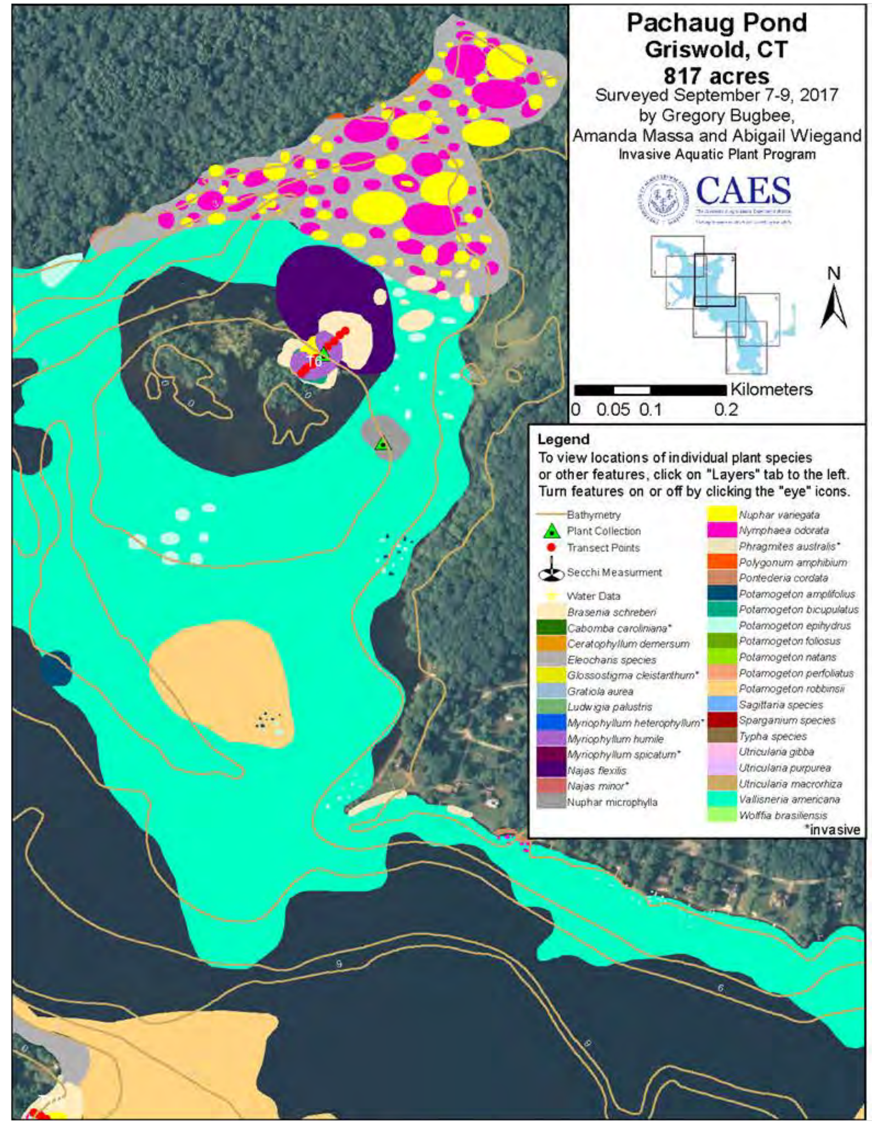


Section 1: 2018 survey of Pachaug Pond (Top), 2017 survey (Bottom).

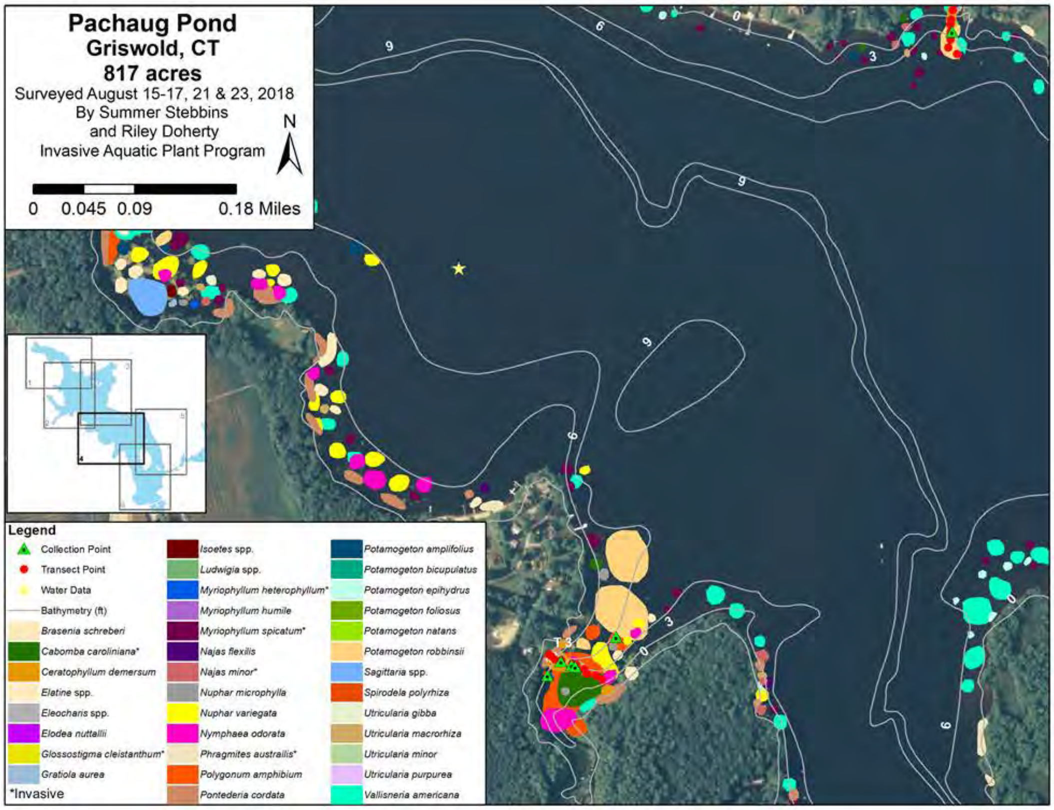


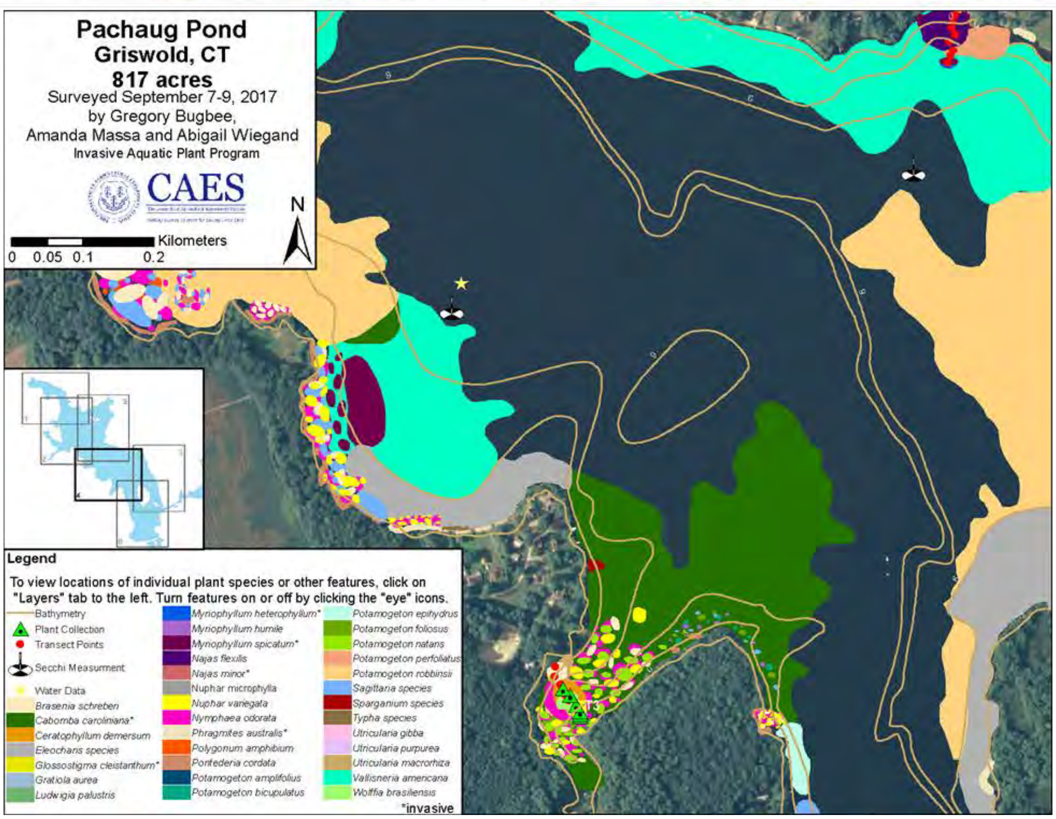
Section 2: 2018 survey of Pachaug Pond (Right), 2017 survey (Left).



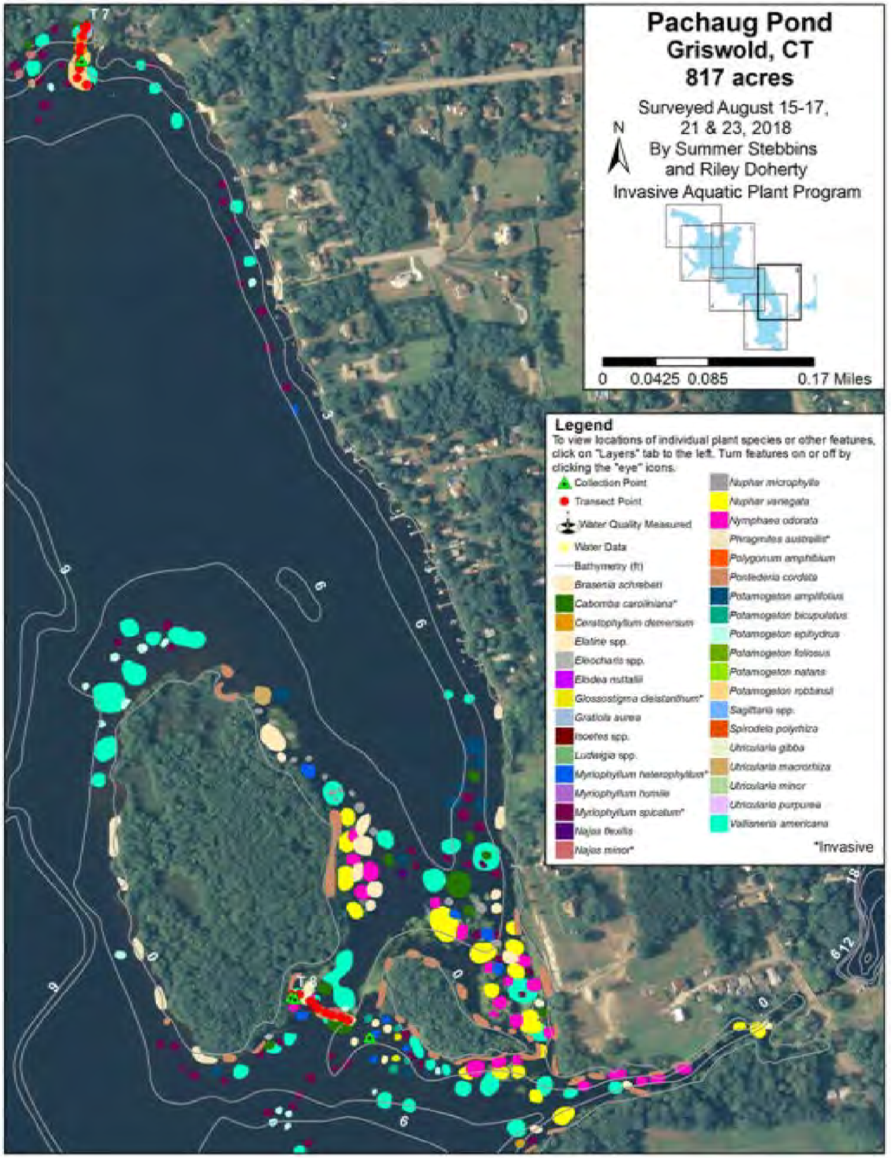


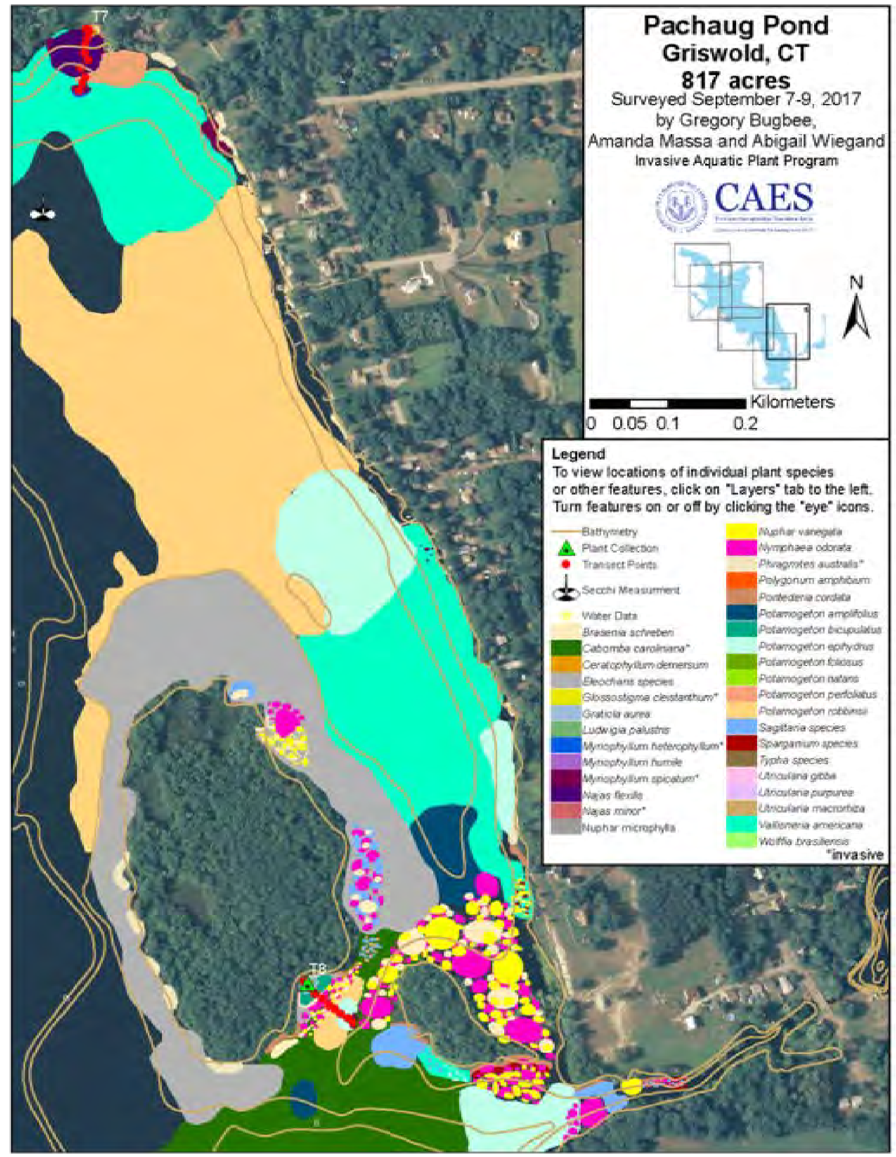
Section 3: 2018 survey of Pachaug Pond (Right), 2017 Survey (Left).



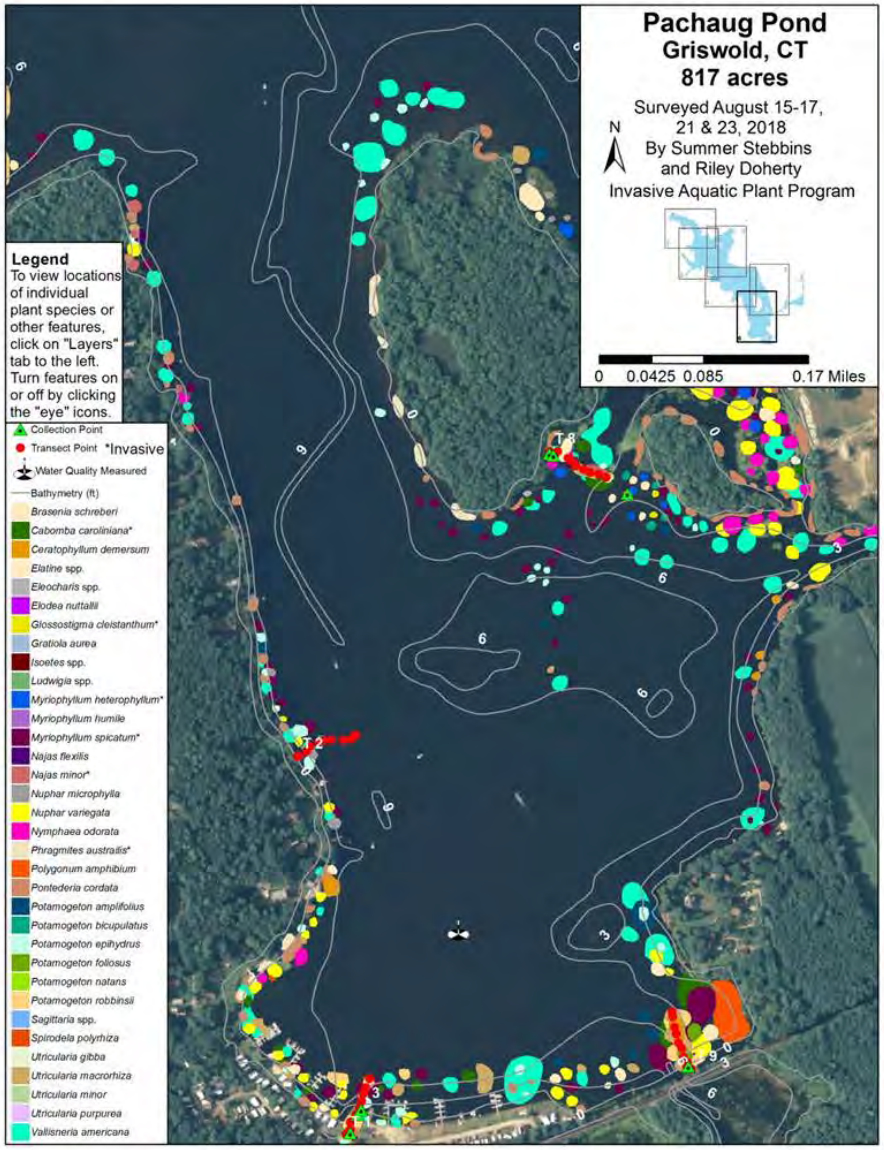


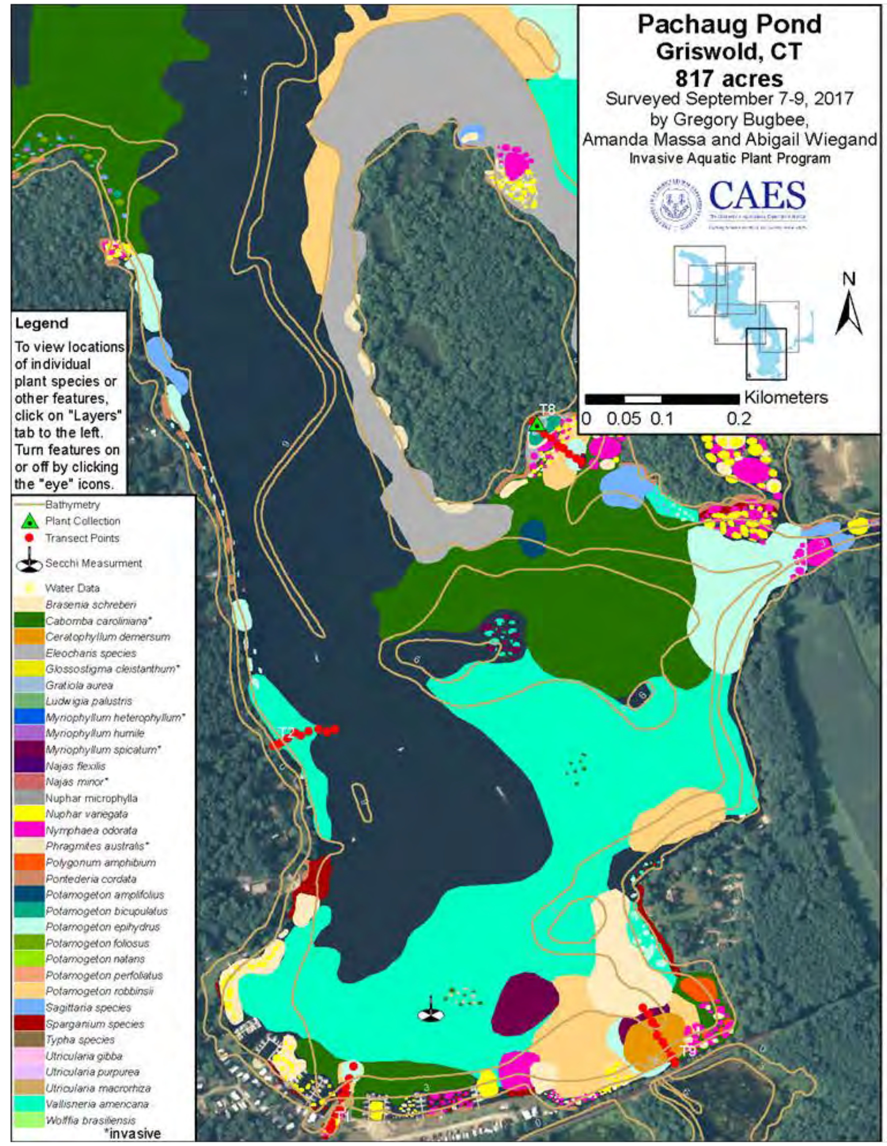
Section 4: 2018 survey of Pachaug Pond (Top), 2017 survey (Bottom).





Section 5: 2018 survey of Pachaug Pond (Right), 2017 survey (Left).





Section 6: 2018 survey of Pachaug Pond (Right), 2017 survey (Left).

Invasive Plant Descriptions

Cabomba caroliniana

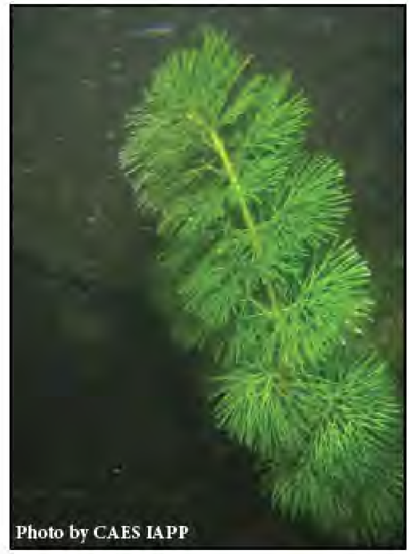
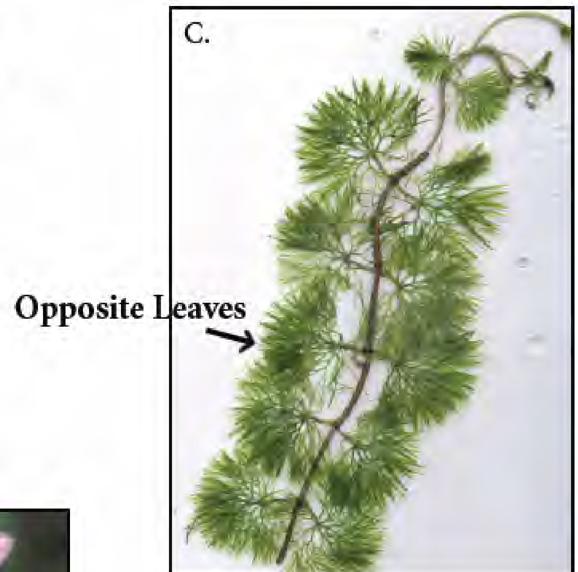


Photo by CAES IAPP

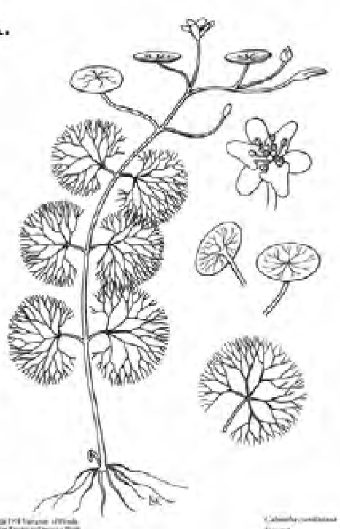
Common names:
Fanwort
Carolina fanwort

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

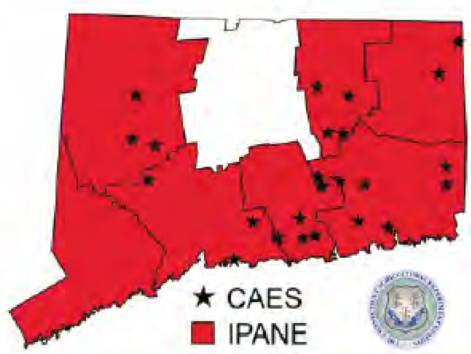
C.


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

A.


B.


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



Myriophyllum heterophyllum

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

Origin:
Southern United States

Key features:
Plants are submersed

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

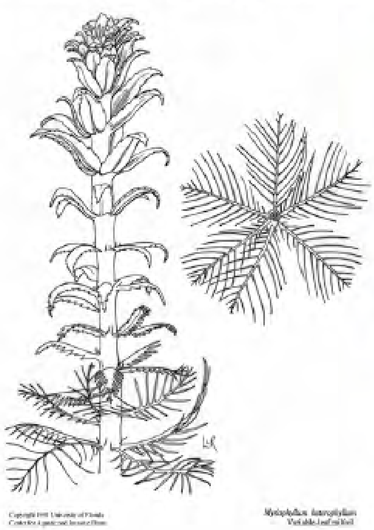
Leaves: Triangular with ≤ 11 pairs of leaflets. Leaves are dissected and whorled (4-6 leaves/whorl) resulting in a feathery appearance with leaf whorls < 1 inch apart giving it a ropy appearance

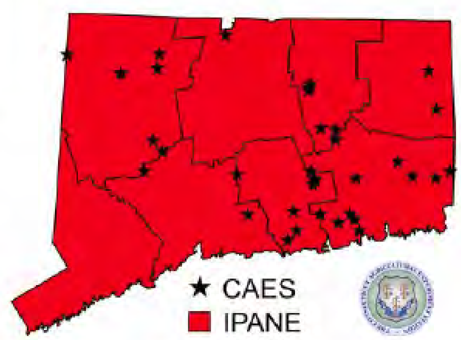
Flowers: Inflorescence spike 2-14 inches (5-35 cm) long extend beyond the water's surface with flowers in whorls of four with reddish petals

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

Reproduction: Fragmentation and seeds

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





Myriophyllum spicatum

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

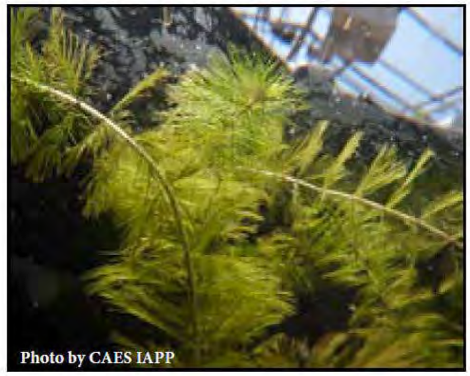


Photo by CAES IAPP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Center forAquatic and Invasive Plants

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

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

Origin:
Europe

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

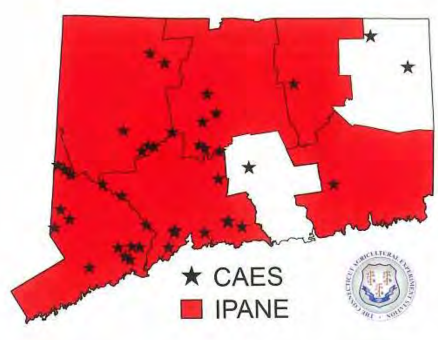
Easily confused species:
Other naiads (native): *Najas* spp.


Photo by CAES IAPP


Photo by CAES IAPP


Photos by CAES IAPP


Photo by CAES IAPP



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	GraAur	IsoSpp	LudSpp	MyrHet	MyrHum	MyrSpi	NajFle	NajMin	NupMic	NupVar	NymOdo	Phrag	PolAmp	PonCor	PotAmp	PotBic	PotEpi	PotFol	PotNat	PotRob	SagSpp	SpiPol	UtrGib	UtrMac	UtrMin	UtrPur	ValAme
1	1	0.5	Summer Stebbins	-71.90059	41.54867	8/21/2018	0.2	Bedrock	0	0	0	0	0	0	0	0	0	0	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	2	5	Summer Stebbins	-71.90056	41.54869	8/21/2018	0.5	Muck	0	0	3	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	3
1	3	10	Summer Stebbins	-71.90052	41.54873	8/21/2018	0.8	Muck	2	2	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	2	0	0	3
1	4	20	Summer Stebbins	-71.90052	41.54881	8/21/2018	1.0	Muck	0	2	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	2	0	0	0	0	3	0	0	0	2	0	0	2
1	5	30	Summer Stebbins	-71.90044	41.54890	8/21/2018	1.0	Muck	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	2	0	0	0
1	6	40	Summer Stebbins	-71.90038	41.54898	8/21/2018	1.0	Muck	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
1	7	50	Summer Stebbins	-71.90034	41.54906	8/21/2018	1.0	Muck	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	1
1	8	60	Summer Stebbins	-71.90032	41.54914	8/21/2018	1.1	Muck	0	2	0	0	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	9	70	Summer Stebbins	-71.90027	41.54922	8/21/2018	1.1	Muck	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0
1	10	80	Summer Stebbins	-71.90022	41.54932	8/21/2018	1.1	Muck	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2	1	0.5	Summer Stebbins	-71.90129	41.55312	8/23/2018	0.1	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
2	2	5	Summer Stebbins	-71.90128	41.55313	8/23/2018	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
2	3	10	Summer Stebbins	-71.90115	41.55319	8/23/2018	0.6	Sand	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2	4	20	Summer Stebbins	-71.90110	41.55324	8/23/2018	1.0	Silt	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	2
2	5	30	Summer Stebbins	-71.90096	41.55329	8/23/2018	1.6	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	2
2	6	40	Summer Stebbins	-71.90090	41.55331	8/23/2018	1.7	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	2
2	7	50	Summer Stebbins	-71.90077	41.55332	8/23/2018	1.7	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
2	8	60	Summer Stebbins	-71.90058	41.55331	8/23/2018	1.9	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
2	9	70	Summer Stebbins	-71.90045	41.55332	8/23/2018	1.9	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
2	10	80	Summer Stebbins	-71.90038	41.55337	8/23/2018	1.9	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
3	1	0.5	Summer Stebbins	-71.90742	41.55966	8/23/2018	0.1	Silt	2	2	0	0	2	0	0	0	0	2	2	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0	2	0	0	2	2	0	0	0
3	2	5	Summer Stebbins	-71.90737	41.55964	8/23/2018	0.3	Silt	2	2	2	0	0	0	0	0	0	0	2	0	2	0	0	2	0	2	0	0	2	0	2	0	0	0	2	0	0	2	2	0	0	2
3	3	10	Summer Stebbins	-71.90732	41.55960	8/23/2018	0.3	Silt	2	2	2	0	0	0	0	0	0	0	0	0	2	0	1	0	0	3	0	2	2	0	0	0	0	0	0	0	0	2	2	0	0	2
3	4	20	Summer Stebbins	-71.90721	41.55959	8/23/2018	0.6	Silt	2	2	2	0	0	0	0	0	0	0	0	0	2	0	1	0	0	3	0	3	0	2	0	0	0	0	0	0	2	2	2	0	0	2
3	5	30	Summer Stebbins	-71.90701	41.55954	8/23/2018	0.6	Silt	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	2	0	2	0	0	3	0	2	2	2	0	0	2
3	6	40	Summer Stebbins	-71.90694	41.55952	8/23/2018	0.6	Silt	0	3	2	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2	0	3	0	2	0	0	0	0	3	0	2	0	2	0	0	0
3	7	50	Summer Stebbins	-71.90682	41.55947	8/23/2018	0.6	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	2	0	2	0	0	0
3	8	60	Summer Stebbins	-71.90677	41.55941	8/23/2018	0.8	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	0	0	2	0	0	0	0	0	0	0
3	9	70	Summer Stebbins	-71.90662	41.55939	8/23/2018	1.1	Silt	0	1	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	0	0	0	0	0
3	10	80	Summer Stebbins	-71.90651	41.55933	8/23/2018	1.1	Silt	2	3	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	3	0	0	0	2	0	0	3	0	0	0	2	0	0	0
4	1	0.5	Summer Stebbins	-71.92119	41.57227	8/17/2018	0.2	Sand	0	0	0	2	0	0	2	0	2	2	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
4	2	5	Summer Stebbins	-71.92108	41.57230	8/17/2018	0.3	Sand	0	0	0	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	2
4	3	10	Summer Stebbins	-71.92102	41.57230	8/17/2018	0.4	Silt	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	2
4	4	20	Summer Stebbins	-71.92093	41.57230	8/17/2018	0.5	Silt	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
4	5	30	Summer Stebbins	-71.92078	41.57235	8/17/2018	1.2	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	6	40	Summer Stebbins	-71.92072	41.57240	8/17/2018	1.8	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
4	7	50	Summer Stebbins	-71.92053	41.57239	8/17/2018	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
4	8	60	Summer Stebbins	-71.92046	41.57239	8/17/2018	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
4	9	70	Summer Stebbins	-71.92034	41.57245	8/17/2018	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
4	10	80	Summer Stebbins	-71.92019	41.57249	8/17/2018	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
5	1	0.5	Summer Stebbins	-71.91857	41.57797	8/17/2018	0.3	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	5	Summer Stebbins	-71.91860	41.57794	8/17/2018	0.5	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	3	10	Summer Stebbins	-71.91862	41.57788	8/17/2018	0.5	Muck	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	4	20	Summer Stebbins	-71.91867	41.57781	8/17/2018	0.8	Muck	3	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5	5	30	Summer Stebbins	-71.91877	41.57776	8/17/2018	0.8	Muck	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
5	6	40	Summer Stebbins	-71.91889	41.57771	8/17/2018	0.9	Muck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	2	0	0	4
5	7	50	Summer Stebbins	-71.91902	41.57767	8/17/2018	0.9	Muck	0	0	0	0	0	0	0	0	0	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
5	8	60	Summer Stebbins	-71.91908	41.57762	8/17/2018	0.9	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	2
5	9	70	Summer Stebbins	-71.91920	41.57758	8/17/2018	0.9	Silt	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
5	10	80	Summer Stebbins	-71.91931	41.57745	8/17/2018	0.6	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	1	0	0	3

Transect	Point	Distance from Shore (m)	Surveyor	Latitude	Longitude	Date	Depth (m)	Substrate	Brasch	CabCar	CerDem	ElaSpp	EleSpp	EloNut	GloCle	GraAur	IsoSpp	LudSpp	MyrHet	MyrHum	MyrSpi	NajFle	NajMin	NupMic	NupVar	NymOdo	Phrag	PolAmp	PonCor	PotAmp	PotBic	PotEpi	PotFol	PotNat	PotRob	SagSpp	SpiPol	UtrGib	UtrMac	UtrMin	UtrPur	ValAme
6	1	0.5	Summer Stebbins	-71.91037	41.57416	8/17/2018	0.1	Silt	3	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
6	2	5	Summer Stebbins	-71.91032	41.57420	8/17/2018	0.1	Silt	3	0	0	2	3	0	0	0	0	0	0	3	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
6	3	10	Summer Stebbins	-71.91028	41.57423	8/17/2018	0.1	Silt	3	0	0	2	3	0	0	0	0	0	0	3	0	1	0	0	0	2	0	0	2	0	1	0	0	0	0	3	0	0	0	0	0	0
6	4	20	Summer Stebbins	-71.91019	41.57432	8/17/2018	0.3	Silt	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	2	0	1	0	0	0	0	0	0	0	2	0	0	2
6	5	30	Summer Stebbins	-71.91013	41.57438	8/17/2018	0.4	Silt	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	2
6	6	40	Summer Stebbins	-71.91005	41.57449	8/17/2018	0.4	Silt	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	2
6	7	50	Summer Stebbins	-71.91002	41.57453	8/17/2018	0.4	Silt	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
6	8	60	Summer Stebbins	-71.90990	41.57460	8/17/2018	0.5	Silt	3	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3
6	9	70	Summer Stebbins	-71.90989	41.57472	8/17/2018	0.5	Silt	3	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3
6	10	80	Summer Stebbins	-71.90988	41.57481	8/17/2018	0.5	Silt	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0.5	Summer Stebbins	-71.90036	41.56800	8/23/2018	0.1	Sand	0	0	0	2	2	0	2	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0
7	2	5	Summer Stebbins	-71.90032	41.56801	8/23/2018	0.2	Sand	0	0	0	0	0	0	0	0	0	2	2	0	2	2	2	0	2	0	0	0	0	0	1	0	0	0	2	2	0	0	2	0	0	2
7	3	10	Summer Stebbins	-71.90035	41.56798	8/23/2018	0.3	Sand	2	3	2	0	0	0	0	0	0	0	2	0	2	2	3	0	0	0	0	0	0	0	1	0	0	0	2	2	0	0	2	0	0	3
7	4	20	Summer Stebbins	-71.90040	41.56789	8/23/2018	0.5	Sand	0	3	2	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	3
7	5	30	Summer Stebbins	-71.90043	41.56777	8/23/2018	0.5	Sand	0	2	2	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
7	6	40	Summer Stebbins	-71.90044	41.56771	8/23/2018	0.6	Sand	0	2	2	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	2	0	0	3
7	7	50	Summer Stebbins	-71.90044	41.56761	8/23/2018	0.8	Sand	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	2
7	8	60	Summer Stebbins	-71.90045	41.56751	8/23/2018	1.0	Silt	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	2
7	9	70	Summer Stebbins	-71.90048	41.56741	8/23/2018	1.0	Silt	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	0	0	0	2	0	0	2
7	10	80	Summer Stebbins	-71.90034	41.56733	8/23/2018	1.0	Silt	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	2
8	1	0.5	Summer Stebbins	-71.89729	41.55668	8/21/2018	0.1	Gravel	0	1	0	2	0	0	3	2	0	3	0	3	0	0	2	2	2	2	0	0	2	0	2	1	0	0	2	3	0	2	2	0	0	2
8	2	5	Summer Stebbins	-71.89722	41.55665	8/21/2018	0.2	Muck	4	2	0	0	0	0	0	0	0	0	3	2	0	2	2	2	0	0	0	0	2	0	0	2	0	2	2	3	0	2	0	2	1	2
8	3	10	Summer Stebbins	-71.89717	41.55669	8/21/2018	0.4	Muck	4	2	0	0	0	0	0	0	0	0	2	0	2	0	2	2	2	2	0	0	0	0	0	2	0	0	0	0	0	3	2	0	0	2
8	4	20	Summer Stebbins	-71.89701	41.55660	8/21/2018	0.6	Muck	2	3	0	0	0	0	0	0	0	0	0	0	2	0	3	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
8	5	30	Summer Stebbins	-71.89696	41.55659	8/21/2018	0.4	Muck	0	4	0	0	0	0	0	0	0	0	2	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
8	6	40	Summer Stebbins	-71.89689	41.55651	8/21/2018	0.4	Muck	0	4	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	0	0	0	2	0	0	0
8	7	50	Summer Stebbins	-71.89677	41.55647	8/21/2018	0.9	Muck	0	0	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	2	0	0	1
8	8	60	Summer Stebbins	-71.89667	41.55643	8/21/2018	0.9	Muck	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	2
8	9	70	Summer Stebbins	-71.89653	41.55641	8/21/2018	0.7	Muck	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	2	0	0	2
8	10	80	Summer Stebbins	-71.89641	41.55637	8/21/2018	0.6	Muck	2	2	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	3
9	1	0.5	Summer Stebbins	-71.89517	41.54939	8/21/2018	0.2	Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
9	2	5	Summer Stebbins	-71.89525	41.54942	8/21/2018	0.7	Gravel	0	2	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	2	0	1	2
9	3	10	Summer Stebbins	-71.89523	41.54948	8/21/2018	1.2	Muck	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	2	0	0	1	0	2	0	0	0	2	0	0	2
9	4	20	Summer Stebbins	-71.89529	41.54954	8/21/2018	1.2	Muck	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	2	0	0	1	0	3	0	0	0	2	0	0	2
9	5	30	Summer Stebbins	-71.89532	41.54964	8/21/2018	1.2	Muck	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	2	0	0	1	0	3	0	0	0	2	0	0	0
9	6	40	Summer Stebbins	-71.89537	41.54971	8/21/2018	1.2	Muck	0	2	2	0	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	2	0	0	0
9	7	50	Summer Stebbins	-71.89540	41.54981	8/21/2018	1.2	Muck	0	2	2	0	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	2	0	0	1
9	8	60	Summer Stebbins	-71.89543	41.54989	8/21/2018	0.9	Muck	0	2	2	0	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	2	0	0	1
9	9	70	Summer Stebbins	-71.89545	41.55001	8/21/2018	0.9	Muck	0	2	2	0	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	2	0	0	1
9	10	80	Summer Stebbins	-71.89546	41.55007	8/21/2018	1.1	Muck	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	2	0	0	0	2	0	0	0
10	1	0.5	Summer Stebbins	-71.91500	41.56549	8/23/2018	0.2	Silt	3	2	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	2	2	0	3	0	2	2	0	0	0	0	0	0	2	0	0	0
10	2	5	Summer Stebbins	-71.91493	41.56549	8/23/2018	0.2	Silt	3	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	2	2	0	3	0	2	2	0	0	0	0	0	0	2	0	0	0
10	3	10	Summer Stebbins	-71.91487	41.56544	8/23/2018	0.2	Silt	3	0	0	0	2	0	2	0	2	0	0	0	0	0	0	0	0	2	0	0	2	0	2	2	0	0	0	2	0	0	2	0	0	2
10	4	20	Summer Stebbins	-71.91475	41.56538	8/23/2018	0.4	Silt	3	0	0	0	2	2	2	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0	2	2	0	0	0	2	0	0	2	0	0	2
10	5	30	Summer Stebbins	-71.91463	41.56535	8/23/2018	0.4	Silt	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	1	2	0	0	2	0	0	2
10	6	40	Summer Stebbins	-71.91451	41.56525	8/23/2018	0.7	Silt	3	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	2	0	0	0	2	0	0	2
10	7	50	Summer Stebbins	-71.91439	41.56528	8/23/2018	0.7	Silt	2	3	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2	0	2	0	2	0	0	0	0	2	0	0	0	2	0	0	2
10	8	60	Summer Stebbins	-71.91432	41.56524	8/23/2018	0.7	Silt	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	2	0	0	0	2	0	0	2
10	9	70	Summer Stebbins	-71.91417	41.56524	8/23/2018	0.7	Silt	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	3	0	0	0	2	0	0	2
10	10	80	Summer Stebbins	-71.91407	41.56521	8/23/2018	0.7	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	3	0	0	0	2	0	0	0