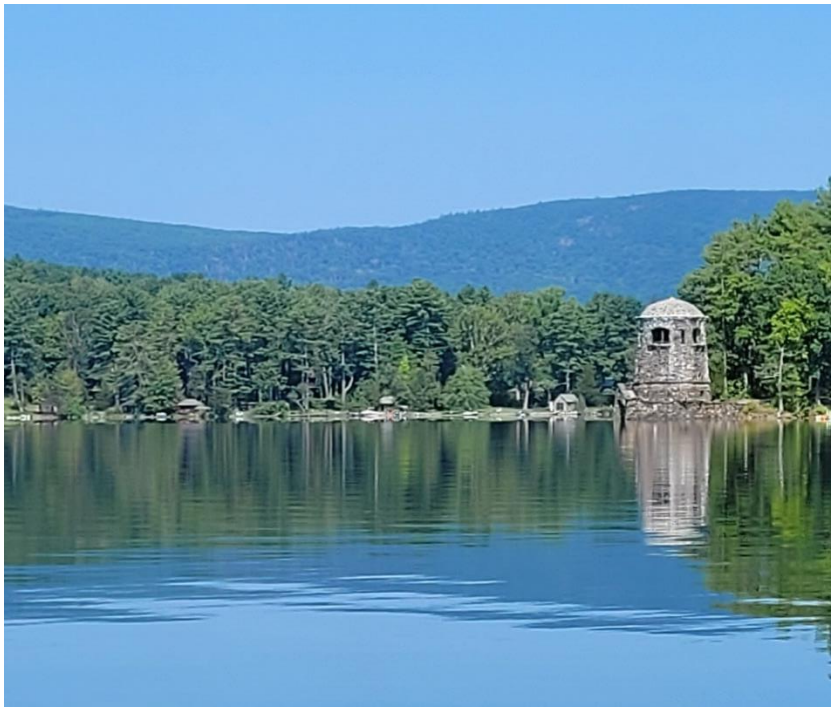
Northeast Aquatic Research

Twin Lakes
2024 Aquatic Plant Monitoring Report

Prepared for the Twin Lakes Association, Salisbury, CT



December 30th, 2024

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Executive Summary

Northeast Aquatic Research (NEAR) conducted extensive surveys of the littoral zone of Twin Lakes in 2024. Comprehensive surveys were conducted in June, July, August, September, and October, searching for invasive aquatic plants (specifically Hydrilla), protected aquatic plant species, and native species.

O'Hara's Marina, on the eastern shore of East Twin Lake, where Hydrilla was first found in June of 2023, was monitored consistently during the season.

- New growth of Hydrilla was first detected in mid-June.
- By mid-July, 70+ plants were mapped in the Marina area, consistent with locations where plants were found in 2023.
- Beds of large Hydrilla plants were found in northern East Twin Lake, within the edge with water lilies. These were more established than plants noted in the marina in 2023.
- Hydrilla is believed to have been introduced to Twin Lakes possibly three to four times, in 2023, 2021, and 2020 based on the sizes of different beds of plants.

Curly-leaf Pondweed in West and Middle Twin Lakes was treated on April 24, 2024, with the contact herbicide Diquat. Curly-leaf Pondweed plants that were treated along the southern shore of Middle Twin Lake did not respond to the herbicide. These plants were hand harvested. This area needs to be searched for regrowth in 2025.

Hydrilla in and around O'Hara's Marina was treated with three herbicides including ProcellaCOR, Fluridone (SonarOne), and Diquat. Treatments for Hydrilla control began in July and ended in October. Hydrilla along the eastern shore of East Twin Lake, north of the Marina, and in the northern extremity of East Twin Lake was treated in August and September.

Hydrilla in the Marina area was killed by the herbicides, as shown by lack of green leaves and whitening of the terminal leaves but showed attempted regrowth by sprouting small green shoots at the end of the branches in September.

Actions for 2025

A. Use Diquat to treat Curly-leaf Pondweed in early spring. Target Curly-leaf plants outside of the non-treatment area, as mapped in 2024. A significant amount of mapped Curly-leaf is within non-treatment areas. It may be possible to shrink the non-treatment area by refining the necessary setback from Water Marigold. Several steps can be taken to increase the amount of Curly-leaf that can be treated without threatening the Water Marigold:
    1. Measure the Diquat concentration outside of the treatment area to determine if the chemical spreads away from where it is applied.
    2. Treat Curly-leaf in proximity to mapped locations of minor amounts of Water Marigold in early spring to determine whether Diquat affects Water Marigold while the plants are mostly undeveloped.

3. No Water Marigold was found in West Twin Lake during the 2024 surveys. This finding should relax the concern regarding treating Curly-leaf Pondweed in that basin.

B. Eurasian Milfoil was present in more abundance later in the season during 2024. There still may not be enough to call for a ProcellaCOR treatment.
    1. Evaluate the Eurasian Milfoil in 2025 for regrowth and possible treatment.
    2. Continue to search for Northern Milfoil.

C. Perform a partial lake Fluridone treatment in the east bay of East Twin Lake.
    1. A significant amount of Hydrilla was found via SCUBA in 2024 in water between 3 and 18 feet, requiring the treatment efforts to shift from spot treatment used in 2024, to whole lake treatment in 2025.
    2. The Hydrilla beds in the northern portion of East Twin should be fully delineated and treated with direct application of Fluridone pellets.
    3. Extend the deeper water search for Hydrilla via SCUBA to both areas south of the Marina and across the east bay from the Marina heading west.

D. The whole lake needs to be diligently surveyed for the presence of Hydrilla during 2025, as was done in 2024.
    1. All locations where Hydrilla plants were documented by boat in 2024 should be studied in 2025 for possible regrowth.
    2. During this survey, all areas of prior reported presence of protected species need to be rigorously searched.
    3. Extend the search for protected pondweeds in Middle Twin.

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Introduction

Twin Lakes, in Salisbury CT, is one of the largest lakes in Connecticut at 846 acres. The lake consists of three connected water bodies: 569-acre East Twin Lake, 177-acre Middle Twin Lake, and 100-acre West Twin Lake. This report considers Middle Twin to be a separate water body distinct from West Twin; in many prior reports by other authors, Middle Twin and West Twin are considered one water body. East Twin Lake is deepest, with a maximum depth of 78 feet and a mean depth[1] of 35 feet. East Twin Lake also has the largest littoral zone (area where aquatic plants can grow) of the three basins at 220 acres. Middle Twin Lake is much shallower, with a maximum depth of 25 feet and a mean depth of 8.8 feet, and a littoral zone of 147 acres. West Twin Lake is the shallowest, with a maximum depth of 10 feet and a mean depth of 4.7 feet. West Twin is all littoral zone, with no water that is too deep to support rooted aquatic plants. Together, the three lakes have a total area of 467 acres where aquatic plants can grow.

To-date, Hydrilla (*Hydrilla verticillata*) has only been found in the eastern bay of East Twin Lake. East Twin Lake is composed of two large bays separated by a long island/causeway that splits the lake into an east and west bay. O'Hara's Marina, located on the eastern shore of the east bay, is where Hydrilla was initially found in June of 2023. The marina consists of a network of boat docks that enclose approximately 4 acres of shallow water along the eastern shore. The maximum water depth along the outer row of docks is approximately 5-6 feet. Hydrilla has been found north of the Marina but not south.

South of the Marina, the littoral zone is narrow, extending no more than 20 feet from shore, with a mostly rocky shoreline. There are few aquatic plant beds that produce topped out leaves. North of the Marina, the littoral zone is broad, with several large shallow areas of <10 feet with dense aquatic plant beds. Docks, beaches, and shallow water use areas line the eastern shore between the Marina and the State of CT car-top boat launch, approximately 1,500 feet north of the Marina. The entire north shore from the car-top boat launch, to the causeway, and to the island, roughly 2,700 feet, is a transition zone between uplands and wetlands. This zone includes red maple and alder; shallow emergents, such as sedge and bulrush; and floating-leaved plants, such white and yellow waterlilies. The waterlily beds are crowded with topped-out aquatic plants such as pondweeds, and crowfoot. The final part of the zone is dense with submersed plants such as Elodea and Bladderwort. The western side of the east bay has a narrow littoral zone dominated by Chara, mostly lacking any other aquatic plants.

No Hydrilla could be found in early June. In early July, 73 distinct Hydrilla plants had sprouted from last year's growth in the Marina area. These plants differed from plants noted in 2023 by having many more branches and runner sprouts, that is, plants that sprout next to the original plant. Surveys on the North Bay revealed a cluster of 12-15 very large plants in the north bay, growing along the outer edge of Water Lily beds. These plants were several feet tall. In early August, three large plants were found roughly 200 to 300 feet outside of the Marina dock network, within a vector pointing toward the

[1] The mean depth is a derived value obtained by dividing the lake volume by the lake surface area and represents the depth the lake would be if the basin was a box with straight sides and a flat bottom.

southern point of the island. This is the navigation route taken to access the western bay of East Twin and the connection to Middle and West Twin Lake. In late August, a SCUBA survey of the deep littoral zone along the eastern shore from the Marina to the northern cluster revealed 20x plants growing between 4 and 22 feet.

The 2024 NEAR surveys found three secondary invasive aquatic plant species: Eurasian Milfoil (*Myriophyllum spicatum)*, Curly-leaf Pondweed (*Potamogeton crispus),* and Brittle Naiad (*Najas minor*). The Watercress (*Nasturtium officinale*) found in the O'Hara's Marina area in 2023 did not come back in 2024.

Our 2024 surveys also documented the state-listed protected Hardstem Bulrush (*Schoenoplectus acutus*), Water Marigold (*Bidens beckii)*, and a new protected species, Flat-stalked Pondweed (*Potamogeton friesii*) We attempted to access the historical location of Small Bur-reed but were unable to do so by boat, suggesting that this species is outside any potential impacts from management of submersed plants in the lakes. The remaining two known protected species in the lake; Straight-leaved Pondweed (*Potamogeton strictifolius)* and Northern Milfoil (*Myriophyllum sibiricum)*, still elude our searching, although the finding of *P. friesii* in Middle Twin Lake is indication of suitable habitat for additional searching for *P. strictifolius* in 2025,

Curly-leaf Pondweed in West and Middle Twin Lakes was treated on April 24, 2024, with the contact herbicide Diquat. Limited testing of Diquat concentrations was conducted to determine the drift of the herbicide into areas with known beds of the protected species Water Marigold.

Hydrilla in and around O'Hara's Marina was treated with three herbicides including ProcellaCOR, Fluridone, and Diquat. Treatments for Hydrilla control began in July and ended in October. Hydrilla in the marina area began to die in September as evidenced by a lack of green leaves and whitening of the terminal leaves but showed attempted regrowth by sprouting small green shoots at the end of the branches.

2024 Survey Results

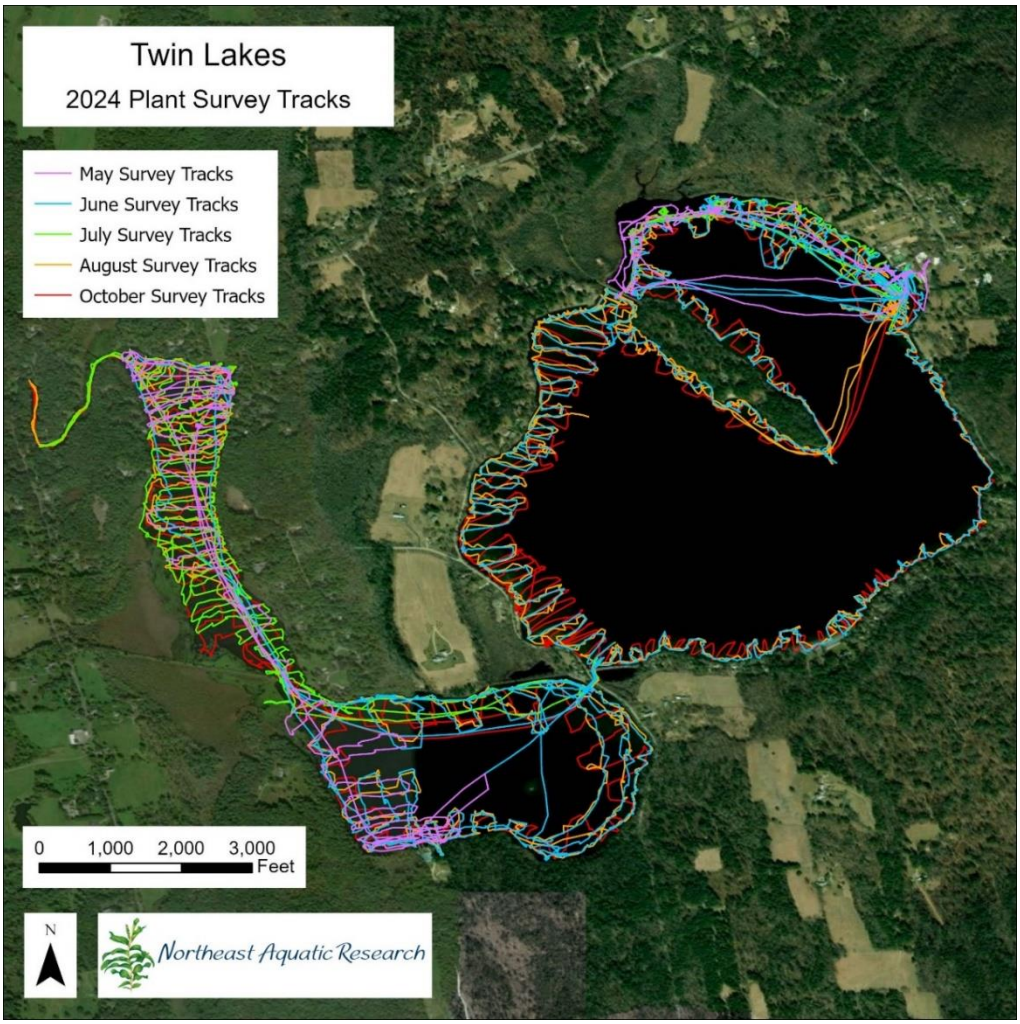
Survey Overview

Northeast Aquatic Research (NEAR) conducted several surveys of the aquatic plants in the Twin Lakes system during 2024 (**Map 1**). Aquatic plant surveys provide required surveillance of Hydrilla, secondary invasives, protected species, and overall condition of the native plant community.

- April 29th – Initial scan for curly leaf pondweed in Middle and West Twin Lakes.
- June 2nd – Recheck on curly leaf pondweeds beds after treatment.
- June 24th, 25th, 26th, 27th, July 1st, and July 2nd – Whole-lake survey, comprehensive across the whole littoral zone of all three basins, with 877 waypoints used to collect specific plant data.
- July 8th – Hydrilla search along the east shore of East Twin Lake.
- July 18th – Hydrilla search in northern end of East Twin Lake.

- July 30th – Water Marigold search in the northern end of East Twin Lake and the north shore of Middle Twin Lake.
- August 5th – Hydrilla search of the northeastern shoreline of East Twin Lake and along the east, north, and west shorelines of the west bay of East Twin.
- August 21st, 22nd, 23rd, 26th, 27th, & 29th – Whole Lake survey, comprehensive across the whole littoral zone of all three basins, with 782 waypoints used to collect specific plant data.
- August 26th, August 28th – SCUBA survey for Hydrilla along the 10-foot contour of eastern East Twin Lake.
- October 1st, 2nd, 4th, 10th, 15th & 16th – Whole Lake survey, comprehensive across the whole littoral zone of all three basins, with 546 waypoints used to collect specific plant data.
- October 22nd – Follow-up SCUBA survey for Hydrilla.

Map 1. Voyage tracks from NEAR's 2024 aquatic plant surveys.



Survey Details

April 29th – On this date, NEAR searched specifically for Curly-leaf Pondweed in Middle and West Twin Lakes. Few other species were observed: Large-leaf pondweed, Chara, and northern *Elodea nuttallii*.

In addition to searching for Curly-leaf Pondweed, we also looked for Hydrilla in areas where it was noted in O'Hara's Marina and the northern reaches of East Twin in 2023. No Hydrilla was found in either area although the protected species Water Marigold was found in northern East Twin as dormant overwintering stalks of about 5 inches long with no new green growth.

June 3rd – We rechecked all areas of Curly-leaf Pondweed that were treated with Diquat in April. No Curly-leaf Pondweed was found in West Twin, however significant growths of Curly-leaf Pondweed were found along the southern shore of Middle Twin Lake. These plants were not impacted by the herbicide treatment. Because these plants were robust, topped out, and in the process of forming turions, the decision was made to have them removed by hand.

June 24th through July 2nd – Over the course of 6 days, we diligently searched the littoral zone of the lake to catalog the aquatic plant population in the three basins. During this survey, we made 877 waypoints to generate a data set on the aquatic plant species distribution, abundance, and density in the combined Twin Lakes basins. These surveys involve stopping the boat, making a GPS waypoint, measuring water depth, and recording the density and growth form of all aquatic plants at that location. During this survey, we found 46 species of aquatic plants, 8 species more than the full survey conducted around this time in 2023 when 38 aquatic plant species were found. During this survey, we found the invasive species Eurasian Milfoil, at low frequency and Curly-leaf Pondweed, as well as the State of Connecticut threatened species Hard-stem Bulrush and special concern species Water Marigold. It was during this survey that we attempted to access the site where the historical location of Small Bur-reed was documented. The vegetation was thick, and we were unable to get to the site in this way. Based on the exclusiveness of that site, we believe that herbicides applied to the waters of Middle or West Twin will not penetrate the dense vegetation to where that plant was found. During this survey, we found the protected species *Potamogeton friesii* in Middle Twin Lake. We also found suspicious plants that could be *Potamogeton strictifolius*, but we could not verify the identification.

July 8th and July 18th – On these two days, the eastern basin of East Twin was searched for Hydrilla plants. All locations where Hydrilla had been noted in 2023 were investigated. Extensive new searching was conducted in the northern part of the East Twin basin for hidden Hydrilla plants that were growing under lily pads. Large beds of plants were discovered in the northern shallows (4-6feet) growing inside the water lily beds. Several new plants were discovered at the CT DEEP public boat ramp, indicating a new introduction in 2024.

July 30th – The *Bidens beckii* beds in northern East Twin Lake were surveyed to determine the extent of distribution and the general overall density of this species. The *Bidens* was found to grow inside a specific depth zone of between 1.5 and 3.4 feet, although isolated plants have been found as deep as 9 feet. No Water Marigold was found deeper than about 10 feet. We were able to locate Water

Marigold in shallower water, growing inside the dense water lily beds, but not as consistently as the band just outside the lilies. All areas along the band were dense and nearly at 100% cover.

August 5th – On this day we investigated the state of growth of all known Hydrilla plants. Plants were found to have grown significantly since the surveys in July, often doubling the coverage and the amount of foliage.

August 21st through August 29th – Over the course of 6 days, the whole littoral zone of the three basins was surveyed again. This survey consisted of 782 waypoints, with 34 species of aquatic plants found, including three invasive species: Hydrilla, Eurasian Milfoil, and Brittle Naiad. No Hydrilla was found outside of the eastern side of East Twin Lake, however three large beds of Hydrilla were found outside of the entrance to the marina in 4-5 feet of water. The protected species Hardstem Bulrush and Water Marigold were also found.

August 26th, 27th, and 28th – On these three dates, the eastern side of East Twin Lake was surveyed using SCUBA. The search involved swimming the 10-foot contour and searching for Hydrilla growing between roughly 5 and 30 feet. The search started offshore of the marina and ended at the northern end of the lake. Hydrilla was found at 30 locations in water depths ranging from 5 to 18 feet. One plant was found at a depth of 22 feet, but this plant was not rooted. Overall, most findings were of single small but rooted plants, however several moderate to large patches were also discovered. These findings indicate that the treatment of Hydrilla is no longer limited to spot treating the known beds in the marina and at the extreme north end. Going forward, all treatment plans must consider that Hydrilla can be anywhere in the eastern basin of East Twin Lake. Survey plans for 2025 include an extended search for Hydrilla in deeper water, including water to the south of the marina and on the western side of East Twin Lake.

October 6th through October 16th – This was the third of the whole lake surveys of the three basins. Over the course of 6 days, a total of 39 aquatic plant species were found. Two invasive plants were found, Hydrilla, and Eurasian milfoil, while the same two protected species were found, Hardstem Bulrush and Water Marigold.

October 22nd – On this date, a follow-up SCUBA survey was attempted. It was cut short because the bottom was covered with precipitated marl, making it difficult to see plants on the bottom. A decision was made to discontinue the search because of the poor conditions and resume the following summer.

Species Summaries

Hydrilla (Hydrilla verticillata)

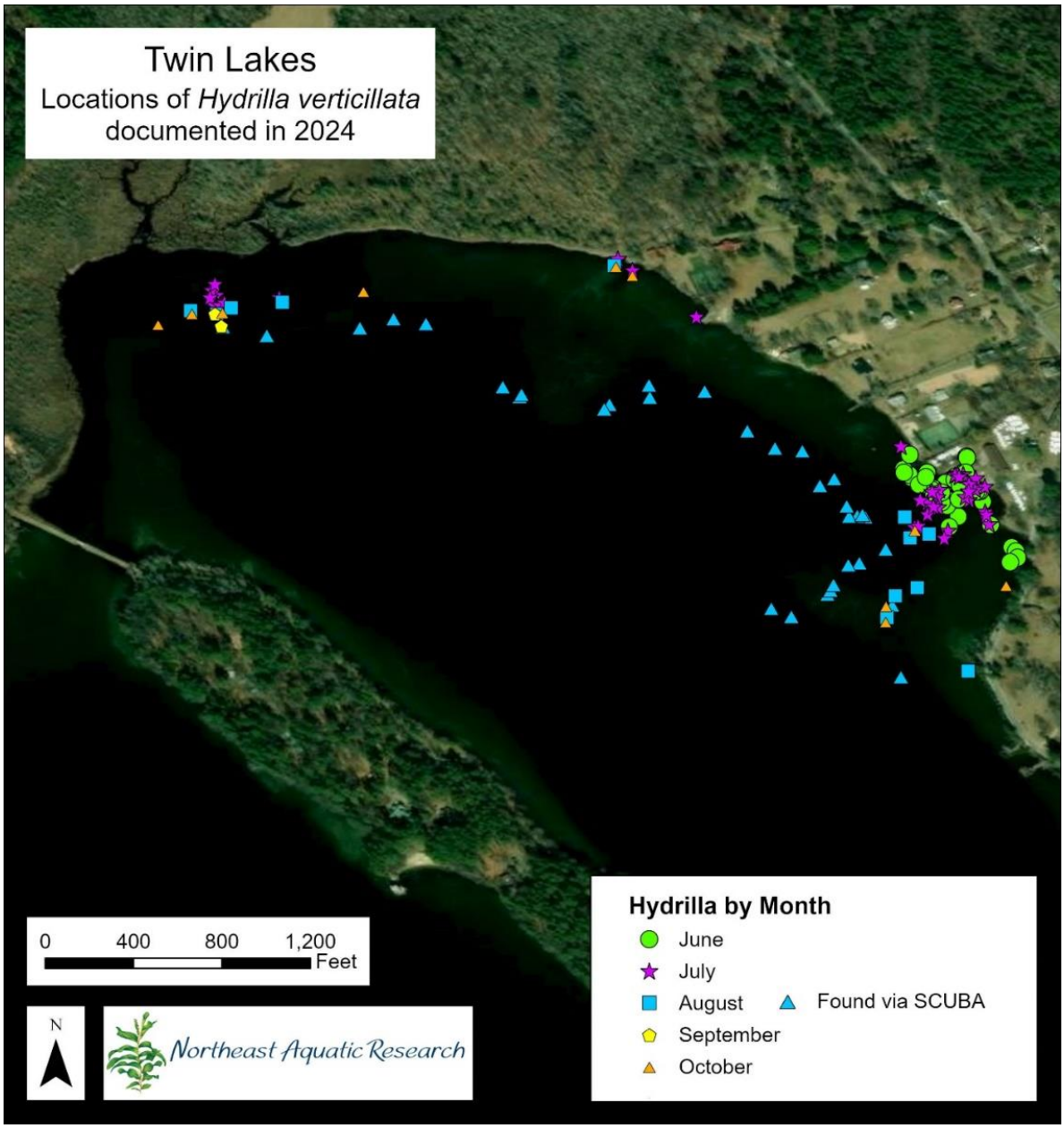
Locations where Hydrilla has been found in East Twin are shown in **Map 2**. The map shows a large cluster of green circles and purple stars as the new growth in the Marina area recorded in late June and early July. Roughly 90% of the plants in the marina area are considered to be third year growth, with 10% fourth year growth, suggesting that most plants in the marina are fragments of an initial plant brought to the lake in 2022. The remaining 10% is represented by a small 30x30 foot bed of dense plants that is likely from an invasion in 2021. The 70+ plants that were noted at this time are the product of that initial invasion. The map shows additional July sightings (purple stars) in the northern end of the lake. These plants were large, consisting of multi-branched shoots that reached the surface with topped-out growth. All were either along the edge of water lilies or within the lily bed. We estimate these plants to be associated with the 2021 invasion.

Plants found in August (blue squares) were large plants found in deeper water of between 4 and 8 feet. These plants were within dense beds of native plants, only becoming noticeable when they became larger than the natives. We estimate these plants to be associated with the 2022 invasion. Several more plants were documented in September and October, both at the northern end and offshore of the Marina.

Plants were consistently found at the location of the car-top launch (1,500 feet north of the Marina). Plants were found here in July, August, and October. Plants were also found in this location in 2023. We believe that Hydrilla was introduced here in both 2023 and 2024.

The map also shows locations of plants found via SCUBA in August (blue triangles). Plants show a general spread northward and westward from the Marina. The SCUBA survey was a critical component of our search for Hydrilla in Twin Lakes. Prior to this survey, only plants that were visible by boat were found. The process of searching in deep water by boat is laborious and not very efficient. Plants found via SCUBA were spaced widely apart, often many yards between growing plants. Plants were in different stages of growth between resting shoots not yet rooted, to large multi-stemmed clumps of plants that were 2-3 feet tall. The large plants found in 2024 may have been from fragments transported last year, in 2023. The remaining littoral zone of East Twin Lake will be investigated by SCUBA in 2025. If plants are found along the western shore of East Twin Lake, deeper water in Middle Twin will also be investigated.

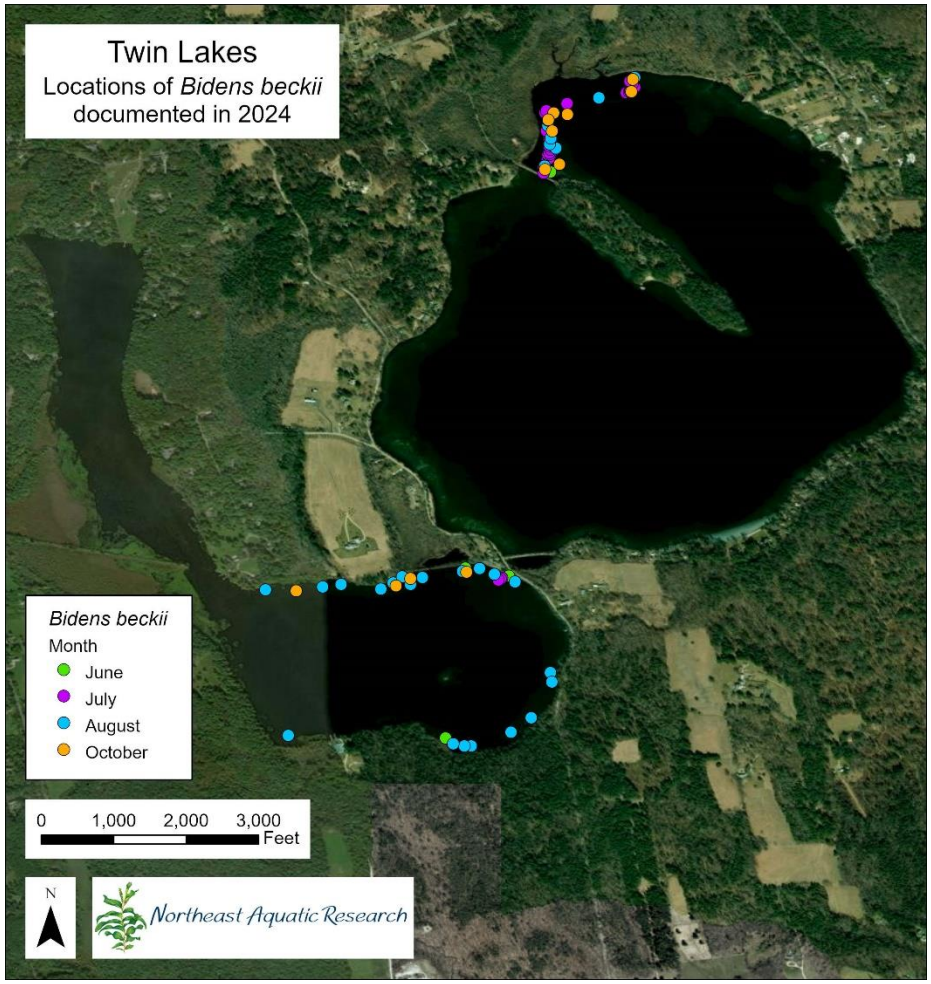
Map 2. All Hydrilla locations from NEAR surveys in 2024.



Water Marigold (*Bidens beckii*)

Water marigold has been thoroughly mapped in the northern end of East Twin Lake and the northern shore of Middle Twin Lake (**Map 3**). Water Marigold along the east and south shore of Middle Twin Lake is less conclusively mapped. The Water Marigold in East Twin Lake and the northern shore of Middle Twin Lake have been found to occupy a specific water depth range of between 1.5 and 3.5 feet. Plants have been found deeper but the dense contiguous beds along both shores was generally found within that depth range. Water Marigold was found to overwinter as short stems of 5-6 inches that lay on the bottom. Plants begin putting on new growth in June and reach maximum biomass in September. Water Marigold was found sporadically along the south shore of Middle Twin, but very little was found along the west shore of Middle Twin.

Map 3. Water Marigold (*Bidens beckii*) in East and Middle Twin Lake during surveys in 2024



Hardstem Bulrush (*Schoenoplectus acutus*)

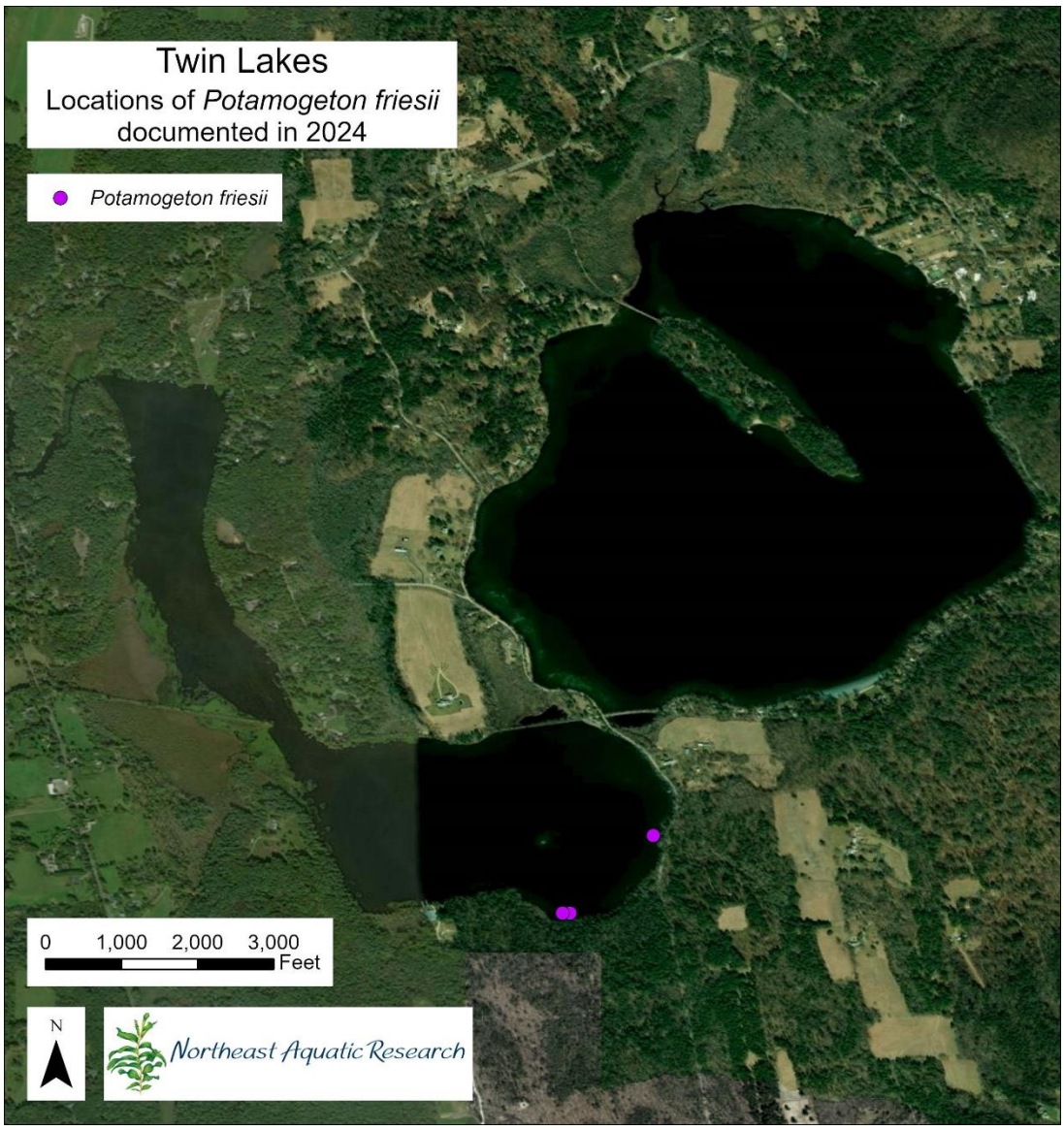
Hardstem bullrush has been well documented along the northern and western shores of East Twin Lake and in West Twin Lake (**Map 4**). There is a large, dense stand of Hardstem Bulrush along the eastern shore of East Twin Lake. Other locations shown in Map 4 are small beds, rarely larger than 50 feet.

Map 4. Hardstem Bulrush *Schoenoplectus acutus* in Twin Lakes during surveys in 2024

Flat-stalked Pondweed (*Potamogeton friesii*)

Flat-stalked Pondweed was found along the south shore of Middle Twin Lake during surveying in June. Plants were dense in each location, growing in 3-5 feet of water. Each of the two general areas shown on **Map 5** were also rich in other narrow-leaved pondweeds, so are likely areas to also find *Potamogeton strictifolius*.

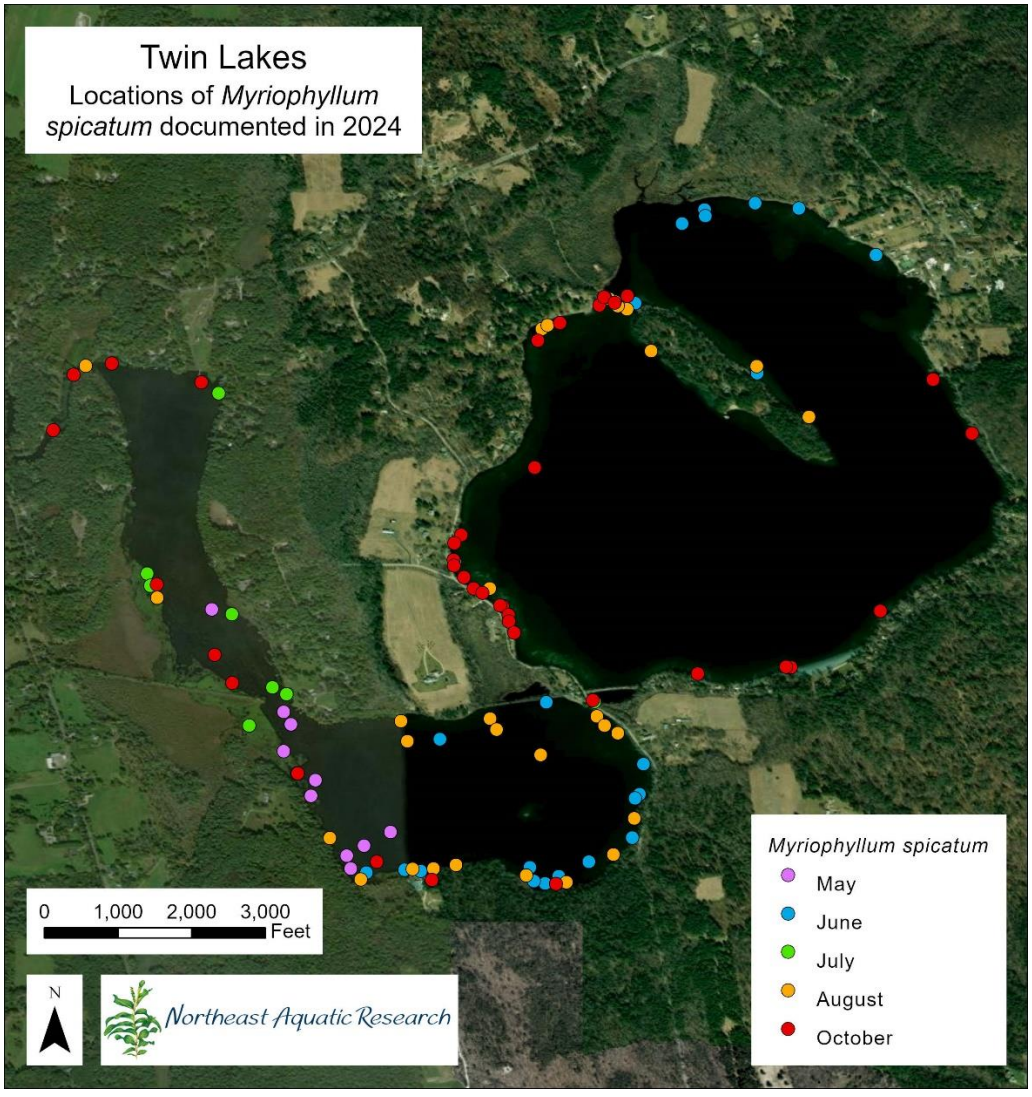
Map 5. Locations of Flat Stalked Pondweed (*Potamogeton friesii*) in Middle Twin Lake in 2024.



Eurasian Milfoil (*Myriophyllum spicatum*)

Eurasian milfoil was found throughout the littoral zone of all three basins (**Map 6**). The number and density of the plants increased as the season progressed. There was more Milfoil in East Twin in October compared to earlier months, but both Middle and West Twin showed more Milfoil in June and September. Eurasian Milfoil was present along the west shore of Middle Twin in June, but none was found there later in the season. These plants may have been impacted by the early season Diquat treatment in Middle and West Twin Lakes.

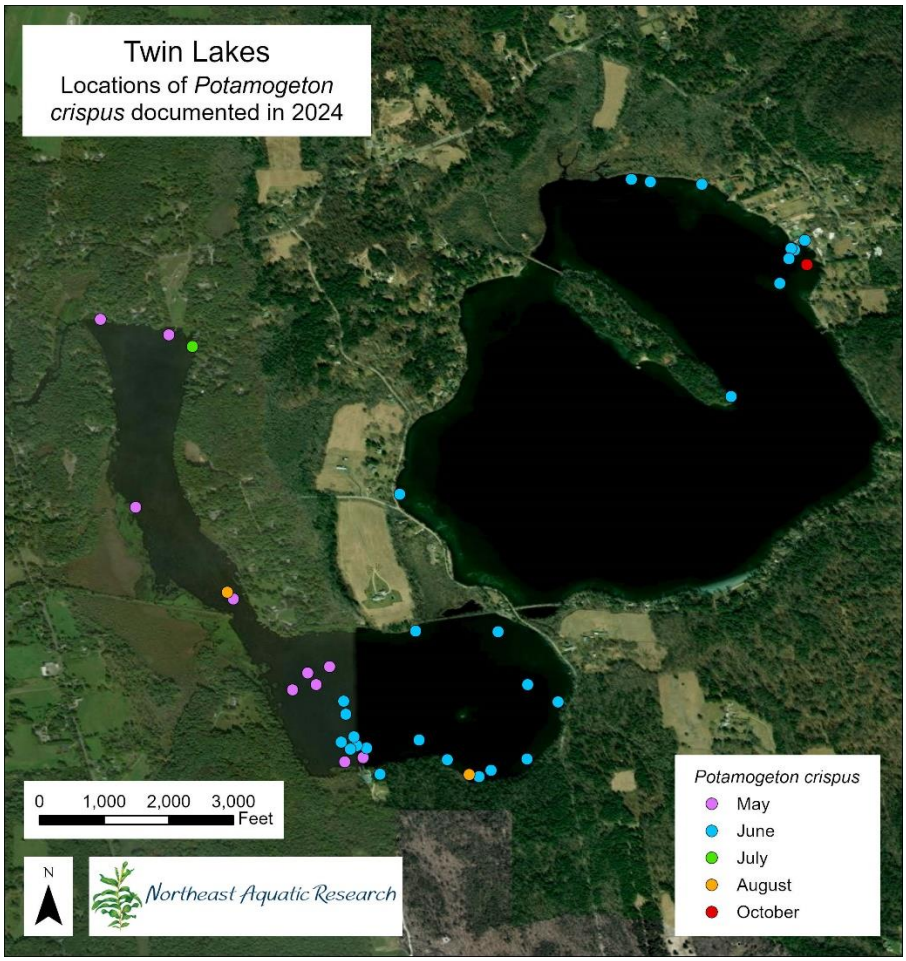
Map 6. Locations of Eurasian milfoil (*Myriophyllum spicatum*) in 2024.



Curly-leaf Pondweed (*Potamogeton crispus*)

Curly-leaf Pondweed was found in all three basins but mainly in Middle Twin (**Map 7**). Few plants were found in East Twin, but those that were found were in the vicinity of the Marina and the public car-top launch. Few plants were found in West Twin as well. The majority of the plants found in Middle Twin were located in the southwestern corner of the lake.

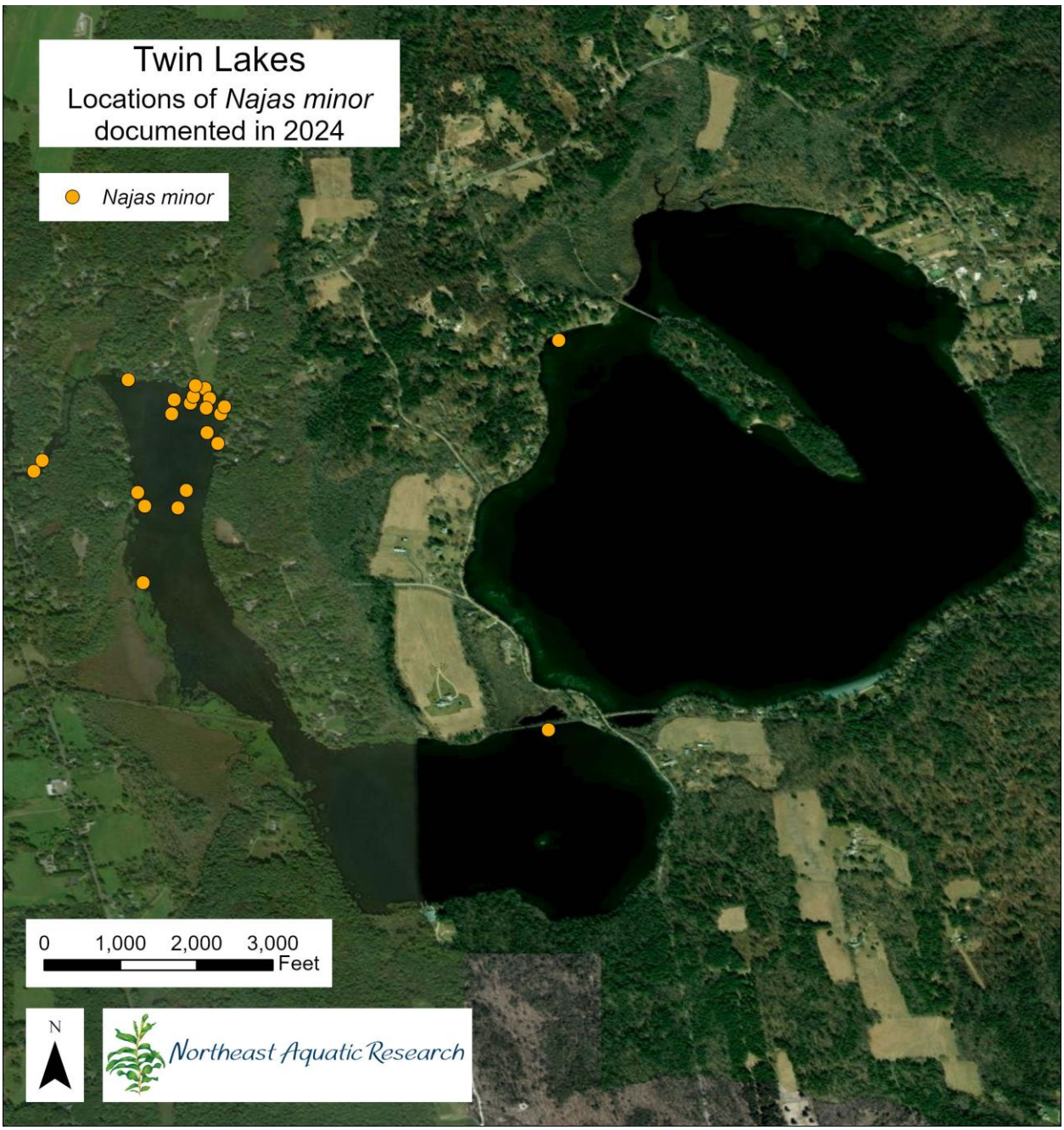
Map 7. Locations of Curly-leaf Pondweed (*Potamogeton crispus*) in 2024.



Brittle Naiad (*Najas minor*)

Brittle Naiad was found principally in the northern part of West Twin Lake (**Map 8**). A single plant was found in the Middle Twin and East Twin Lakes. Brittle Naiad is an annual that appears to come and go seasonally.

Map 8. Locations of Brittle Najad (*Najas minor*) in Twin Lake in 2024.



Native Species

In 2024, NEAR spent a total of 18 days surveying the native aquatic plants in the Twin Lakes – roughly 6 days each in June, August, and October. Additional days were spent looking specifically for certain species: Hydrilla, Bidens, or Curly-leaf pondweed, but if new native species were found during those surveys, they were recorded on the master list. Our master list of species now includes 49 species, the same number found during all 2023 surveys, including ad-hoc surveying for Hydrilla in 2023. Two species found in 2023 were not found in 2024: *Nasturtium officinale*, and *Stuckenia pectinata*. A few species found by AER in their 2017 and 2021 surveys were located: *Eleocharis acicularis,* and *Utricularia gibba*. Other species found by AER have not yet been located: *Myriophyllum sibiricum, Ceratophyllum echinatum, Potamogeton foliosus, Potamogeton strictifolius*, and *Utricularia radiata*.

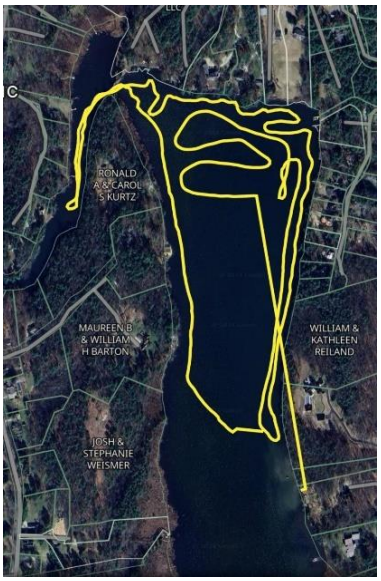
West Twin Lake had the most species at 38, Middle Twin the least at 28 species, and East Twin had 33 species. All abundant species were found in all three water bodies. Roughly 5 species found in East Twin were not found in either of the other two water bodies. Twelve species found in West Twin were not found in East Twin. Four species that were found in Middle Twin were not found in either of the other two water bodies. A full analysis of the distribution of aquatic plants in the Twin Lakes, both across different basins and over the course of the season, will be included in the water quality report to be completed in January of 2025.

Herbicide Treatments

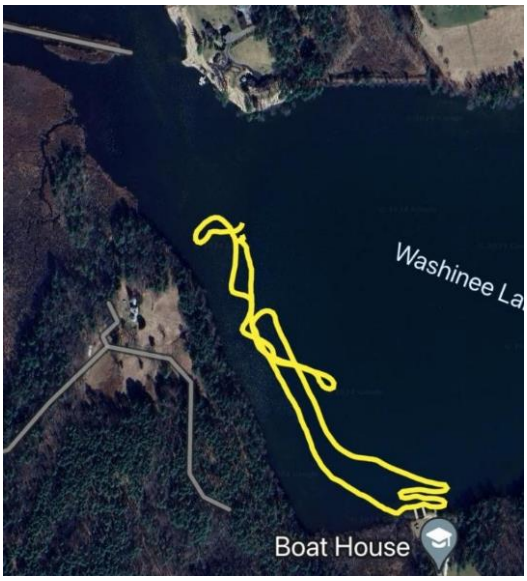
Several herbicide treatments were made in 2024. All but the first treatment targeted Hydrilla.

April 25th – Approximately 50 acres of Middle and West Twin Lakes were treated with Diquat to control Curly-leaf Pondweed. Most of the northern section of West Twin was treated, while only a thin section of the west side of Middle Twin was treated (**Map 9, Map 10**). The Middle Twin treatment included the shallow water offshore of the Boat Clubhouse and docks located on the southern shore.

Map 9. Diquat treatment area in West Twin 4/25/2024.



Map 10. Diquat treatment area in Middle Twin 4/25/2024.



July 8th, July 16th, July 30th – SonarOne in the Ohara's Marina area. The treatment area was designed to target all the locations of Hydrilla in the Marina area as shown by the green circles in **Map 2** at a dose of ~4 ppb (**Map 11**). This area is roughly six acres and includes all plants west (out toward the open lake) to the last parallel dock, south to the end of the southernmost dock, and north to the end of the northernmost dock.

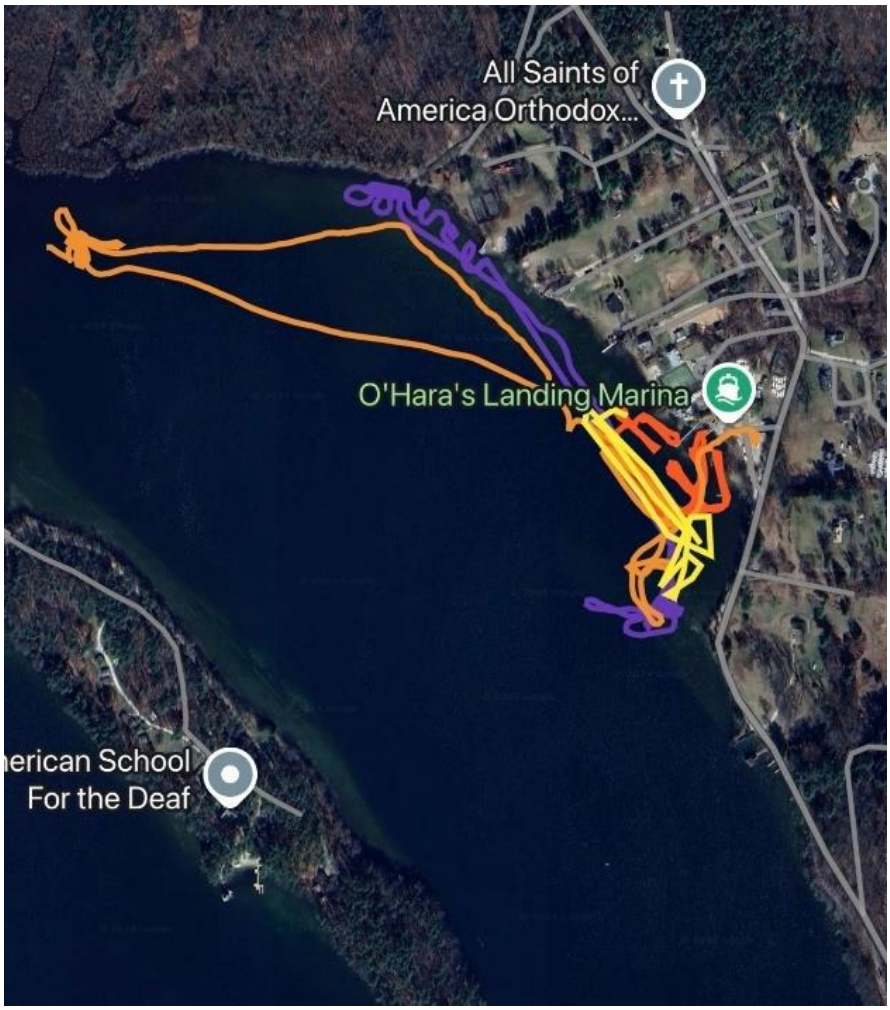
On the same date, the same Marina area was also dosed with ProcellaCOR at 20PCU.

Map 11. Marina SonarOne treatment area July 2024.

August 7th , August 23rd – Extended SonarOne in Marina area, as well as offshore of the Marina and northerly along the eastern shore to the State of CT car-top launch, such that plants found outside of the Marina were treated (**Map 12, Map 13**).

Map 12. Extended treatment area westerly.

Map 13. Extended treatment area northerly.

September 3rd, September 16th, September 25th, and October 11th – Early September to mid- October extended SonarOne treatment in O'Hara's Marina, along the eastern shore, and in northern East Twin (**Map 14**). The large established beds of Hydrilla in the northern extremity of East Twin Lake were included in this treatment. In late September, Diquat was used along the line of plants found during the SCUBA survey (see blue triangles on **Map 2**). A final pass with Sonar one was made in the Marina area and the extreme northern beds.

Map 14. Early September to early October SonarOne and Diquat treatments in East Twin.