AQUATIC ECOSYSTEM RESEARCH
A Freshwater Conservation Company

TWIN LAKES – SALISBURY

Rare Aquatic Macrophyte Species Survey - 2017

EXECUTIVE SUMMARY

Aquatic Ecosystem Research was engaged by The Town of Salisbury to conduct a rare aquatic macrophyte survey and inventory state-listed macrophyte species; the last rare species survey was conducted in 2000. The purpose of conducting this survey was to ensure that there were up-to-date maps of rare species distributions, which are important to the acquisition of CTDEEP plant management permits. Finally, The Town of Salisbury was concerned that future permits might be denied or delayed due to the age of the previous rare aquatic macrophyte survey; therefore, a rare macrophyte species survey was undertaken during the summer of 2017.

Survey Methodology:
The surveys of East and West Twin Lakes were conducted over a 5-day period in August of 2017. Furthermore, the surveys were conducted using a grid method that was restricted to the littoral zone of each lake where 400 and 180 points were visited in East and West Twin Lake, respectively. Plants were identified visually at each point after sampling with a grapple and given a value of 0 or 1, which is indicative of absence or presence, respectively. Each species was photographed using a high-resolution camera (see Digital Herbarium) and specimens thought to be state-listed species were retained at -10C.

Survey Findings:
Twenty-eight rooted macrophyte, 3 floating macrophyte, and one macroalgae species were found in the Twin Lakes system. Three state listed species were found:

- *Megalodonta beckii* (East and West Twin Lakes)
- *Myriophyllum sibiricum* (East Twin Lake)
- *Potamogeton strictifolius* (East and West Twin Lakes)

The distributions of the state-listed species were mapped using field data and an interpolation method to develop probability-of-occurrence-zones for each species (see figs. 5-8, 11-13). The rare species were principally found north of Isola Bella in East Twin Lake and in the main body of West Twin Lake. The total area that potentially contains rare species in East and West Twin Lake were 39,777.3m^2 and 30,240.7, respectively.

Proposed Boat Lane:
The boat lane proposed to increase recreational access to the wetlands north of East Twin in "Twin Lakes: Historical Data Analysis and Lake Management Plan" was found to be in areas with rare-species detection probabilities between 50 and 100%. Eighty-one percent of the total proposed boat lane area was within areas that could contain rare species.

Potamogeton strictifolius:
Aquatic Ecosystem Research believes that the species The State determined to be *P. strictifolius* may in fact be *Potamogeton zosteriformes* or a hybrid. AER is unable to confirm The State's identification based on the following:

- The key used by The State to determine this species in 2000 does not allow for the presence of a nodal gland in the identification of *Potamogeton zosteriformes*. A new key provided by C. Barre Hellquist as a supplement to the old key from 2000 allows for *P. zosteriformes* identification with a nodal gland.

    - *Potamogeton zosteriformes* and *Potamogeton strictifolius* do not key together after the nodal gland determination in the older key.
    - *Potamogeton zosteriformes* and *Potamogeton strictifolius* key together after the nodal gland determination in the new supplemental key.
        - *Potamogeton zosteriformes* and *Potamogeton strictifolius* share many features (i.e. stipule sheath structure and nodal glands) but differ in the leaf-vein-structure and stem morphology.
            - *Potamogeton zosteriformes* has a flat stem and leaves 3 bold veins.
            - *Potamogeton strictifolius* has a rounded stem and leaves with 3-13 veins that are similarly discrete.
    - In the old key, the species in question is directly identified as *P strictifolius*.
    - In the supplemental key, the species is directly identified as *P. zosteriformes*.
- Aquatic Ecosystem Research believes that the species in question might be *Potamogeton zosteriformes* or a hybrid but defers to previous identifications until a *Potamogeton spp.* taxonomic expert can make a determination.

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INTRODUCTION

Purpose:
Aquatic Ecosystem Research was engaged by the Town of Salisbury and the Twin Lakes Association due to concerns related to the presence of aquatic macrophyte (i.e. plant) species that meet state requirements for conservation (i.e. endangered, threatened, or special concern). The presence of those species in the Twin Lakes ecosystem limits the Town's ability to manage recreational access and ecosystem health since any plant management activities can only occur in areas free of the species classified as endangered, threatened, or special concern. Finally, since the last assessment of rare species was conducted in 2000 there were concerns that future herbicide permits sought by the Town of Salisbury might be delayed or compromised given the lack of rare plant data over the last 17 years.

Endangered, Threatened, or Special Concern Species Thought to be Present:
The following aquatic macrophyte species are thought to exist in the Twin Lakes System:

- *Megalodonta beckii* – Status: Threatened
- *Myriophyllum sibiricum* – Status: Threatened
- *Potamogeton ogdenii* – Status: Endangered
- *Potamogeton strictifolius* – Status: Endangered
- *Schoenoplectus acutus* – Status: Endangered
- *Sparganium natans* – Status: Endangered

The aforementioned species were detected during previous surveys of East Twin Lake in the areas shown in Figure 1. The first four species from the aforementioned list are likely to be found in the zones outlined in Figure 1 because those areas are in waters with a depth of 1m or greater; the last two species in the list are semiaquatic species normally found in non-lentic wetland environments. Aquatic Ecosystem Research was unable to obtain a map specifically related to the marginal or semiaquatic species (i.e. *Schoenoplectus acutus* and *Sparganium natans*).

Study Goals:
This study's main aims were:

1) Inventory the aquatic macrophyte community
2) Delineate areas of high species richness.
3) Identify specific locations of state-listed species.
4) Develop probability-of-occurrence-zones for the state-listed species.

METHODOLOGY

Experimental Design:
Due to the fact that the Twin Lakes are large bodies of water, it was necessary to develop a comprehensive and feasible approach to surveying the aquatic plant community. Aquatic Ecosystem Research approached the issue of sampling effort and fiscal responsibility by developing a grid system for each of the Twin Lakes.

Using Geographic Information Systems (GIS) AER's geospatial analyst established a geogrid for each lake where the corners of each grid block would act as a sample point. For West Twin Lake, a grid of 75m x 75m was established; that grid resulted in a total of 212 sample points distributed throughout the entire surface area of the lake (Fig. 2). For East Twin Lake, which exhibits a much steeper bathymetry, AER established a grid of 50m x 50m to ensure that a suitable number of points were represented in the theoretical littoral zone (i.e. <7m deep). The resulting geogrid for East Twin Lake had a total of 922 points distributed throughout the water body (Fig. 3). The aforementioned sampling grids were further refined to remove points deeper than 7m since plants will not become established in those light limited areas. The result of undertaking this process yielded grids for West and East Twin Lakes that contain 180 and 400 points, respectively.

Plant Sampling and Data Collection:

Each grid point in both lakes were located using a Garmin GPS unit with <3m accuracy. At each point the plant community was assessed visually and sampled using a grapple. The sample technique was composed of two individual grapple tosses – one to each side of the boat. Plants were identified visually using Crow and Hellquist (2000) and a *Potamogeton spp.* supplemental key, which was provided by C. Barre Hellquist. This supplement was used because there have been some significant changes to the taxonomic characteristics utilized in the identification of *Potamogeton* species. A representative sample of each species was retained and photographed using a high-resolution (i.e. 20Mpixel) digital camera. Those photos were stored in AER's digital herbarium. If rare species were found, a representative sample was frozen at -10C and retained at AER's office.

Data were logged in field notebooks as present or absent; data were always logged with an identifier that coincided with the grid sample point. Those data were transferred to lake-specific Excel spreadsheets for further processing.

Data Processing and Analytical Techniques:

Field data, as it related to individual sample points from specific lakes, was logged as an attribute table in the previously constructed survey grids. Each sample point in each lake coincided with a series of variables, which included latitude, longitude, depth, and all of the species detected during the survey. The species data were logged in that attribute table with one of two indicators that were used in post processing and probability-of-occurrence calculations. If the species was present, the species variable was given a value of 1. If the species was absent, the species variable was given a value of 0. Species presence-absence data were then used to calculate richness (i.e. total number of species at the point) and "rare" (i.e. if there was a rare species at the point). After constructing the two lake-specific datasets, the data matrix was comprised of the variables latitude, longitude, depth, richness, "rare", and the following species variables:

- *Brasenia schreberi*
- *Ceratophyllum demersum*
- *Chara spp.*
- *Lemna trisulca*
- *Megalodonta beckii* (**state listed)**
- *Myriophyllum sibiricum* **(state listed)**

- *Myriophyllum spicatum*
- *Najas flexilis*
- *Najas guadalupensis*
- *Najas minor*
- *Nuphar variegata*
- *Nymphaea odorata*
- *Pontederia cordata*
- *Potamogeton amplifolius*
- *Potamogeton illinoensis*
- *Potamogeton natans*
- *Potamogeton pusillus*
- *Potamogeton robbinsii*
- *Potamogeton strictifolius* **(state listed)**
- *Potamogeton zosteriformes*
- *Ranunculus longirostris*
- *Sagittaria graminea*
- *Sparganium spp.*
- *Spirodella polyrhiza.*
- *Utricularia gibba*
- *Utricularia intermedia*
- *Utricularia macrorhiza*
- *Utricularia minor*
- *Utricularia purpurea*
- *Utricularia radiata*
- *Vallisneria americana*
- *Wolffia spp.*

Those data matrices were loaded in to Geographic Information System (GIS) software to undertake a variety of analytical protocols. Firstly, we used the richness variable to develop a spatial assessment of plant community richness. Those data, which had the potential to range from zero to infinity, were interpolated to determine how species richness is distributed throughout each of the lakes and to identify areas of high species richness. Secondly, the "rare" variable was used to develop a spatial assessment of all rare species distributions together. Those data were interpolated to determine the probability of encountering a rare species – independent of identity – in any given area of the lakes. Probability-of-occurrence maps were created by assigning 1 as the highest chance of encountering a rare species (i.e. where it was actually found) and interpolating data from adjacent points in an iterative fashion throughout the sample grid. Thirdly, the individual rare species data were used to develop a spatial assessment of each rare species' distribution. Those data were interpolated to determine a probability of encountering the rare species in any given area of the lake. The individual species' probability-of-occurrence maps were determined in the same manner described above for the "rare" variable.

After conducting the spatial analyses, those matrices were used to calculate some basic statistics (i.e. number of detections and percent of community). Finally, AER's statistician regressed depth vs. richness to examine the relationship between those two variables. To develop that relationship, we evaluated three different type of explanatory models: 1) Linear, 2) polynomial, and 3) logistic. The final model was

chosen based on fit; the characteristic used in model selection was the coefficient of determination (r^2).

RESULTS

East Twin Lake – Basic Plant Community Findings:
Twenty-two rooted aquatic macrophyte species, 3 floating macrophyte species, and one macroalgae were found among the 400 points that were visited. The most common species detected during this survey was the macroalgae *Chara spp.* *Chara spp.* was found at a total of 237 points or 82.29% of the survey points that contained plant life. *Potamogeton illinoensis* was the second most common species in East Twin Lake and was found at 143 points or 49.65% of the survey points that contained plant life. The third most common species was *Potamogeton amplifolius*, which was found at 104 points and 36.11% of the points that contained plant life. For a complete list of species detections and percentages, see Table 1.

Three state-listed species were found during this survey. *Megalodonta beckii*, *Myriophyllum sibiricum*, and *Potamogeton strictifolius* were found 4, 6, and 9 points, respectively. That same list of species was found to be present at 1.39, 2.08, and 3.13% of the points where plant life was detected.

One non-native species was found during this survey: *Myriophyllum spicatum*. It was found to be present at 29 points or 10.07% of the sample points that contained aquatic macrophytes.

East Twin Lake – Statistical and Spatial Analyses:
In the analysis of richness vs. depth, the model that best characterized those data was logarithmic in nature. The final model (r^2=0.507) suggested that richness was greatest between 0.5 and 2m with the highest values being found between 0.5 and 1m (Fig. 4).

Megalodonta beckii, which is listed as "Special Concern" by The State of Connecticut, was found at four points in the northwestern quadrant of East Twin Lake (Fig. 5), north of Isola Bella near the causeway. Using those data points and the spatial interpolation technique described in the methodology section of this report, AER's geospatial analyst developed a map that estimated the probability-of-occurrence distribution for *M. beckii* in East Twin Lake (Fig. 5).

Myriophyllum sibiricum, which is listed as "Threatened" by The State of Connecticut, was found at six points on the sample grid. Three of the points were clustered in the same area as *M. beckii* located north of Isola Bella near the causeway. The other three points were located along the northern-most shore, adjacent to O'Hara's Marina, and along the western coast south of Isola Bella (Fig. 6). Using those data points and our spatial interpolation method, AER's geospatial analyst developed a map that characterized the probability-of-occurrence for *M. sibiricum* in East Twin Lake (Fig. 6).

Potamogeton strictifolius, which is listed as "Endangered" by The State of Connecticut, was found at nine points on the sample grid. Six of those points were clustered along the northern shore of East Twin Lake north of Isola Bella (Fig. 7). Furthermore, *P. strictifolius* was found at one point adjacent to O'Hara's Marina and along the western coast south of Isola Bella. Those data were modeled using the previously described

interpolation technique to derive a probability-of-occurrence map for *P. strictifolius* (Fig. 7).

Using all of the rare species' detections on the sample grid, AER's geospatial analyst developed a map characterizing the probability of finding a rare species throughout East Twin Lake. The areas of high probability were determined to exist in the northwestern quadrant of East Twin Lake, near O'Hara's Marina, and along the western shoreline south of Isola Bella (Fig. 8). The total area of concern for East Twin Lake was 39,777.3m^2. Interestingly, all of the rare species were found in areas where there was a significant accretion of organic matter.

Finally, species richness was analyzed in a similar manner. However instead of developing our interpolation model based on presence and absence, the analysis of richness was conducted using the raw species counts. Those data were interpolated and a map depicting the spatial distribution of richness in East Twin Lake was developed (Fig. 9). That analysis elucidated that the areas of greatest species richness were north of Isola Bella along the western and northern shorelines, near O'Hara's Marina, and south of Isola Bella along the western shoreline (Fig. 9). Consequently, the areas of greatest richness overlay the areas containing rare species fairly closely (Figs. 5-9).

West Twin Lake – Basic Plant Community Findings:
Twenty-three rooted aquatic macrophyte species and one macroalgae were found among the 180 points that were visited. The most common species detected during this survey was *Vallisneria americana*. *Vallisneria americana* was found at a total of 78 points or 59.09% of the survey points that contained plant life. *Najas flexilis* was the second most common species in West Twin Lake and was found at 66 points or 50.00% of the survey points that contained plant life. The third most common species was *Potamogeton amplifolius*, which was found at 62 points and 46.97% of the points that contained plant life. For a complete list of species detections and percentages, see Table 2.

Two state-listed species were found during this survey. *Megalodonta beckii* and *Potamogeton strictifolius* were found at 2 and 4 points, respectively. Those species were found to be present at 1.52 and 3.03% of the points where plant life was detected.

One non-native macrophyte species was encountered on the West Twin Lake grid. *Najas minor* was present at 1 point or 0.76% of points with plant life.

West Twin Lake – Statistical and Spatial Analyses:
In the analysis of richness vs. depth, we found that the model that best characterized those data was also logarithmic in nature. The final model (r^2=0.415) suggested that richness was greatest between 0.5 and 1.5m with the highest values being found between 0.5 and 1m (Fig. 10).

Megalodonta beckii, which is listed as "Special Concern" by The State of Connecticut, was found at two points along the northern shore of the main body of West Twin Lake (Fig. 11). Using those data points and the spatial interpolation technique described in the methodology section of this report, AER's geospatial analyse developed a map that estimated the probability-of-occurrence for *M. beckii* in West Twin Lake (Fig. 11).

Potamogeton strictifolius, which is listed as "Endangered" by The State of Connecticut, was found at four points on the sample grid. Those points were clustered in the eastern part of West Twin Lake's main body (Fig. 12). Those data were modeled using the previously described interpolation technique to derive a probability-of-occurrence map for *P. strictifolius* (Fig. 12).

Using all of the rare species' detections on the sample grid, AER's geospatial analyst developed a map characterizing the probability of finding a rare species throughout West Twin Lake. The areas of high probability were determined to exist in the main body of West Twin Lake (Fig. 13). The highest probability of detecting rare species was found to be along the northern and eastern shorelines of the lake. The total area of concern for West Twin Lake was 30,240.7m^2. Except for the northern area of high probability, these areas did not tightly coincide with any qualitative features of the lake's sediments.

Finally, species richness was analyzed in a similar manner. However instead of developing our interpolation model based on presence and absence, the analysis of richness was conducted using the raw species counts. Those data were interpolated and a map depicting the spatial distribution of richness in West Twin Lake was developed (Fig. 14). This analysis indicated that the areas of greatest species richness were present in the panhandle of West Twin Lake. The richest areas were found to be along the western shoreline north of the gazebo landmark. There were other rich areas found at the northern most reaches of the panhandle and along its eastern shoreline (Fig. 14). There were some areas of high richness in the main body of West Twin and those areas loosely coincided with the areas where rare species were found (Figs. 11-14).

DISCUSSION OF SPECIFIC FINDINGS

This section is intended to discuss specific portions of the results. Many of the results are self-explanatory but some do require additional explanation. This section will also describe some taxonomic issues that were encountered during this study and provide recommendations.

Lake Richness and Qualitative Plant Community Perspective:
The Twin Lakes System was found to contain 31 aquatic macrophyte species and 1 macroalgae. The average number of plant species per lake in The State of Connecticut is 13 (CAES Database); therefore, the Twin Lakes system contains more species than the average lake in the State of Connecticut.

Aquatic Ecosystem Research spent five full days surveying the Twin Lakes system. In general, it was our opinion that plant density was relatively sparse except for a few select areas. West Twin Lake had significant plant density along the northwestern and western shorelines of the panhandle and the northern shoreline of the main water body. There is very little development along the western shoreline of the panhandle and the northern shoreline of the main water body. Therefore, there is little need for plant management in those areas because there is little impact on recreational access. However, a number of homes are located in the northwestern shoreline of the panhandle, which also has a relatively dense plant community compounded by significant sediment accretion. In this area, it may be prudent to manage the plant

community and sediment accretion through a hydroraking or dredging initiative to increase recreational access. No rare species were detected in that area so there should be little issue obtaining state permits to undertake such a project. Finally, it was evident that specific areas of lily-pads are still impinging on the rowing-lane; It is AER's opinion that these areas should be managed with a hydrorake as was outlined in "Twin Lakes: Historical Data Analysis and Lake Management Plan".

East Twin Lake exhibited significant plant density north of Isola Bella from the causeway east to the State boat launch. In these same areas, there were populations of the state listed species. However, there is no development along the shoreline north of Isola Bella; therefore, there is no need for plant management. Furthermore, the presence of State-listed species would complicate any plant management initiatives in that area. Overall, the plant community of East Twin Lake appears to require minimal manipulation. It is the opinion of AER to continue to inspect the areas outlined in "Twin Lakes: Historical Data Analysis and Lake Management Plan" and manage *Myriophyllum spicatum* when necessary.

Boat Lane Construction:
During the survey, AER found that the boat lane that was proposed in "Twin Lakes: Historical Data Analysis and Lake Management Plan" is approximately 984.4m^2 and planned in the areas likely to contain *Potamogeton strictifolius* (Fig. 15). The probability of finding *P. strictifolius* in areas occupied by the proposed boat lane range from 50 to 100 percent, which may pose a problem in obtaining state permits. The risk areas for detecting *P. strictifolius* encompass 793.24m^2 or 81% of the proposed boat lane.

Based on this finding, it will likely be difficult to obtain permission to construct the proposed boat lane; however, it would be pertinent to open a dialog with the CTDEEP and discuss potential options for enhancing recreational access to the northern wetlands.

Rare Species Identifications:
There were no significant issues in the identification of *Megalodonta beckii* and *Myriophyllum sibiricum*. Aquatic Ecosystem Research is confident in those species' visual identifications and considers them confirmed. However, identification of *Potamogeton strictifolius* was not as clear-cut. When "Aquatic and Wetland Plants of Northeastern North America" (2000) was used in the identification of *P. strictifolius* specimens, the final result from moving through that dichotomous key was a *Potamogeton strictifolius* identification. However when the *Potamogeton spp.* supplemental key, which was provided by C. Barre Hellquist, was used to confirm *P. strictifolius* identifications, the final result of moving through that dichotomous key was *Potamogeton zosteriformes*, which is not a state-listed species. The major difference between the two keys in regards to *P. strictifolius* and *P. zosteriformes* is the way the two species are identified based on an anatomical structure called the nodal gland. In the key from the year 2000, *P. zosteriformes* and *P. strictifolius* are distinguished based on the presence or absence of a nodal gland while the new supplemental key allows for the presence of a nodal gland in both species. Interestingly, the identification of *Potamogeton strictifolius* by the State was probably conducted with the dichotomous key from 2000. That species was visually similar to the species AER has identified differently using the old and new keys (Fig. 16). Furthermore, the morphology of the stem is not assessed before reaching a *P. strictifolius* conclusion in the key from 2000. The specimens found by AER, which are

visually similar to the species the State believes to be *P. strictifolius*, have a flattened stem and three bold veins. Those features are indicative of *Potamogeton zosteriformes* in the supplemental key provided by C. Barre Hellquist. In that supplement, both species have nodal glands and similar stipule structure but differ in the stem morphology and leaf-vein structure. When AER used the supplemental key to identify the species in question, our conclusion was that it was *P. zosteriformes.* Moreover, the species in question was always found adjacent to populations of *P. zosteriformes* that were easily identified as such; therefore, the species identified as *P. strictifolius* by the State could be diminutive individuals of *P. zosteriformes* or a hybrid. Aquatic Ecosystem Research attempted to confirm the identification through C. Barre Hellquist and Zdenek Kaplan using our high resolution photographs. Neither person – both of whom are considered experts in *Potamogeton spp.* taxonomy. – were willing confirm whether it was *P. strictifolius* or *P. zosteriformes* based on the pictures. Ultimately, this means that the species in question might require a newly collected sample be sent to either of the aforementioned individuals or that the specimens are identified genetically.

As a final note in that regard, AER believes that there is a chance that the species in question is *Potamogeton zosteriformes* or a hybrid; however, AER has decided to defer to the State's current identification as *Potamogeton strictifolius* until an expert in *Potamogeton spp.* taxonomy confirms the identification of the specimen in question.

TABLES

Table 1: East Twin Lake basic plant community statistics

Species	Count	Percent of Points with Plants
Brasenia schreberii	1	0.35
Ceratophyllum demersum	28	9.72
Chara spp.	237	82.29
Elodea nuttallii	6	2.08
Lemna trisulca	8	2.78
*Megalodonta beckii***	4	1.39
*Myriophyllum sibiricum***	6	2.08
Myriophyllum spicatum	29	10.07
Najas flexilis	38	13.19
Nuphar variegata	17	5.90
Najas guadalupensis	5	1.74
Nymphaea odorata	15	5.21
Potamogeton amplifolius	104	36.11
Pontederia cordata	12	4.17
*Potamogeton strictifolius***	9	3.13
Potamogeton illinoiensis	143	49.65
Potamogeton natans	3	1.04
Potamogeton pusillus	1	0.35
Potamogeton robbinsii	25	8.68
Potamogeton zosteriformes	23	7.99
Ranunculus longirostris	4	1.39
Spirodella polyrhiza	5	1.74
Utricularia gibba	6	2.08
Utricularia macrorhiza	4	1.39
Valisneria americana	93	32.29
Wolffia spp.	3	1.04

** indicates species that are listed by the State as endangered, threatened, or special concern

Table 2: West Twin Lake basic plant community statistics

Species	Count	Percent of Points with Plants
Brasenia schreberii	16	12.12
Ceratophyllum demersum	20	15.15
Chara spp.	56	42.42
*Megalodonta beckii***	2	1.52
Najas flexilis	66	50.00
Najas guadalupensis	4	3.03
Najas minor	1	0.76
Nuphar variegata	22	16.67
Nymphaea odorata	34	25.76
Pontederia cordata	1	0.76
Potamogeton amplifolius	62	46.97
Potamogeton illinoiensis	27	20.45
Potamogeton natans	1	0.76
*Potamogeton strictifolius***	4	3.03
Potamogeton zosteriformes	14	10.61
Sagittaria graminea	4	3.03
Sparganium spp.	7	5.30
Utricularia gibba	21	15.91
Utricularia intermedia	17	12.88
Utricularia macrorhiza	16	12.12
Utricularia minima	6	4.55
Utricularia purpurea	11	8.33
Utricularia radiata	6	4.55
Vallisneria americana	78	59.09

** indicates species that are listed by The State as endangered, threatened, or special concern

FIGURES

Figure 1: Areas thought to contain State Listed species as assessed in the year 2000

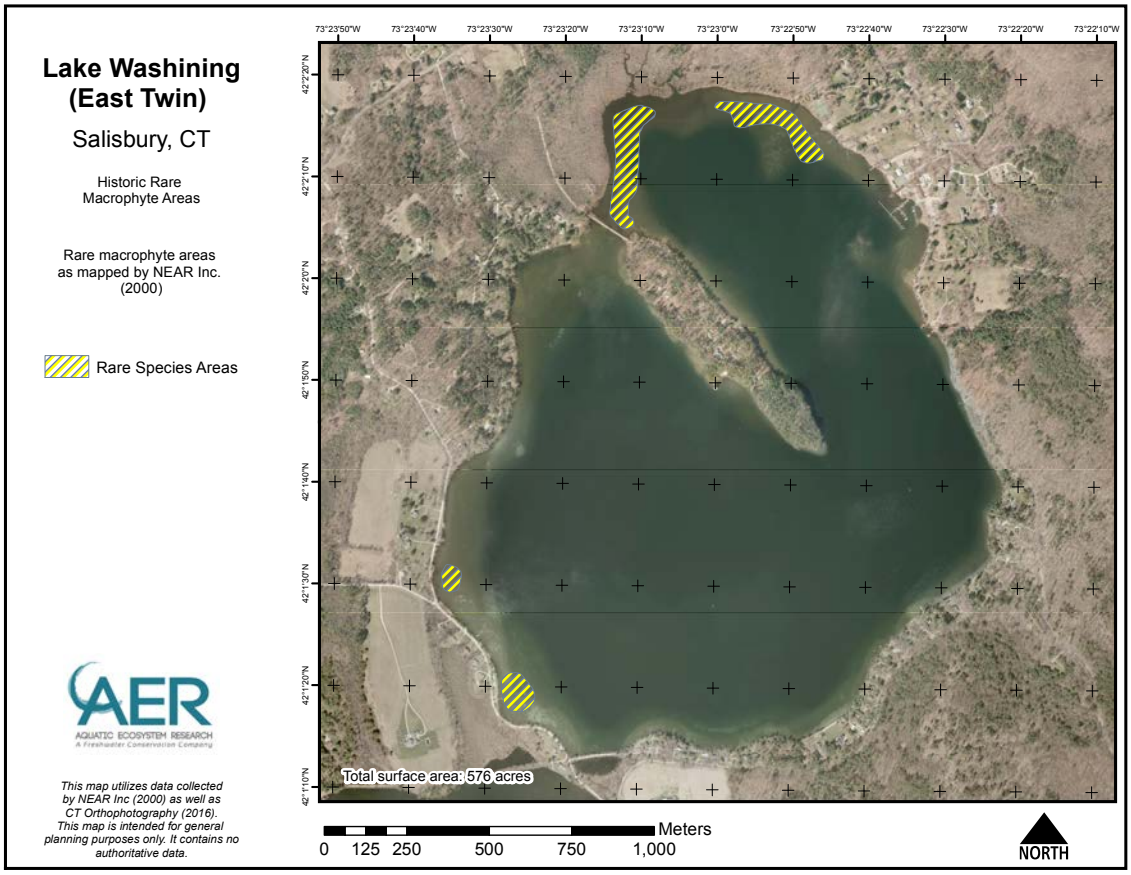

Figure 2: West Twin Lake sampling grid (2017, AER)

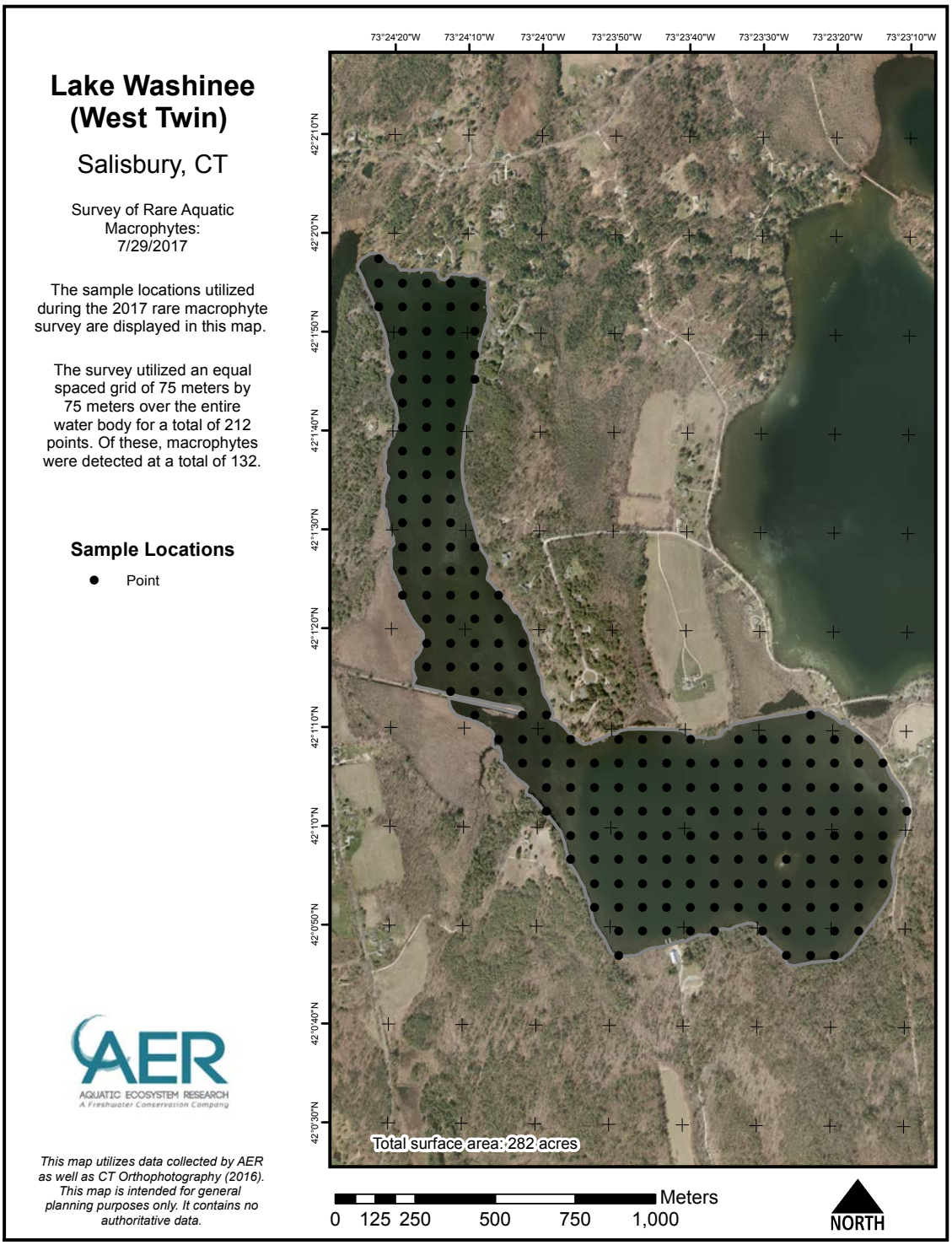

Figure 3: East Twin Lake sampling grid (2017, AER)

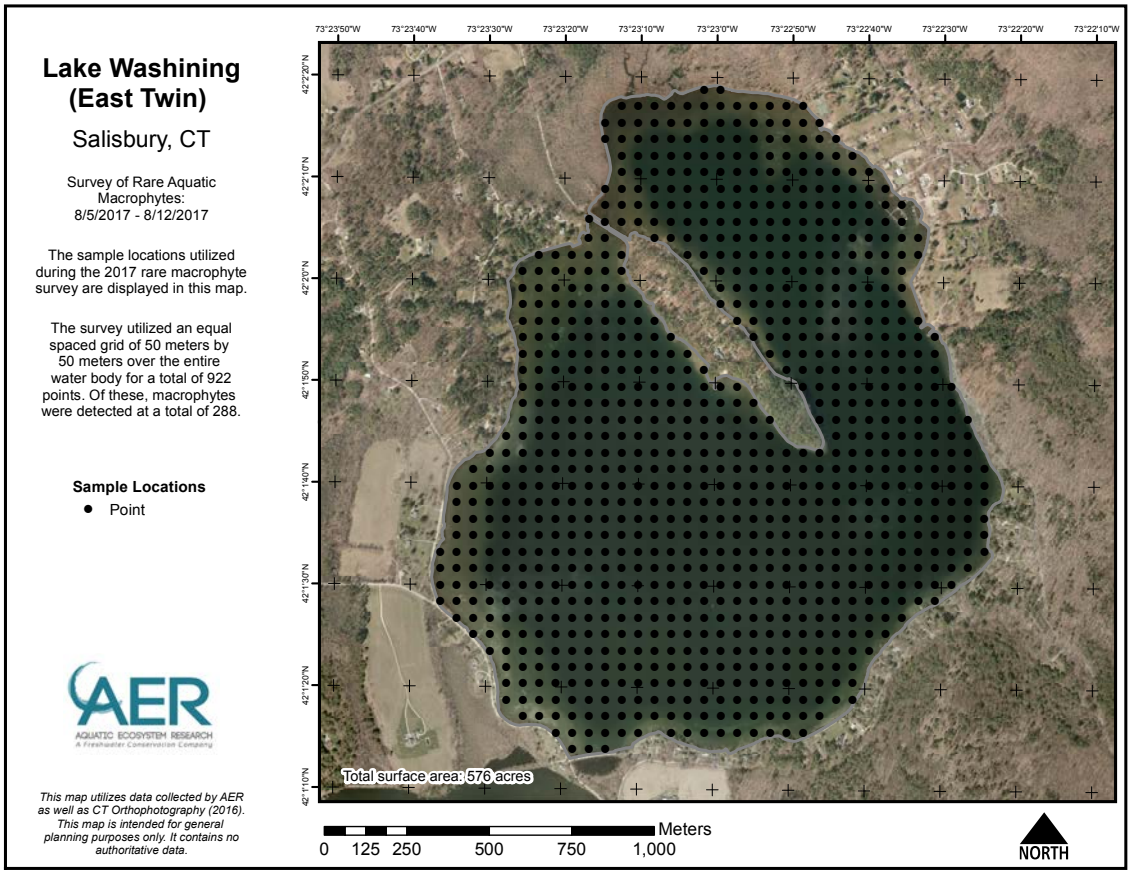

Figure 4: East Twin Lake – logistic regression of richness vs. depth

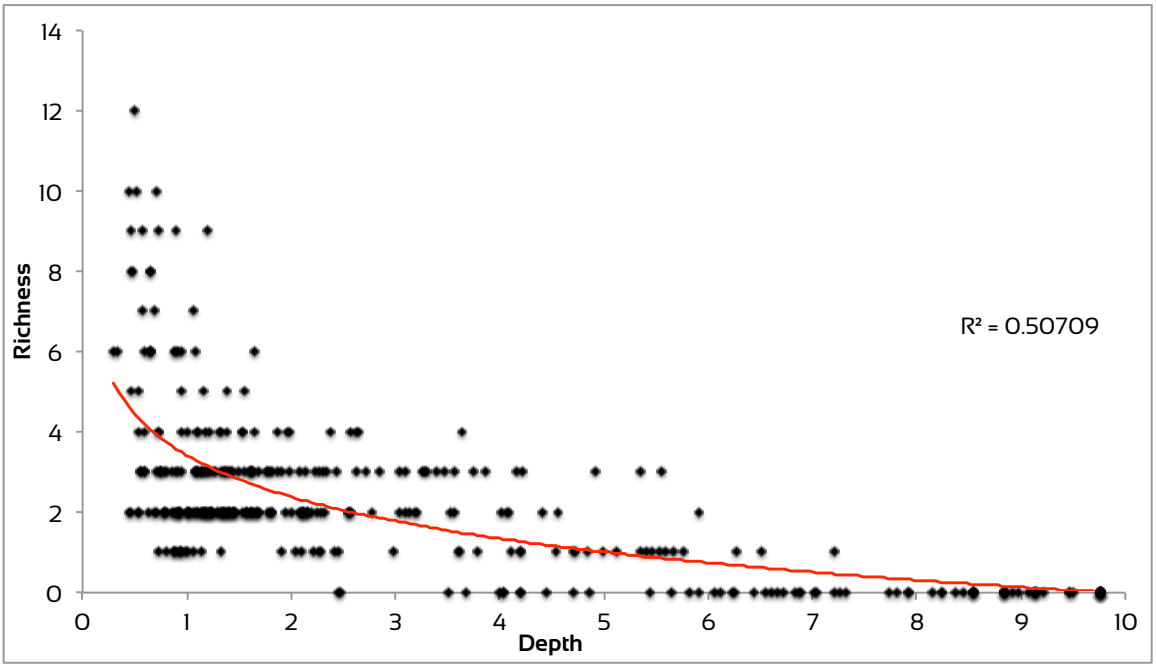

Figure 5: Interpolated spatial distribution of *Megalodonta beckii* in East Twin Lake

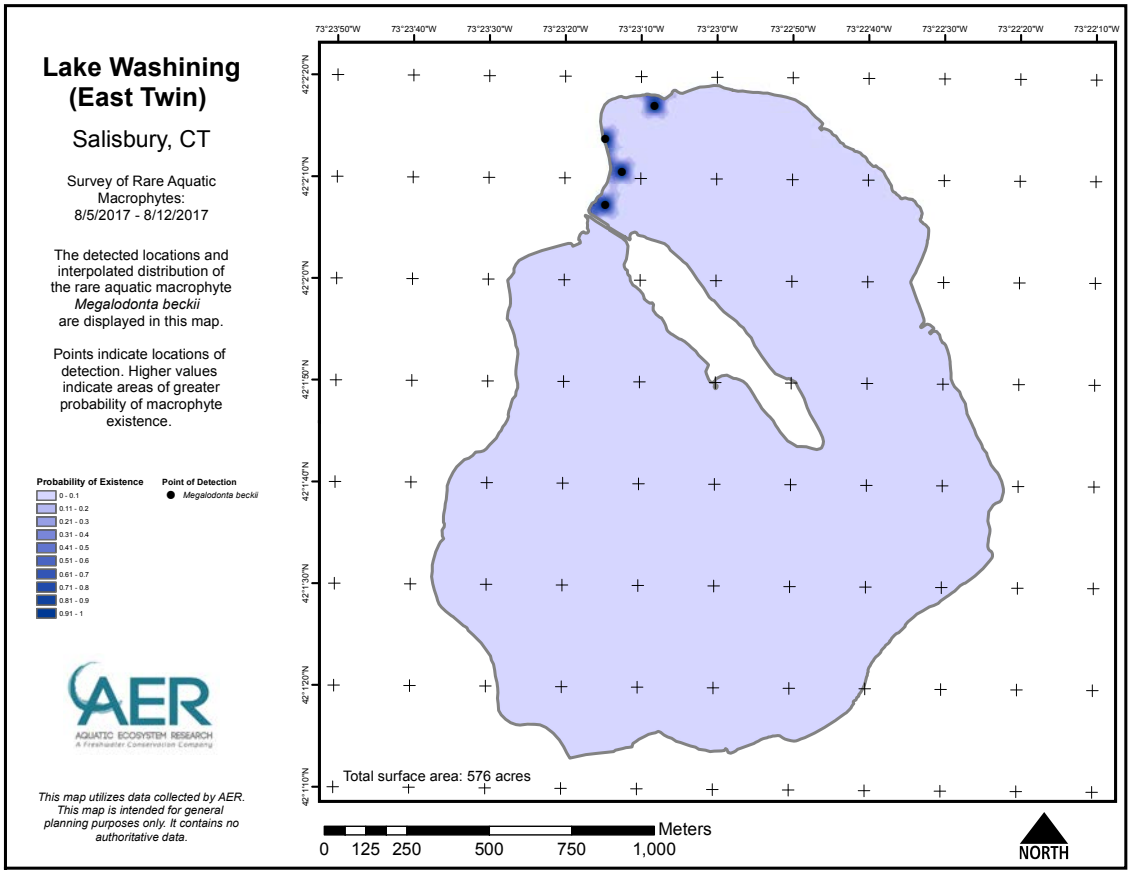

Figure 6: Interpolated spatial distribution of *Myriophyllum sibiricum* in East Twin Lake

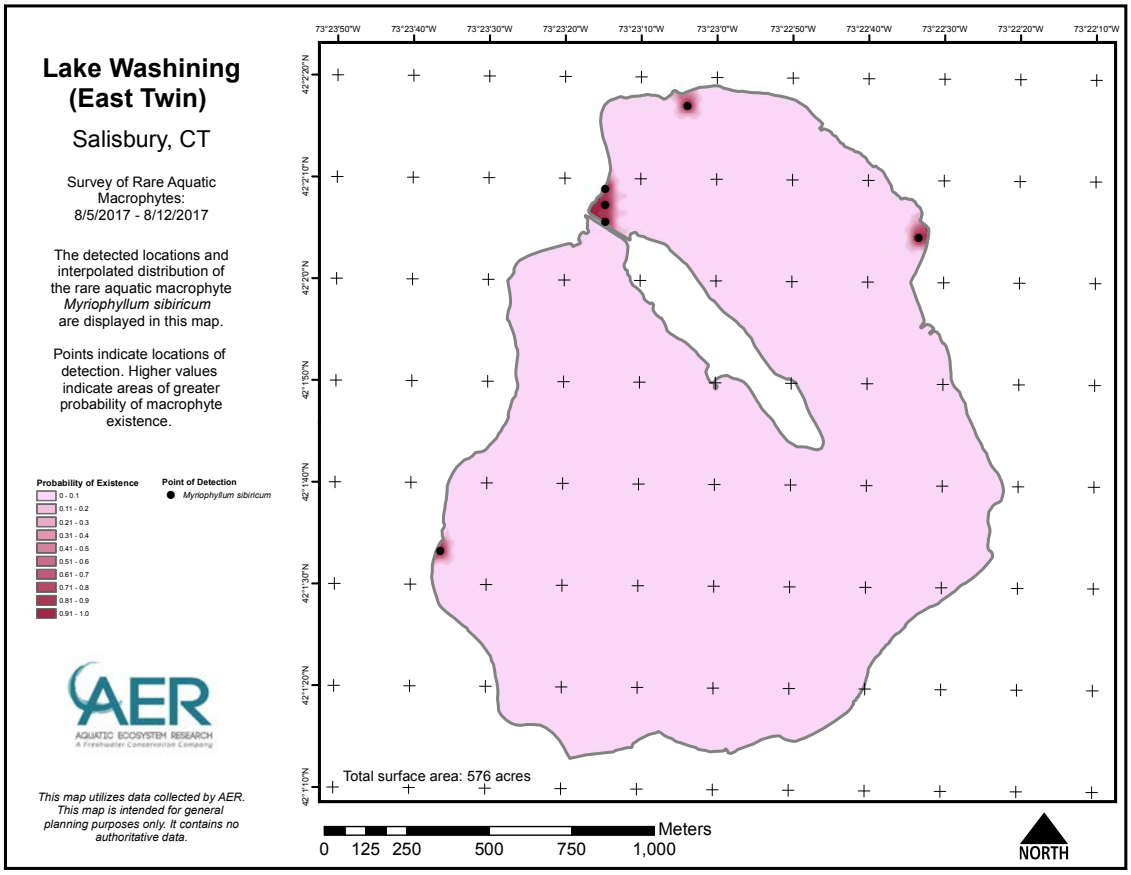

Figure 7: Interpolated spatial distribution of *Potamogeton strictifolius* in East Twin Lake

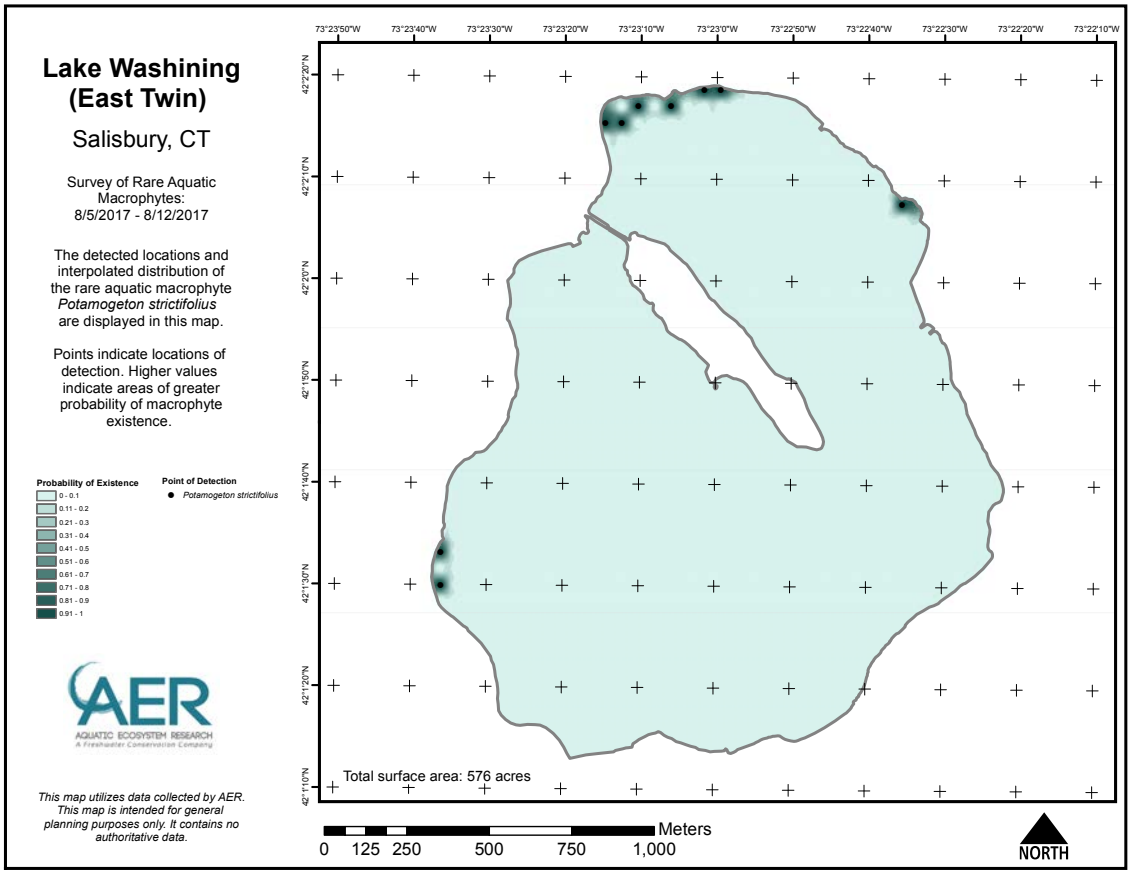

Figure 8: Interpolated spatial distribution of all State Listed species in East Twin Lake

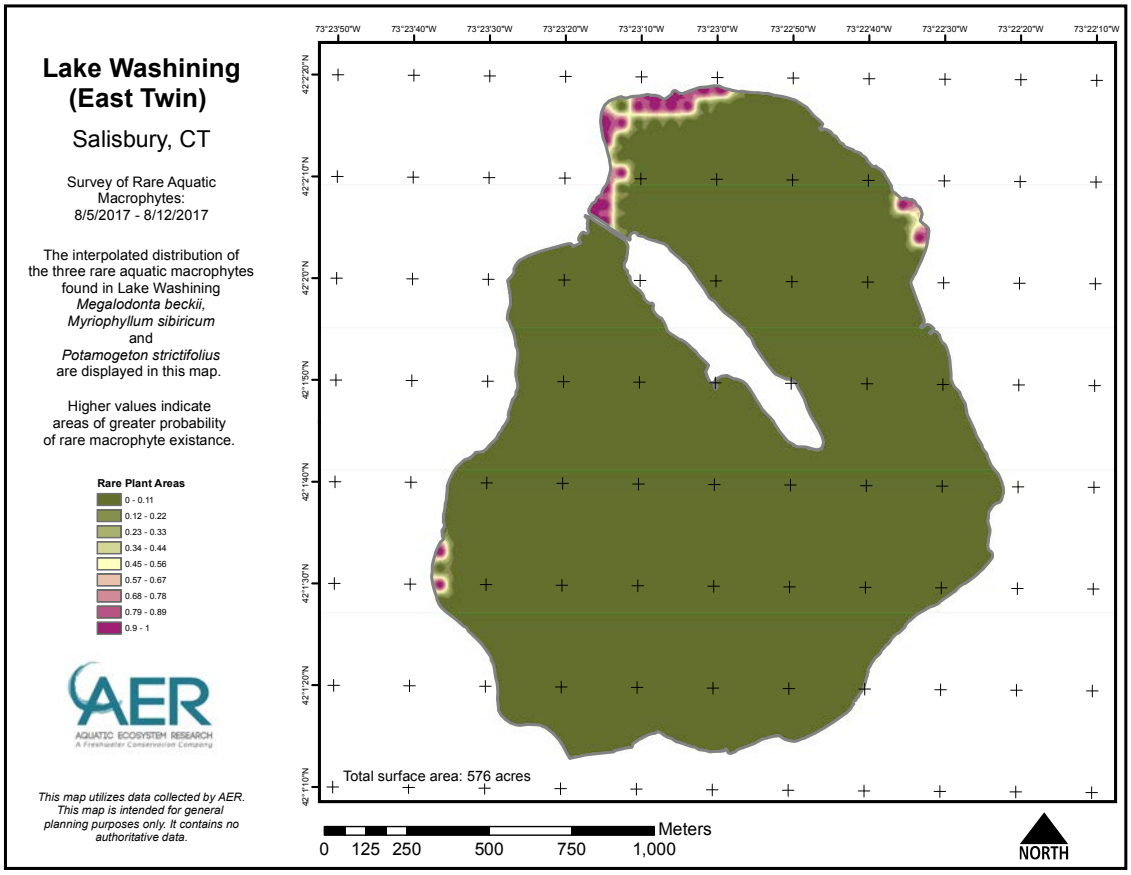

Figure 9: Interpolated spatial distribution of plant community richness in East Twin Lake

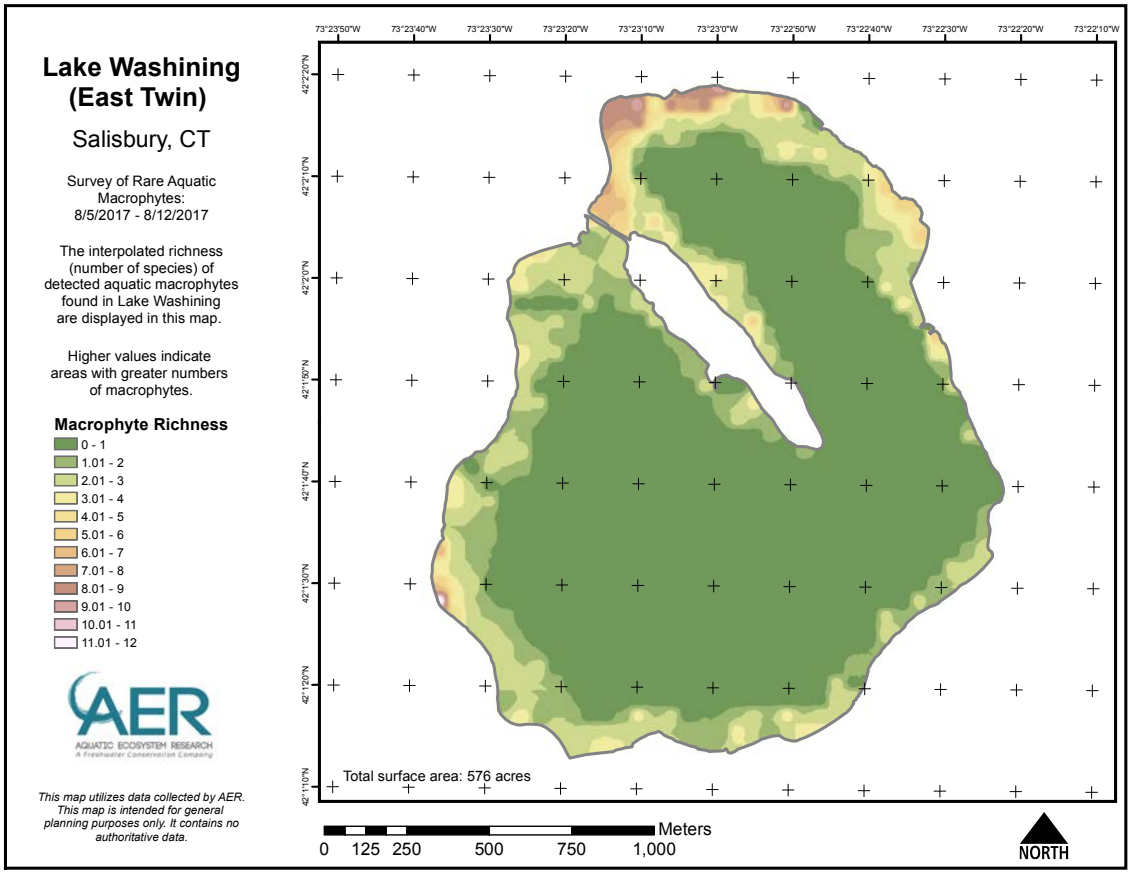

Figure 10: West Twin Lake – logistic regression of richness vs. depth

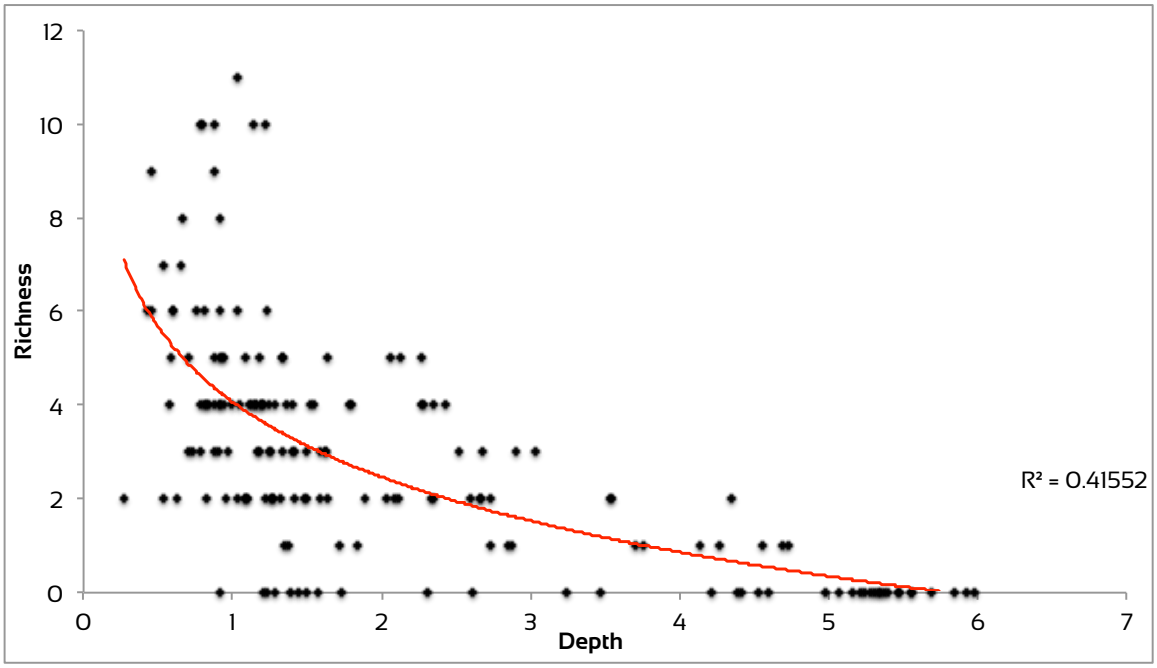

Figure 11: Interpolated spatial distribution of *Megalodonta beckii* in West Twin Lake

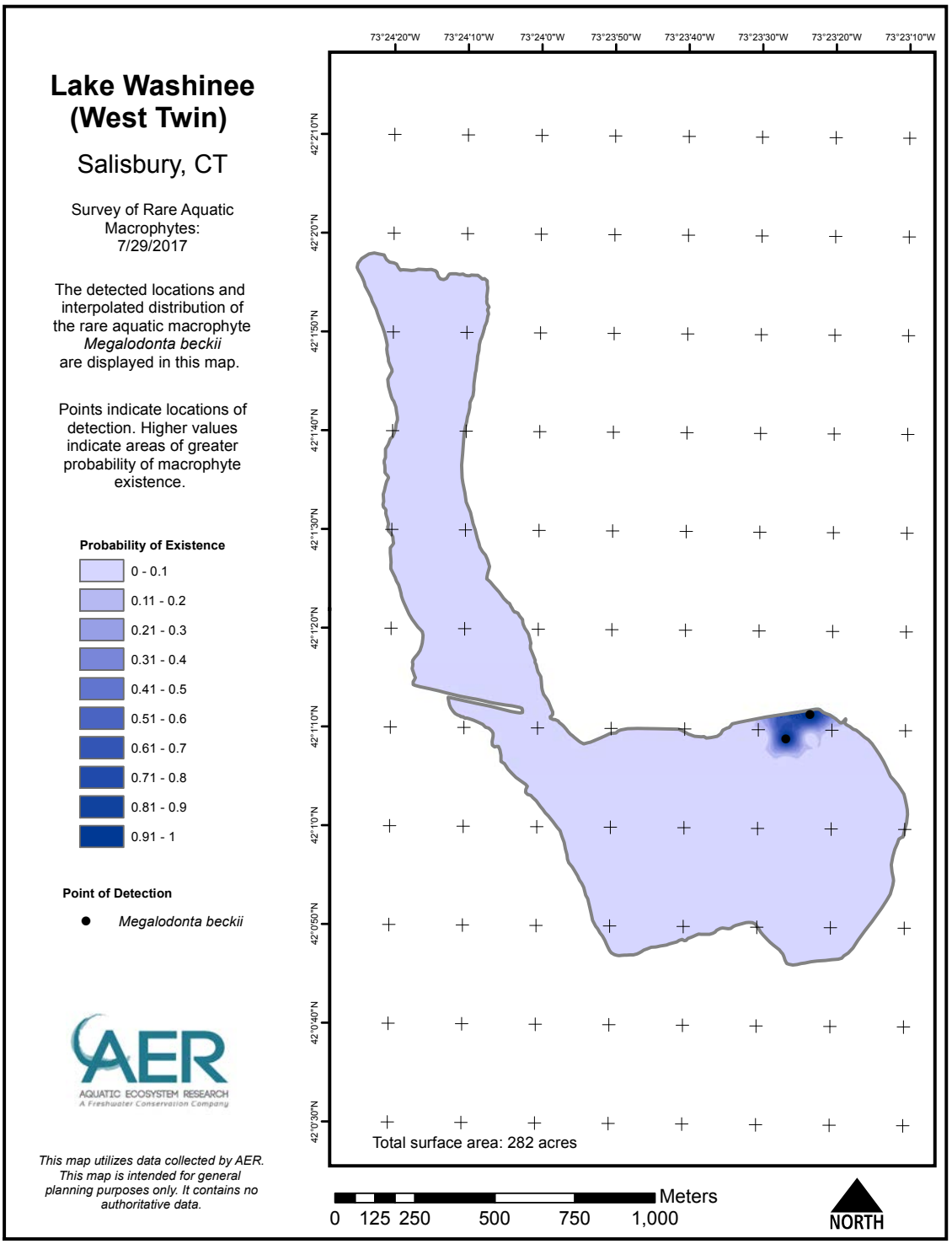

Figure 12: Interpolated spatial distribution of *Potamogeton strictifolius* in West Twin Lake

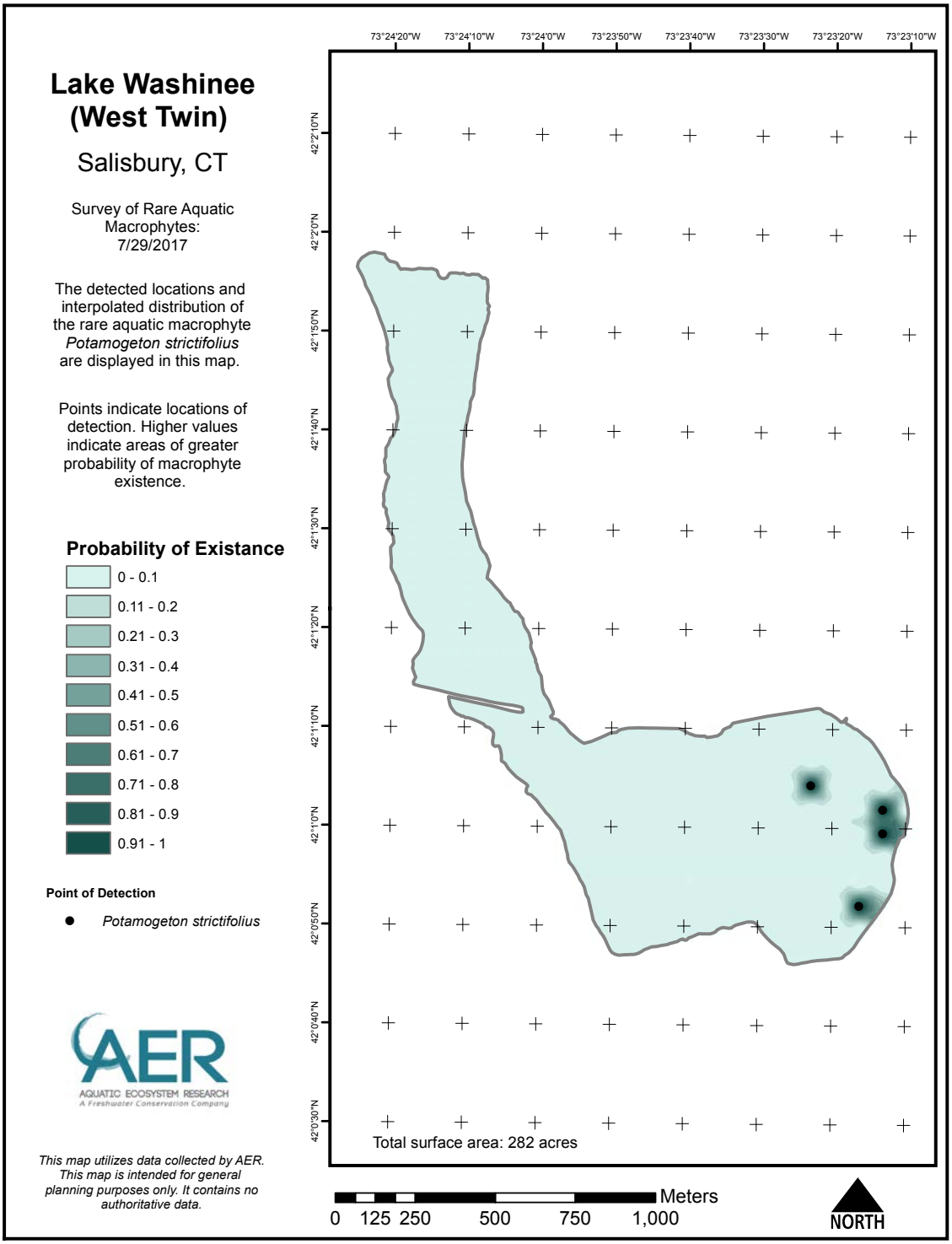

Figure 13: Interpolated spatial distribution of all State Listed species in West Twin Lake

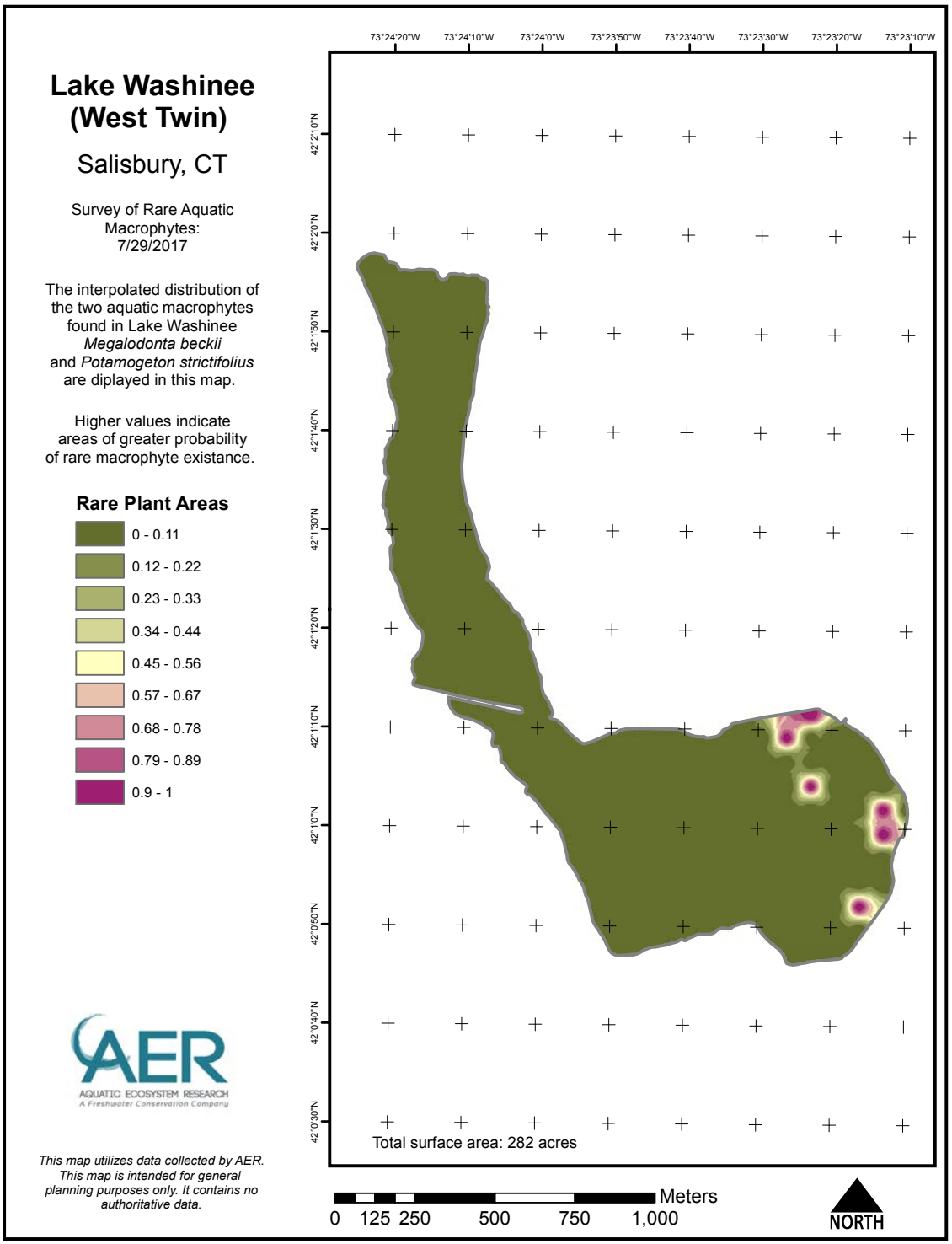

Figure 14: Interpolated spatial distribution of plant community richness in West Twin Lake

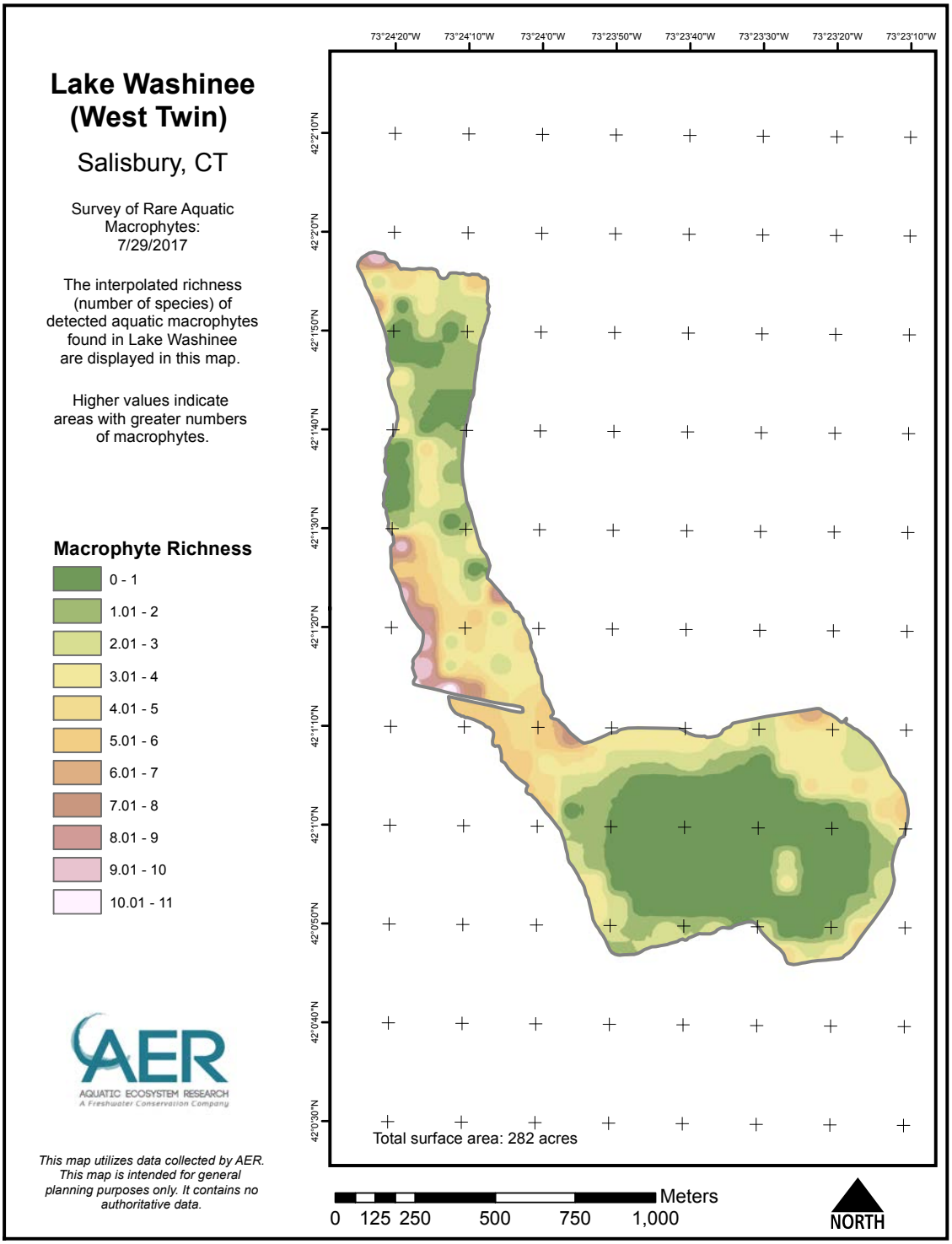

Figure 15: Interpolated map of rare species zone in relationship to the proposed boat lane.

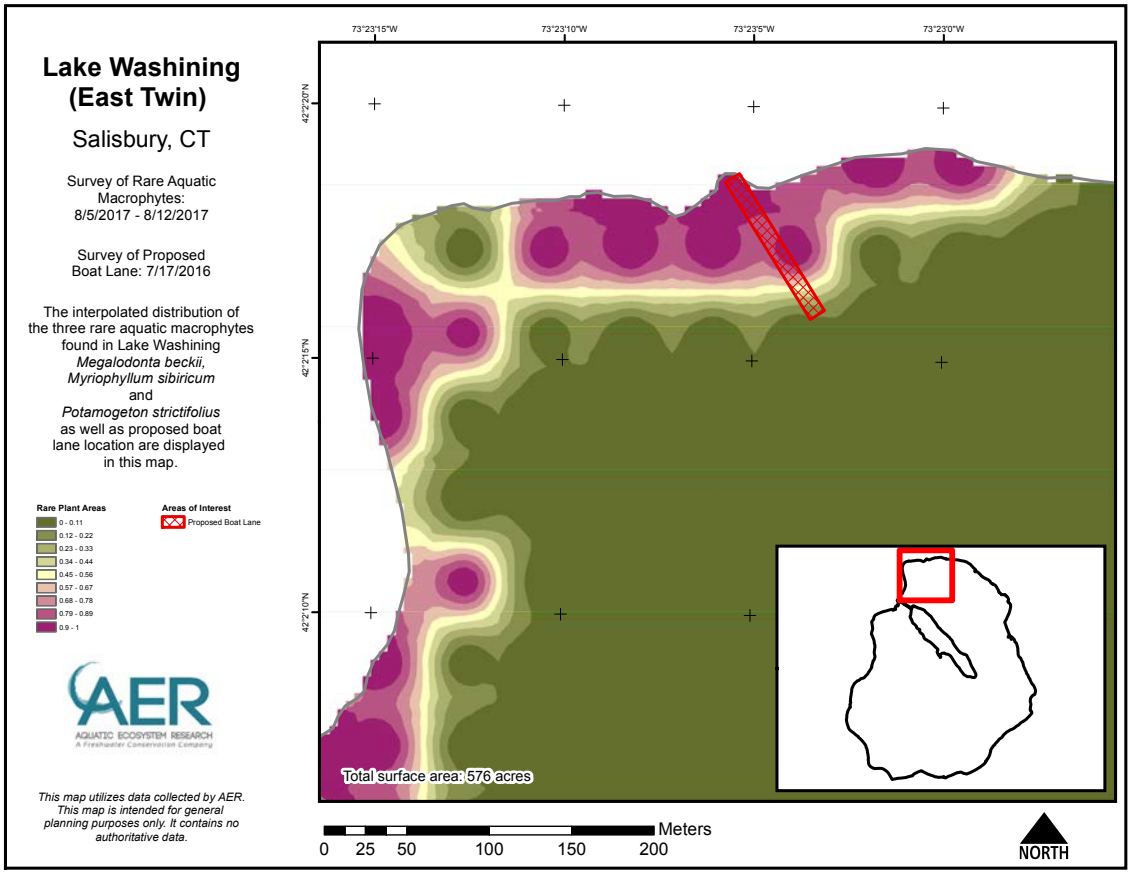

Figure 16: Specimen from UCONN herbarium – previously identified *Potamogeton strictifolius*