Chara
Muskgrass

Utricularia vulgaris
Common
Bladderwort

Najas gracillima
Slender
Water-nymph

Potamogeton Crispus
Curly Leaf
Pondweed

Hydrophyte Diversity Survey

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Elodea canadensis
Elodea

Potamogeton foliosus
Leafy
Pondweed

Najas Guadalupensis
Southern
Water-nymph

Ceratophyllum Demersum
Coontail

Summary

I surveyed the main marsh at Nahant Marsh to determine the diversity of hydrophytes (aquatic plants) throughout. There are some known aquatic species, but no previous record of plants to expect within the marsh. I surveyed eight species of hydrophytes, including one invasive species; they were all fully submerged. The highest diversity in the marsh is on the west and southwest sides, which is where the lowest human activity is, hence where the wildlife can thrive. These results show that there is a minimal amount of diversity overall in the main marsh, but what there is, is due to wildlife and introduction of the drainage ditch.

Introduction

Nahant Marsh is a diverse and well kept native area for plants but the aquatic plants have yet to be recorded. The main marsh is the most known place at Nahant as it has areas for the public along one side. This part of the marsh was converted with a preservation outlook in the year 2000 and has continued to develop. The changes within the marsh like floods, droughts, and agricultural runoff have been documented. However, it has not been thoroughly studied how these factors have affected the aquatic plants within the marsh. Maintaining a record of diversity is important so through time the efforts of conservation can be shown. The hydrophytes within the marsh provide shelter for animals, better vegetation quality for adjacent plants, and help stabilize water quality. I will survey the main marsh in eleven transects to record the amount and variety of plants in each sector. I will also be comparing the diversity of each transect to each other to better understand the underwater ecosystem Nahant has created.

Methodology

The main marsh was divided up into eleven transects each 250-300ft apart. The transects were made using Google Earth Pro to estimate their equivalence. Along these transects, a square meter quadrat was used every 10 meters to survey the area. When out on the water, stakes had to be used to keep the quadrat from floating away so that the correct area could be surveyed. The area inside the quadrat was cleared of floating foliage, then the hydrophytes beneath the water were counted by hand. If the plants were not tall enough to be seen, then a flashlight was used. If a plant had multiple stalks it was counted as one individual and if there were more than 100 individuals of the same species in an area it was marked as 100. If the plant could not be identified multiple pictures were taken of it using a camera, later it was submitted into the app iNaturalist to identify, and a Wetlands Vegetation book was used to identify as well.

The surveys were started at each transect on the edges of the water and a GPS coordinate was taken at the back left corner of the quadrat for each. A 100m open reel tape measure would be hooked onto the back left stake that held the quadrat in place. I would kayak until the tape measure would reach 10 meters and another stake would be put down marking the next area to survey. This process was repeated for the full eleven transects across the entire marsh.

Results

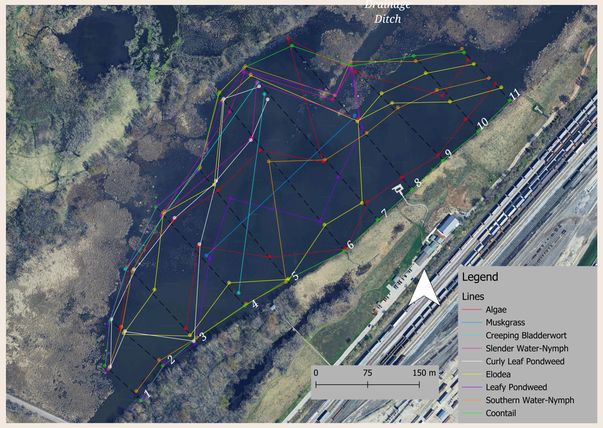

Figure 1: This image shows the area each hydrophyte encompasses through the eleven transects going from left to right across the marsh. Between the two lines of each color is the area enveloped by the accompanying plant, where the two lines represent the start and the end of that plants growth in each transect.

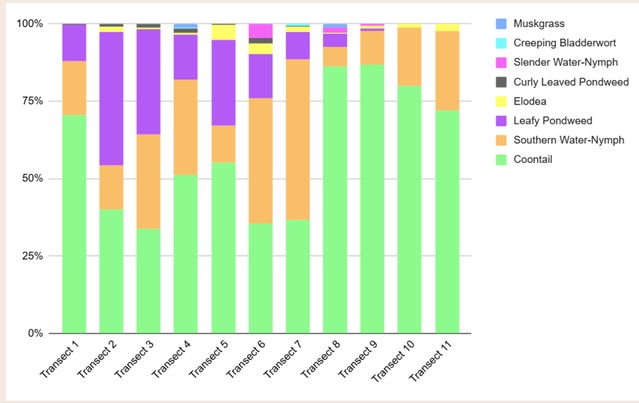

Figure 2: This chart displays the percent composition of each transect across the marsh, showing the different diversity levels. The transects go through the marsh from left to right matching the chart.

Shannon Diversity Index										
Transect 1	Transect 2	Transect 3	Transect 4	Transect 5	Transect 6	Transect 7	Transect 8	Transect 9	Transect 10	Transect 11
0.816	1.115	1.179	1.146	1.102	1.339	1.044	0.573	0.474	0.549	0.677

Table 1: Compares Shannon Diversity Index between each transect, quantifying species diversity across the marsh.

The eight different hydrophytes surveyed were used because they are all completely submerged aquatic plants that are shallowly rooted. In Figure 1, algae is included; previous observations show that there is more algae this year than in years past. It is important to track where it is currently to gauge growth for future years. Less algae ensures the fully submerged plants can continue to grow well. Out of the eight plants, one was an invasive non-native species called curly leaf pondweed. In Figure 1, it can be seen that the invasive plant is found on the west and southwest of the marsh, which is where a majority of the diversity is too. Figure 1 can help visualize where the diversity is in the marsh; it makes it clear that it starts at the drainage ditch and goes west, curving along with the marsh.

Figure 2 shows the percent out of 100 that each plant makes up in its related transect. It is organized from most to least abundant for clarity. The dominant plant in the marsh is coontail, followed by southern water-nymph and leafy pondweed. These plants are all native; however, coontail is the most dangerous because it could outcompete the other plants under high-nutrient environments.

Transects 2-7 can be seen as the most diverse out of them all in Table 1, as the values are above 1.0. The values for a diverse environment are 3.5 - 4.5 and as the numbers decrease the diversity level decreases. The Shannon Diversity Index is more influenced by rare species but the low values across the marsh indicate low species richness and evenness. The values show low diversity and that the marsh is dominated by a single species, coontail.

Conclusion

Based on the results, the conclusion made is that the main marsh is not a very diverse area. Still, a higher sampling size has the potential to increase the resulting diversity calculations. The marsh's diversity is promoted by the drainage ditch flowing into the marsh and the continued movement of wildlife throughout. The one invasive species is not much of a concern right now, but it is definitely something to take note of. The public areas on the south side of the marsh will continue to keep diversity low as there is limited movement in the water. Aquatic plants provide a food source and shelter for wildlife, so they are crucial to the ecosystem. The plants are thicker by the edges of the marsh to provide for the wildlife and keep the plants that are emergent or on shore healthy. Plants rely on each other to grow, and with so many native plants in and around the marsh, there is no doubt it will continue to flourish.

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