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NYS WATER RESOURCES INSTITUTE

Region 9 Aquatic Invasive Species Monitoring Program

Aquatic Vegetation Survey

Findley Lake, Chautauqua County, NY

Final Report, 2022

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AIS Monitoring Program: Problem Definition and Background

Aquatic invasive species (AIS) are non-native plants, animals or pathogens that have the potential to cause harm to the environment, economy, or human health once introduced. Some of these impacts can include competition with native species for habitat and food resources, predation on native species, and impairment of water quality. Over the past two centuries, the Great Lakes have seen the establishment of 188 non-native species introduced through ballast water of commercial vessels, canals, organisms in trade, and recreational boats and equipment. While there are numerous aquatic invasive species management activities being conducted by multiple agencies and special interest groups in Lake Erie and Lake Ontario, the capacity for similar efforts in inland waterways within the Great Lakes watershed in Region 9 of New York has been limited. Without knowing the full distribution and degree of establishment of invasive species, managers are less likely to be able to efficiently manage infestations and prevent their further spread. The Region 9 AIS Program aims to bridge the gap in this knowledge and assist in early detection-rapid response (EDRR) of aquatic invasive plants, invertebrates, and vertebrates through a variety of sampling techniques.

The Region 9 AIS Program was initiated in 2022 with the goal of monitoring high-priority water bodies for target invasive plant species, including hydrilla, water hyacinth, water lettuce, European frogbit, and water chestnut, to be added into the state's preferred data repository (iMapInvasives). The program aims to be a complete monitoring and management program that consists of a variety of survey components, all to provide a more descriptive picture of the presence of AIS in the region. These components include point-intercept submersed aquatic vegetation surveys of a random-systematic design for presence/absence and density of native and invasive plants using the rake toss method (Madsen 1999; Madsen and Wersal 2017), zooplankton sampling, and macroinvertebrate sieve surveys, where applicable.

Project Description

Site Snapshot	
Site Name and Location: Findley Lake, Chautauqua Co., NY	
Monitoring Date(s): 6/3/2022, 7/7/2022	**Monitoring Type(s):** Vegetation, Incidental macroinvertebrate
Acres Monitored: 53 (of 292)	**Observations Reported:** 305
AIS: Eurasian watermilfoil, curly-leaf pondweed, brittle naiad, mystery snail, zebra mussel	

The Region 9 AIS Strike Team conducted a point-intercept survey at Findley Lake on June 3, 2022 (continued on July 7, 2022). Typically, two surveys are performed (once in late spring/early summer and once in late summer/early fall) in order to ensure that phenology of individual species will be accounted for, but due to the size of the lake and available equipment we were unable to do a full season survey, nor were we able to reach a substantial portion of the lake. Findley Lake is 292 acres, with an average depth of 5.2 feet at all points sampled. The deepest part of the lake surveyed was 22.9 feet. The number of recreational users and subsequent wave action made our standard method using a motorized canoe very difficult, and thus we focused on the north side near the boat launch, as well as the heavily vegetated southern end. The dominant substrate type of the lake is muck. The dominant bottom coverage is macrophytes.

A total of 94 points were surveyed across both dates using the rake-toss method, a standard across New York state. Two rake tosses are performed at each point on either side of the vessel, with total vegetation density and individual species density collected. Density is recorded using the following scale: Zero (0), Trace (1), Sparse (2), Moderate (3), and Dense (4). The data collected is then averaged to estimate species density and frequency in both lakes, all of which can be found in the Appendix at the end of this report. It should be noted that a mechanical harvester was running throughout our surveys, and strong wave action pushed fragmented vegetation into coves near the lake edge; this will significantly impact the accuracy of species density estimates.

Invasive Species at Findley Lake

Three invasive plants were found in Findley Lake Lake: Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), and brittle naiad (*Najas minor*). Invasive species made up ~42% of the total species composition of the points surveyed in the lake. Yellow flag iris, an emergent invasive species, was noted at the southern end of the lake but excluded, as emergent vegetation is not the focus of our program. Zebra mussels were also found within the lake attached to vegetation and woody debris but have been excluded from analysis. Charts and maps of frequency, whole rake abundance (density) and species composition at each survey point can be seen in Appendices I and II.

Eurasian watermilfoil (*Myriophyllum spicatum*) is extremely dominant throughout New York and most of the United States. It can survive low water temperatures, giving it the ability to overwinter beneath ice and begin to grow earlier each season than most other native aquatic plants. Eurasian watermilfoil also has the propensity to form dense canopies, impeding recreation and contributing to declines in native aquatic plant diversity and abundance. Although Eurasian watermilfoil typically produces flowers twice a year which can be wind pollinated, in North American populations, fragmentation is believed to be the main source of spread. A piece of plant no larger than 2 inches, so long as there is a stem and a node with leaves, can establish an entire new infestation.

Curly-leaf pondweed (*Potamogeton crispus*) is dominant throughout New York and all of the United States. Vegetative reproduction through turions, or hardened overwintering buds that begin to grow in autumn and persist throughout the winter in a slow-growing or dormant state, is the most important form of reproduction for curly-leaf pondweed. This makes it one of the first plants to appear each season, appearing as early as February/March. Curly-leaf pondweed often outcompetes native plants and may impede recreation. It typically dies off by July, but has been persisting through the fall in many New York lakes in recent years.

Brittle naiad (*Najas minor*) is an under-reported but established invasive species in our region. This plant prefers slow moving areas of ponds, lakes, and reservoirs and is highly tolerant to turbidity and poor water quality. There are other native naiad species, but brittle naiad can be identified by thin, green, stiff leaves that curve downward, with serrated edges and pointed tips. When pulled from the water, brittle naiad holds its shape, unlike the native naiads. Stems fragment very easily (explaining why it was named 'brittle!'), contributing to its spread. It also spreads through seeds.

Mystery snails are robust invasive snails with coiled, spiral shells. When their shell is pointed up, the shell opening is on the right. They graze on lake and river bottom material. There are multiple species of mystery snails, but all are highly tolerant to poor water quality conditions due to the presence of an operculum, a trapdoor that closes and protects the snail until more favorable conditions arrive, which allows them to outcompete native snails. These snails give birth to live young and are nearly impossible to eradicate once established.

Zebra mussel (Dreissena polymorpha), a mollusk named for its dark, zig-zagged stripes on its shell, are triangular, shaped like the letter D, with a sharply pointed edge at the hinge. They can be found attached to objects and many surfaces, giving them the ability to clog pipes and block water flow, damage boats and other property, and injure water-goers with their sharp edge. Zebra mussels can also attach to other native mussels, which ultimately die because they cannot feed. They are also filter feeders that can rapidly filter entire bodies of water. During the summer, they filter a volume of water equal to all the water in the Hudson River estuary every 2-4 days! This efficient feeding method lessens the amount of food available to native invertebrates and other animals, disrupting food webs and threatening other species in the waterbody. Overall, once they are attached to an ideal surface, zebra mussels multiply rapidly and form dense colonies. One individual can release up to one million eggs each year.

Management

Best management practices are methods, techniques and plans that have been tested to achieve an objective, while keeping finance resources in mind. It is also critical to evaluate to feasibility and efficacy of potential management options as they relate to the overall goal of plant management within the lake. The primary management goals for invasive plant management considered by the DEC are prevention, eradication, and suppression/containment.

Prevention refers to management options that limit the spread and potential introduction of aquatic invasive species through education and outreach, physical barriers, decontamination methods, etc. New York's most successful prevention initiative is the Watercraft Inspection Steward Program, which educates hundreds of thousands of recreational water users and intercepts new invasive species attached to vessels, such as hydrilla, each year. To learn more about this program, visit https://www.dec.ny.gov/animals/107807.html#:~:text=DEC%2C%20Parks%2C%20and%20the%20NY%20Natural%20Heritage%20Program,are%20connected%20within%20and%20beyond%20New%20York%20State.

Eradication refers to control of a species to the point at which it is no longer found in the waterbody. This option is typically applied to emerging or less common species but may also be appropriate for early infestations of regionally widespread species. The evaluation of the feasibility eradication as a goal is highly necessary, as not all infestations are capable of being eradicated, especially considering the potential treatment options used. Some methods will be ineffective at eradication no matter the size of infestation, purely from the method's mode of action. Mechanical methods like harvesters, for example, rarely (if ever) result in full eradication, as there is a high potential for induced fragmentation and vegetative reproduction. Typically, hand-pulling and/or chemical control are the most appropriate activities for a goal of eradication. But remember, species can always be reintroduced, which is why prevention activities post-eradication for several years is important.

Suppression, or containment, refers to the management of a species to limit continued spread both within and outside of the waterbody, and potentially offset negative impacts to the ecosystem with priority treatment areas. This is a common goal for widespread species, especially at sites with high risk of reintroduction or sites with older, larger infestations. Physical methods such as hand-pulling, benthic barriers, mechanical harvesters, drawdown, and even targeted chemical control are options for suppression or containment. Another less common option with high potential is native plant restoration in areas that have plants with early-season senescence, such as curly-leaf pondweed. This may allow for native plant beds to take up space in disturbed areas that are at the greatest risk of invasion.

Recommendations for Findley Lake

Disclaimer: Mechanical harvesting is clearly being used to manage vegetative biomass for recreational purposes. If this is the overall goal for this lake, rather than a goal of dedicated invasive plant management, then the use of a mechanical harvester will continue to meet that need. The following recommendations are based solely with ecological community health/invasive plant control in mind, not recreational access.

Eurasian watermilfoil and curly-leaf pondweed are both widespread species in the region and state, and due to the extent of both species within the lakes, potential age of the infestations, and risk of reintroduction from recreational use, eradication is likely infeasible and control strategies with this goal in mind is not recommended. Curly-leaf pondweed is of highest concern, as it occurs more frequently and at higher densities than individual native species, however it should be noted that native *Potamogeton* species were found at equally high frequency and density, so it is unclear how significant the ecological impact of both Eurasian watermilfoil and curly-leaf pondweed is.

Should control of these two species be pursued, a goal management for suppression/containment is most appropriate with targeted herbicide treatments in areas of high density. It is understood that mechanical harvesters have been utilized at this site in the past to decrease vegetative biomass. Mechanical harvesters are not recommended for this site as a strategy for invasive plant management unless the intention is to continue annual harvesting in perpetuity, as this will not provide adequate, lasting control of Eurasian watermilfoil or curly-leaf pondweed due to the continuous reintroduction of plant fragments. Additionally, harvesters are non-selective, and may have a significant impact on the native plant community. There is evidence that harvesters can suppress AIS populations over time, but this is only if timely management occurs consistently for several years, even decades. Herbicide treatments could be done for one or two seasons and then spot treated intermittently at a much lower operational cost and with higher selectivity. Other non-chemical methods could be potentially successful but require substantially higher budgets and/or dedicated staff time (diver assisted suction harvesting, benthic barriers, etc.). More information on these techniques can be found in the Aquatic Ecosystem Restoration Foundation's Best Management Practices publication at [http://aquatics.org/bmp.html.](http://aquatics.org/bmp.html)

Aforementioned management strategies notwithstanding, continued annual or bi-annual monitoring for high-priority species as well as consideration for introducing a seasonal boat steward for AIS prevention is recommended.

Appendix I. Graphs and Tables

1. Plant Composition of Findley Lake

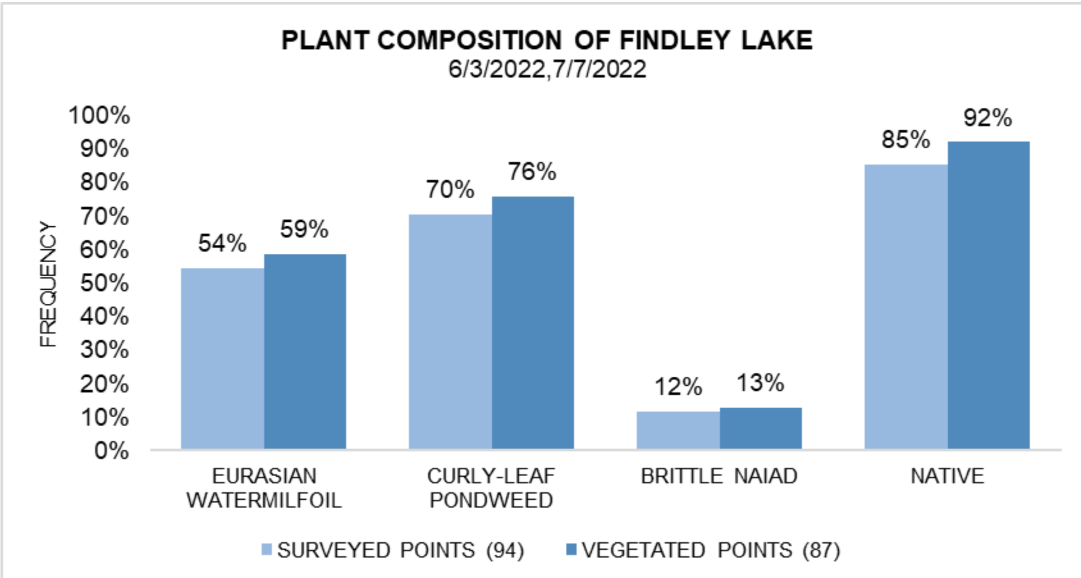


Fig. 1 Comparison of plant composition between **all surveyed** points and **vegetated** points in Findley Lake in 2022. This graph represents the overall frequency of individual species at all points surveyed within the lake as well as locations exclusively with vegetation. This can be interpreted as the frequency of surveyed points being representative for the entire lake, while the frequency at vegetated points is often higher because "zero" points have been eliminated.

2. Frequency and Density of Plants in Findley Lake

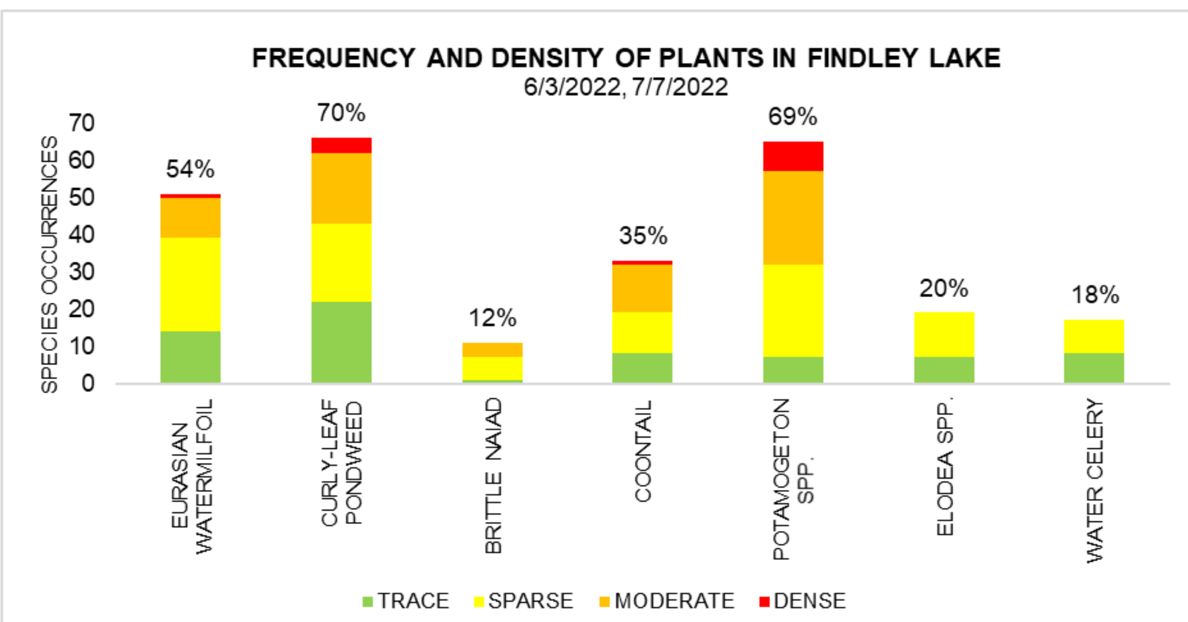


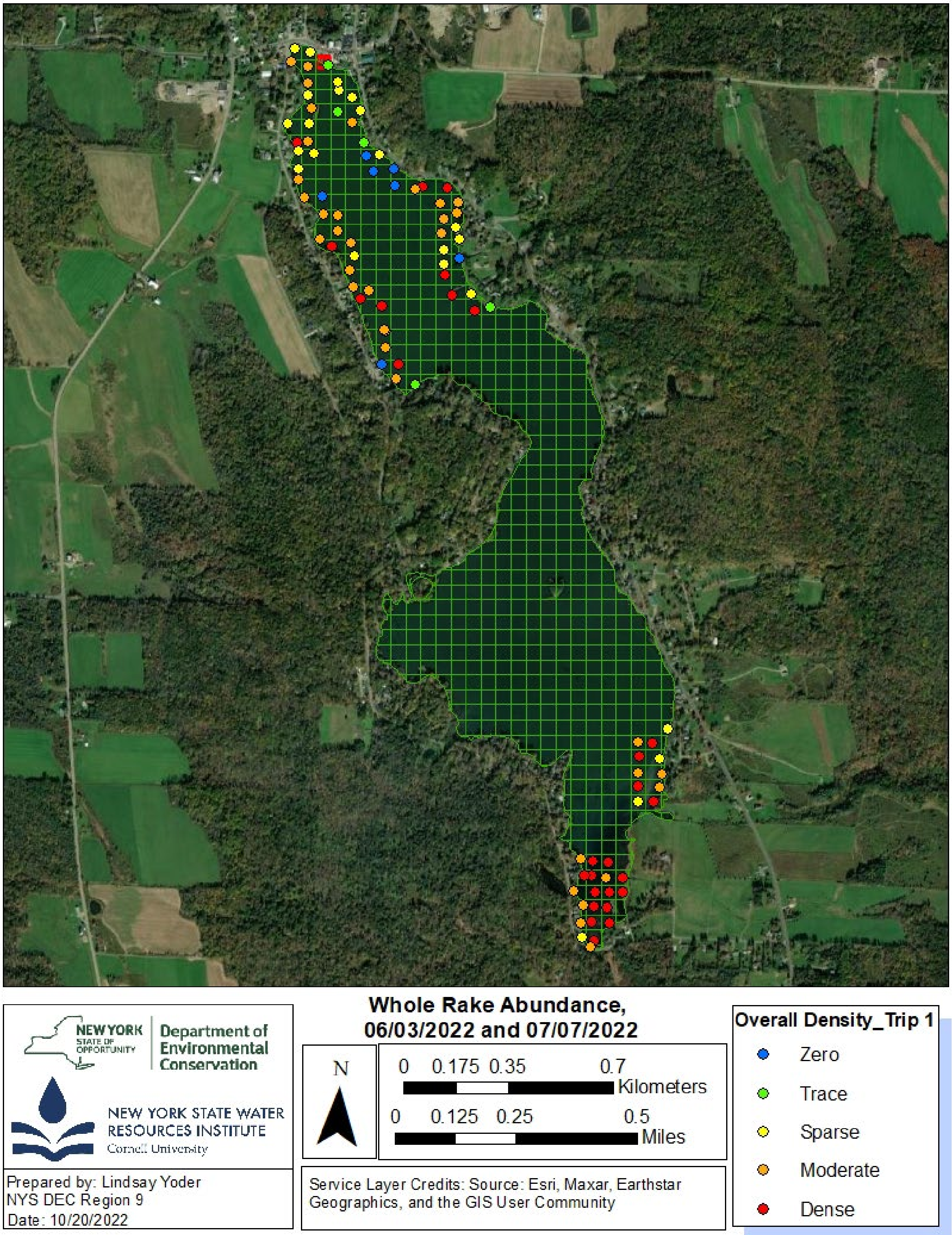
Fig. 1 Frequency and density of key native and invasive plants found in Findley Lake in 2022. This graph depicts the density or abundance levels (trace, sparse, moderate, and dense) broken down within the overall frequency of species at all vegetated points.

3. Overall Vegetation Summary of Findley Lake

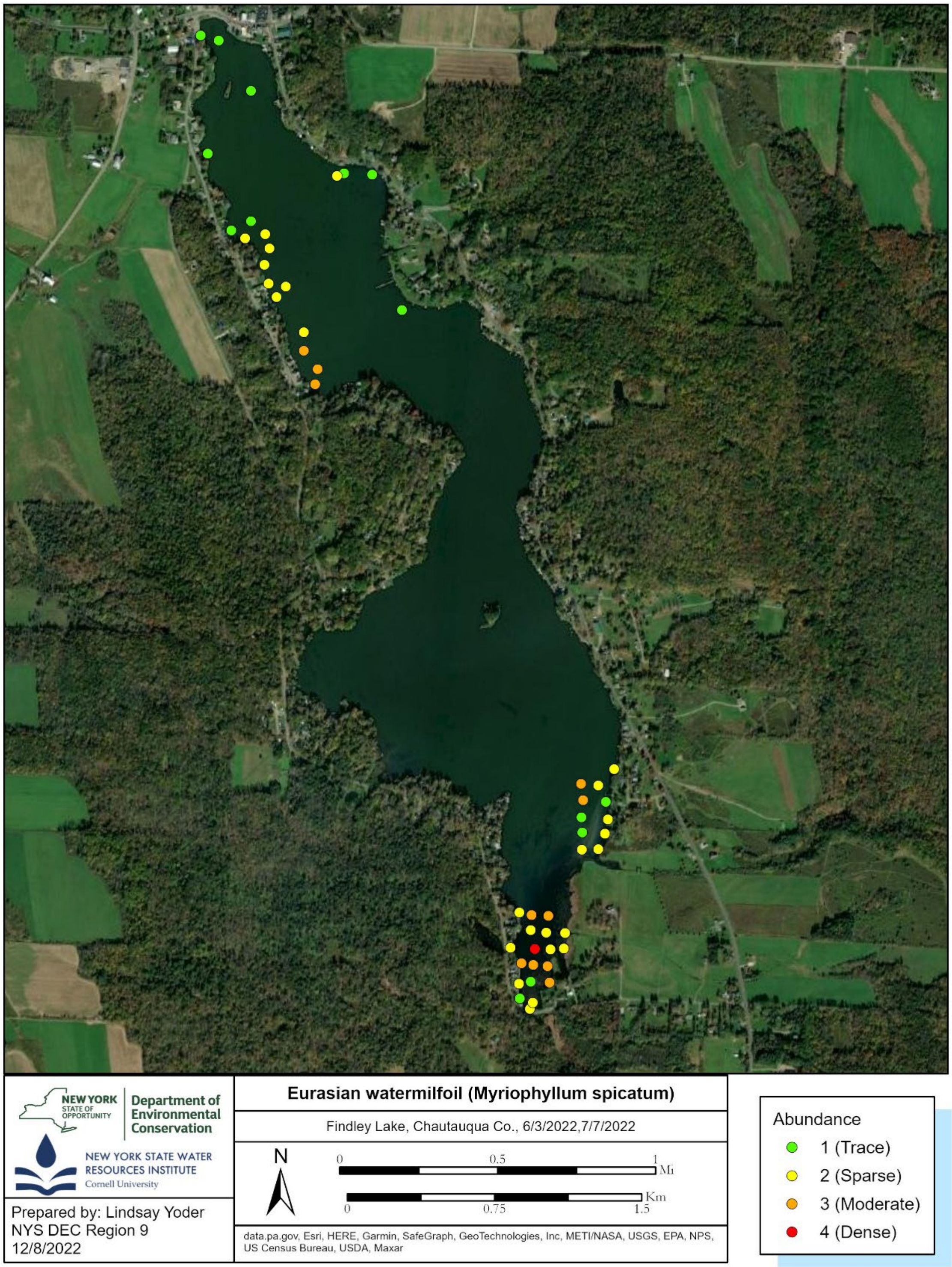
Lake Summary	June 3-July 7, 2022	Total Records: 94	Vegetated Records: 87	
Species	**Total Species Occurrences**	**Total Frequency of Macrophytes (All observations)**	**Total Frequency of Macrophytes (Observations with Vegetation)**	**Average Species Density (Observations with Vegetation)**
Eurasian watermilfoil	51	54%	59%	2
Curly-leaf pondweed	66	70%	76%	2
Brittle naiad	11	12%	13%	2.3
Potamogeton spp.	65	69%	75%	2.5
Coontail	33	35%	38%	2.2
Elodea spp.	19	20%	22%	1.6
Water celery	17	18%	20%	1.5
White water lily	9	10%	10%	2.3
Greater duckweed	8	9%	9%	1
Sago pondweed	8	9%	9%	2.5
Spatterdock	6	6%	7%	2.3
Common duckweed	5	5%	6%	1.2
Slender naiad	3	3%	3%	2.7
Bladderwort spp.	2	2%	2%	1.5
Flat-stem pondweed	2	2%	2%	1.5

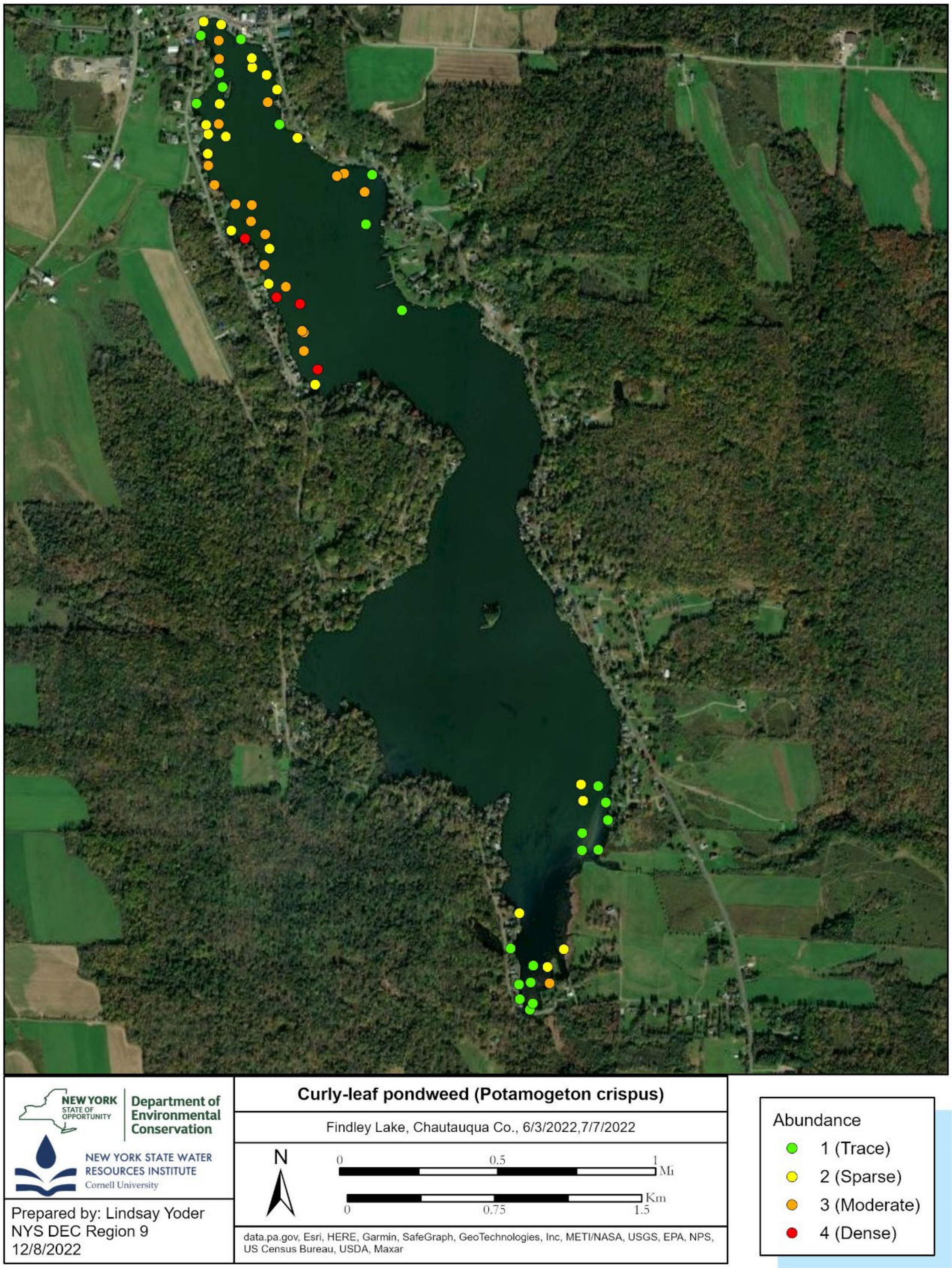
Appendix II. Maps

1. **Whole Rake Abundance**



2. Individual Species Density





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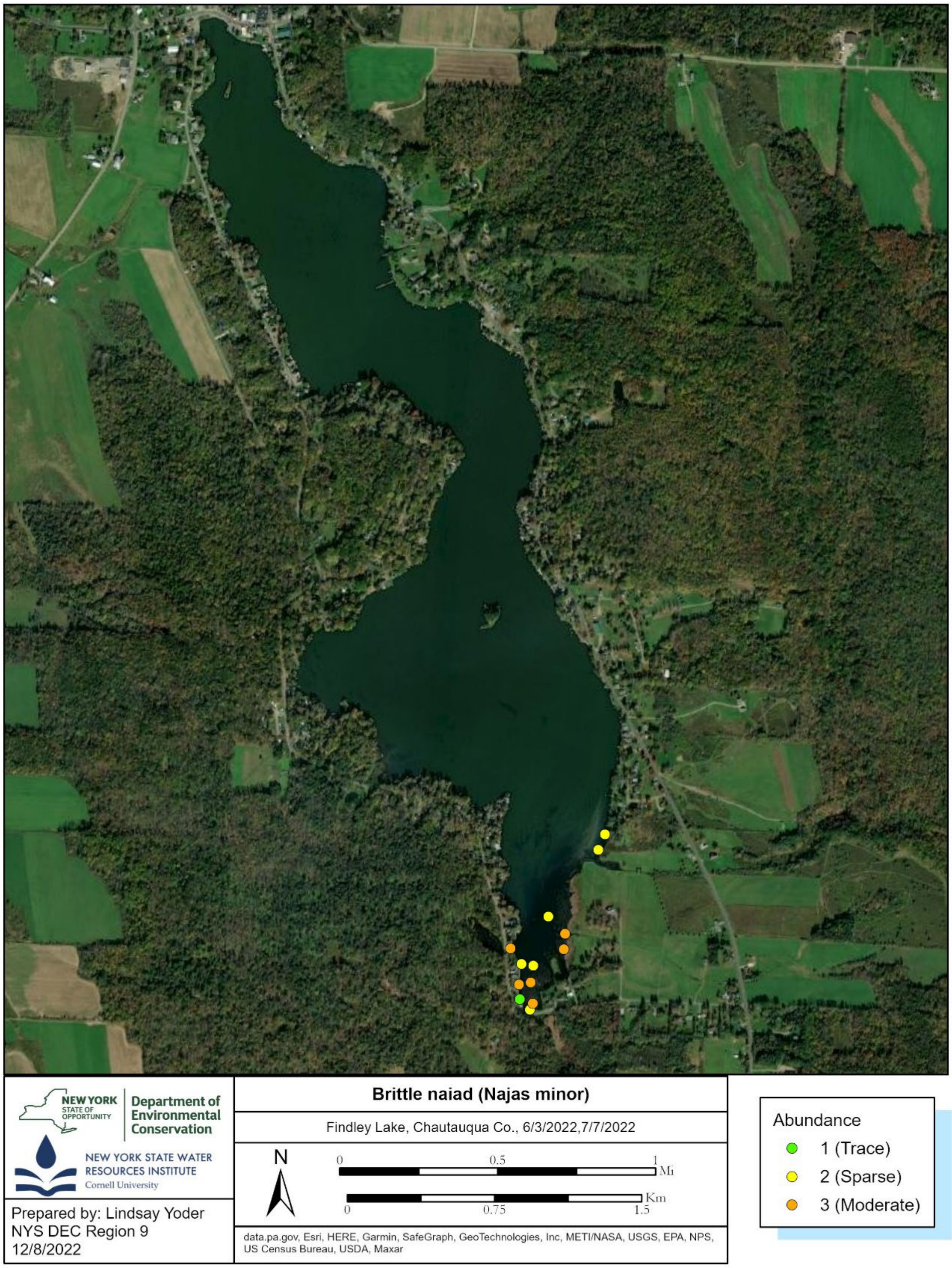
NYS DEC Region 9
12/8/2022
Curly-leaf pondweed (Potamogeton crispus)
Findley Lake, Chautauqua Co., 6/3/2022,7/7/2022
N
0
0.5
1
Mi
0
0.75
1.5
Km
data.pa.gov, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Maxar
Abundance
1 (Trace)
2 (Sparse)
3 (Moderate)
4 (Dense)



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Brittle naiad (Najas minor)
Findley Lake, Chautauqua Co., 6/3/2022,7/7/2022
N
0 0.5 1 Mi
0 0.75 1.5 Km
Prepared by: Lindsay Yoder
NYS DEC Region 9
12/8/2022
data.pa.gov, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Maxar
Abundance
1 (Trace)
2 (Sparse)
3 (Moderate)

Appendix III: Methodology

Submersed Aquatic Vegetation Survey (Non-motorized)
The AIS Strike Team technicians utilize the point-intercept method and a random systematic sampling design to monitor plant distribution in small waterbodies throughout Region 9. Sample points are selected based on pre-generated locations across a 50 m^2 grid, overlayed on the New York State Priority Waterbodies Listing polygon layer in ArcMap 10.7. Coordinates of sampling points are loaded onto Garmin eTrex 30 GPS units. Depth is recorded and points are surveyed using the rake-toss method, wherein a double-sided garden rake attached to 50ft of rope is thrown from the boat, allowed to sink, and slowly dragged to retrieve a representative sample of vegetation at a given location. Two rake tosses are performed at each point on either side of the vessel, with total vegetation density and individual species density collected. Density is recorded using the following scale: Zero (0), Trace (1), Sparse (2), Moderate (3), and Dense (4). The data collected is then averaged to estimate overall density and lake wide distribution and recorded in SASPro, housed in the Survey123 application, which is quality checked before approval to upload into iMapInvasives.

Invertebrate Sieve Survey
At the end of the survey, a mesh sieve will be used to sample for invertebrates in shallow areas near the shoreline, specifically focusing on the Asian clam, the New Zealand mud snail, and mystery snails. Sediment will be scooped into the sieve and water will be poured over the sample to wash away fine sediments. This will be repeated up to 7 times in a ray pattern as much as depth will allow. Sessile invertebrates (zebra mussels) will be documented by observing stationary objects/vegetation within the waterbody. Only invasive invertebrate samples will be kept. Invasive animals will be disposed of or collected in a sampling jar with lake water. All species will be collected in a container with oxygenated water from the site and euthanized by a 2-step euthanization process suitable for the taxon as outlined by the 2020 AVMA Guidelines for the Euthanization of Animals, as AIS cannot be re-released into the water as per 6 NYCRR Part 576. This process includes immersion in 95% ethanol (10-30 mL/L for fish or 10-50mL/L for invertebrates) for at least 10 minutes, and then frozen. Species will be stored in 70% ethanol for preservation for educational purposes or disposed of. The species found will be noted in SASPro.