2021 CAPITAL REGION PRISM

Aquatic Invasive Species Surveys

Early Detection Team Report

ADIRONDACK RESEARCH

2021 Capital Region Aquatic Invasive Species Surveys

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Background Cover image: Ballston Lake, Saratoga County, June 2021.

Executive Summary

Invasive species are any kind of living organisms that are not native to an ecosystem and causes some sort of ecological, human health, or socio-economic harm. In 2021, Adirondack Research, a private research and mapmaking firm constituted the Capital Region PRISM's Aquatic Invasive Species (AIS) Early Detection Team. The team surveyed prioritized lakes and ponds in the Capital Region PRISM with a focus on discovering and documenting new populations of European frog-bit (*Hydrocharis morsus-ranae*) and used data collected in the field to produce individualized maps documenting AIS distribution, bottom sediment hardness, and bathymetry.

In this report, we address the results of this year's work along with recommendations for continuing and adapting the survey strategy to enhance early detection and rapid response capabilities as well as ways to continually improve ongoing efforts to address AIS impacts in the Capital Region.

Figure 1: Illustration of the survey techniques utilizing a combination of sonar recording and manual rack toss.

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Acknowledgments

The Capital Region PRISM, a program hosted by the Cornell Corporation Extension of Saratoga County, is one of eight PRISMs in New York State whose mission is to protect the Capital region from the negative impacts of invasive species. The Capital Region PRISM contracted Adirondack Research during the 2021 field season to conduct AIS early detection surveys on 9 lakes in the Capital Region. Field work, data collection and the compilation of the narrative, maps and materials included in this report were conducted by Thomas Firkins, Patrick Bly, Lura Johnson, Mark Privee, Joshua Young, Timothy Murphy and Dr. Ezra Schwartzberg, who constituted the Capital Region Early Detection Team. Project planning and lake prioritization was conducted by Kristopher Williams, Invasive Species Coordinator of the Capital Region Prism.

Completion of this project would not have been possible without members of lake associations, businesses and other agencies: Capital Region PRISM, Kristopher Williams, Cornell Cooperative Extension, and McConchie's Heritage Acres Campground. We are grateful for their role in protecting many of these important Capital Region lake ecosystems.

This project was advanced under contract with Adirondack Research, with funding provided by New York State's Environmental Protection Fund as administered by The Cornell Cooperative Extension.

Photo 1: *Research Technician, Josh Young investigating aquatic plants on Ballston Lake, Saratoga Co., NY in June 2020.*

Introduction

By deploying an Early Detection Team, new infestations of aquatic invasive species can be quickly recognized, and appropriate management actions taken before significant impacts are observed. Surveys this year were the second of two initial years completed by Adirondack Research and were part of a pilot study to better understand how to prioritize lakes in the Capital Region PRISM for future aquatic invasive species early detection surveys. Each survey on a lake had an emphasis on searching for European frog-bit since it has such damaging effects to waterbodies and waterways. European frog-bit is a free-floating aquatic plant with small heart shaped leaves. This invasive aquatic plant species thrives in shallow, slow moving, calcium rich waters. The plant regenerates by producing over-wintering turions that float to the surface in the spring and begin to grow. From there the turions are able to float downstream or around the waterbody and create new infestations and clog waterways[1] .

Photo 2: *Research technician Patrick Bly with a dense rake toss of European frog-bit from Weaver Lake, August 2020.*

That said, early detection has always been the primary goal of the Team. Starting in 2020, the Team began using the Lowrance HDS Live Chartplotter and ReefMaster cloud processing platform (to map bottom hardness and bathymetry) as part of standard protocol. Bottom hardness is determined by using the strength of sonar reflectivity to infer whether the bottom is soft, medium or hard. Generally, sound signals reverberate strongly off hard substrates such as gravel and rocks and weakly off soft substrates such as muck and mud. In the maps presented in this report, the darkest shade of orange is the hardest and the lightest shade of orange is the softest. Data captured on the Lowrance HDS Live Chartplotter were uploaded to the ReefMaster web interface and then post-processed with Arc GIS Pro and Adobe Illustrator with Avenza MAPublisher to create the maps displayed in this report. This information will be used to inform invasive species vulnerability assessments to better prioritize and allocate resources for future early detection surveys.

Photo 3: *Photo of European frog-bit with its small white flower. Note small, heart shaped leaves similar to lily pads (Photo from WNYPRISM, 2020).*

[1] *Jacono, C.C., and L. Berent, 2020, Hydrocharis morsus-ranae L.: U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=1110, Revision Date: 8/19/2019, Access Date: 8/25/2020*

Objectives

The primary objective of the AIS Early Detection Team was to detect and delineate any new or existing aquatic invasive plant or animal infestations within prioritized lakes with an emphasis on surveying for European frog-bit. The secondary objective was to deploy the Lowrance HDS Live system to map the contour lines and bottom hardness of all waterbodies to gather important baseline data on the physical parameters that influence aquatic species invasion.

Species Prioritization – A tier ranking system

The PRISM has categorized invasive species based on known populations into a tier ranking system. The purpose of the tier system is to focus attention on high threat species that are not found in our region or are appearing in small populations that are manageable with limited resources. Preventing the introduction of new species is the most cost-effective strategy in controlling invasive species. Early identification and rapid response to new infestations that are found in small populations can result in successful eradication that are cost effective. When an invasive species is found regionally over a widespread area the cost to control populations can become prohibitive.

Photo 5: *Water chestnut and variable leaf milfoil among native plants on Ballston Lake, Saratoga Co., NY in June 2021.*

Tier 1 - Prevention / Early Detection

Tier 1 includes species that are not in yet PRISM, but that have anticipated high or very high impacts. Species delineation is necessary when new populations are found to advise on management.

- **Tier 1a:** Species not in the PRISM, but in the buffer (surrounding PRISM)
- **Tier 1b:** Species not in PRISM or the buffer, but in Eastern North America (with potential for establishment)
- **Tier 1c:** Species far outside PRISM and buffer (not in east NA), but introduction pathway exists

Tier 2 – Eradication / Full Containment may be Feasible

Tier 2 species have high and very high impacts but with low enough abundance and suitable treatment method available to make eradication feasible within the PRISM. These warrant the highest level of early detection and response efforts and surveys are designed to delimitate populations to determine the full extent of such populations.

Lake Selection and Prioritization

Lake selection was done by Kristopher Williams from Capital Region PRISM, along with recommendations from Adirondack Research, to establish a baseline survey for ten lakes in the Capital Region PRIM due to no lakes having this type of survey before. From the results this summer, researchers will be able to look at the data and prioritize lakes in the future for performing early detection surveying for AIS and European frog-bit.

Photo 4: *Research Technician Alex delineating beds of invasive milfoils on the tablet-based Arc Collector app.*

Methods

Equipment

Equipment used during this project consisted of double-sided rakes, Lowrance HDS Live Chartplotters, Bluetooth GPS antennas (Garmin GLO), and iPad 4 minis equipped with a cellular connection. Data and observations were recorded on iPad 4 mini using The Nature Conservancy's Invasive Plant Mobile Monitoring System (IPMMS), an Esri Collector for ArcGIS application. Surveys were completed using console motorboats or canoes, depending on waterbody access. Since the team was accessing multiple waterbodies over the course of each week, specific precautionary measures were taken to guarantee all equipment was decontaminated between waterbodies. Equipment was decontaminated using the Adirondack AIS Prevention Program's free boat wash and decontamination services located throughout the Adirondack Park. The team visited several different decontamination stations, multiple times, over the course of the summer. High pressure and hot water were used to kill any organisms, native or invasive, present on equipment after surveys. The specific equipment that was decontaminated by professional decontamination technicians included: motorboat hulls, trailers, motor lower units and bilges; canoes and paddles; ropes and all jars and containers.

Photo 6: On of Adirondack Research's watercrafts and equipment used for surveys.

Littoral Zone Plant Surveys and Identification

The littoral zone of each lake was surveyed for aquatic plants by the Early Detection Team from shoreline to a depth of about 15 feet, although the littoral zone water depth and distance from shore varied between waterbodies. Some waterbodies were completely comprised of littoral zone; others contained little area that supported plant growth. The team surveyed in a zig-zag search pattern, using visual detection from the surface in combination with the sonar output from the Lowrance unit, to locate plant beds. Once a plant bed was located, rake tosses were conducted to retrieve and identify plants that could not be confirmed through visual detection alone.

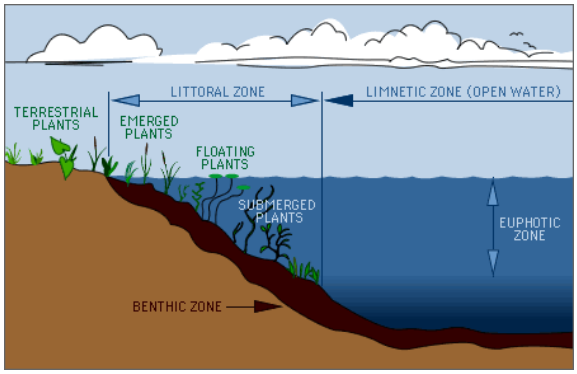


Figure 2: Illustration depicting the littoral zone on a waterbody.

Figure 3: *Example of AIS polygon delineated on a waterbody in the Capital Region.*

All plants retrieved, invasive and native, were identified using the field guides: "Aquatic Plants of the Upper Midwest" by Paul M. Skawinski and/ or "Maine Field

Guide to Invasive Aquatic Plants and Their Common Look Alikes" by the Maine Center for Invasive Aquatic Plants and Maine Volunteer Lake Monitoring Program. If an AIS infestation was detected, an occurrence point was marked in its approximate center using the IPMMS. The occurrence feature classifies which species is present and contains unique naming and attribute information for the specific infestation. After an occurrence was entered, the team collected an assessment polygon for the infestation. An assessment polygon was mapped by circumnavigating the exterior boundary of the infestation. The percent cover of the invasive plant was documented for each assessment polygon. Since the polygon is marked with GPS points, changes in acreage and percent cover can be monitored over time. The most common native plants identified were also recorded and noted for this report. However, complete lists of native plants and their abundance in each lake were not recorded.

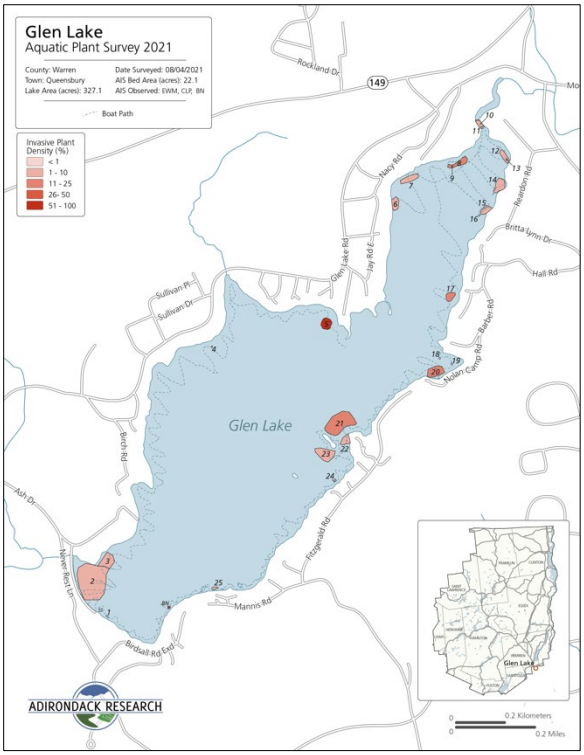


Figure 4: *Example of AIS polygon delineated on a waterbody in the Capital Region.*

Complete Lake Mapping

When conducting plant surveys, the AIS Early Detection Team focused efforts in the littoral zone of each waterbody. In the littoral zone, sunlight can penetrate through to the bottom of the lake, which allows for plant growth. Typically, the littoral zone of a lake is exclusively near shore. However, as advancements are made in underwater mapping and new technologies arrive, it's becoming more apparent that we are all still learning about what lies below the surface of many lakes and ponds. Sunken islands or ridges can arise in seemingly deep water, resulting in potential aquatic plant habitat in unexpected locations of the lake. Covering all acreage of a waterbody lessens that chance of missing a "hidden" area of plant growth.

On lakes or ponds where complete lake mapping/surveys were conducted, the Team generally split the waterbody in half and each team of two paddled or drove from shore to shore in their respective half. To ensure no gaps in coverage occurred, each pass was done about 120 feet apart, which is within the range that ReefMaster can automatically interpolate lake characteristic parameters. For the purposes of this report, complete lake mapping/surveys refer to this method of data collection from the entire acreage of a lake or pond. Surveys of the littoral zone are still considered "completed," but they do not typically include waterbodies in their entirety.

Photo 7: *Research vessel 'The Predator' cruising down the lake in July 2020 on a waterbody in the Capital Region.*

Data Management

To ensure all data collected in the field were safely stored, redundant copies were kept at multiple steps throughout the collection process. Following are the steps taken to store and organize data:

Lowrance Chartplotter

1. Data collected on the Lowrance Chartplotter were saved on 32GB memory cards in the field.
2. New files were created and saved every hour to lessen the amount of data lost if a file became corrupted.
3. At the end of each week, data collected from the Lowrance Chartplotter and stored on memory cards were saved on a computer and backed up on a separate external hard drive.
4. Once backed up, data from the Lowrance Chartplotter were uploaded to the ReefMaster platform and processed. All processed data were then copied onto Adirondack Research's cloud data storage. Chartplotter data were also backed up (third copy) to cloud storage periodically.

ESRI ArcGIS Collector App – Invasive Plant Mobile Monitoring System (IPMMS)

1. Esri ArcGIS Collector data were backed up on the Esri server weekly. All ArcGIS data were uploaded to Adirondack Research's cloud storage in the middle of the field season, then again at the end of the season.

Paper Collection

1. Lists of native plants identified were recorded on paper and transcribed to digital form weekly.

GIS

1. Post processed GIS data (lake boundaries, invasive plant bed polygons and associated data, point data from Kriging interpolated biovolume, bottom hardness and bathymetry) were stored as GIS shapefiles in vector and raster format, depending on data source.
2. All GIS shapefiles and attribute tables were packaged and submitted to the Capital Region PRISM with this report and will be cross-walked to iMapInvasives for long-term storage and retrieval.

GIS Data Processing

GIS data were exported directly from ReefMaster and then post processed using a secondary Kriging interpolation. ReefMaster interpolated data to estimate and plot the geospatial extent of two parameters: bottom hardness and bathymetry. Data was further post-processed (exported in point and grid format) using subsequent interpolation to achieve the rasterized visualizations of these parameters displayed in the maps included in this report. Our interpolation was checked against the visual output available directly from ReefMaster on their web interface and confirmed that our interpolation methods resulted in identical visualizations of the two parameters mentioned above. These interpolations are stored as raster images in our report and the actual data points that created these images (available from ReefMaster or from raw sonar files) will need to be further processed if used for GIS-informed risk assessment.

The main uses of this GIS data are to record and track AIS abundance and distribution. Data was also used to create visually appealing lake maps for each of the 9 lakes surveyed. Because AIS presence data were collected using an Esri Collector for Arc GIS app, the original shapefiles recorded during each survey are stored in and are accessible through the GIS database accompanying this report.

Scheduling and Travel

The team of six worked 40-hour weeks, spending the majority of time in the field and the rest in the office planning for the following week and uploading and processing data. To increase efficiency and reduce travel costs, lodging near clusters of lakes to be surveyed were selected each week. Lake survey order for the week was determined by distance to lodging, weather, and scheduling with lake associations.

Photo 8: *Research Technician Josh Young examining water chestnut on Ballston Lake, Saratoga Co., NY.*

Photo 9: *A rake toss sample with Eurasion watermilfoil.*

Results

Between June 9 and August 6, nine lakes and ponds were surveyed with the objective of AIS early detection. Of the nine lakes, eight were documented to be invaded by at least one AIS. Even though eight lakes and ponds surveyed contained AIS, all had been documented as invaded prior to 2020. No newly invaded lakes or ponds were discovered by the Early Detection Team in 2021. The most common AIS detected was *Myriophyllum spicatum* (Eurasian watermilfoil), which was detected in eight of nine lakes and ponds. Six lakes contained *Potamogeton crispus* (curly-leaf pondweed). Lakes surveyed ranged in size from 9.9 acres (Dead Lake) to 327.1 acres (Glen Lake). Approximately 144.8 acres of beds containing invasive plants were mapped.

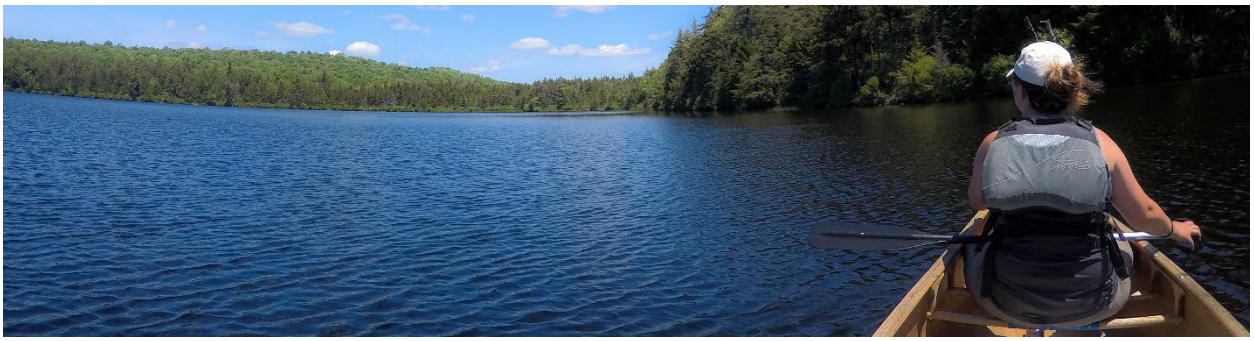


Photo 10: *Research Technician Sarah in 2019 on Horseshoe Lake, St Lawrence Co., NY.*

Native Vegetation

Below is a list of the common native plant species recorded in each surveyed lake. Assessing native vegetation biomass and richness was not the top priority but native aquatic plants were recorded when observed to better understand the plant community of the waterbody.

Capital Region Native and Invasive Plant List		Ballston Lake	Champlain Canal	Dead Lake	Dyken Pond	Glen Lake	Hedges Lake	Lake Lauderdale	Mayfield Lake	Schoolhouse Lake
Eurasian watermilfoil	*Myriophyllum spicatum*	*	*	*		*	*	*	*	*
Curly-leafpondweed	***Potamogeton crispus***	*	*			*		*	*	*
Brittle naiad	*Najas minor*					*				
Water chestnut	***Trapa natans***	*	*							
Bladderwort	*Utricularia sp.*					*				
Blue flag iris	***Iris versicolor***				*					
Broadleaf arrowhead	*Sagittaria latifolia*	*								
Cattail	***Typha sp.***	*					*	*		*
Claspingleaf pondweed	*Potamogeton perfoliatus*		*			*	*	*		
Common bladderwort	***Utricularia vulgaris***	*			*					
Common duckweed	*Lemna minor*		*					*		
Common eel grass	***Vallisneria americana***		*		*		*	*	*	*
Coon tail	*Ceratophyllum demersum*	*	*				*		*	
Elodea	***Elodea sp.***			*		*	*	*		*
Floatingleaf pondweed	*Potamogeton natans*		*	*	*			*		
Largeleaf pondweed	***Potamogeton amplifolius***		*		*		*	*	*	*
Little floating heart	*Nymphoides cordata*				*					
Narrowleaf burr reed	***Sparganium angustifolium***		*		*	*				
Pickerelweed	*Pontederia cordata*		*							
Robbin's pondweed	***Potamogeton robbinsii***		*					*	*	
Slender pondweed	*Potamogeton pusillus*							*		*
Slender waterweed	***Elodea nuttallii***		*						*	
Spatterdock	*Nuphar variegata*	*	*				*	*		*
Thread-like naiad	***Najas gracillima***			*			*	*		*
Threeway sedge	*Dulichium arundiaceum*				*					
Watershield	***Brasenia schreberi***	*		*	*				*	
White water lily	*Nymphaea odorata*	*	*		*	*	*	*	*	*
Naiad spp.	***Najas sp.***					*				
Pipewort	*Eriocaulon aquaticum*					*				
White stemmed pond weed	***Potamogeton praelongus***					*				

Table 1: *Native vegetation table for each surveyed lake.*

Data and Research Limitations

Project results were affected by various sources of data error, time limitations, and equipment issues. Acknowledging these limitations provide a more prudent analysis of the data and assist with planning for future surveys.

Survey Accessibility

The team used either a canoes or motorboats to complete surveys depending on the accessibility and size of each waterbody. The canoes allowed the team to access lakes with restrictions on motorized usage, whereas the motorboat gave the team opportunity to conduct field work on a sturdier platform. There were limitations associated with each mode of transportation. Lakes and ponds are not always comprised of unobstructed, open water. Many waterbodies surveyed contained downed trees, stumps, rocks, emergent tussocks, mats of floating and submerged plants, or human improvements, such as docks and blocked off swimming areas. These obstacles limited the team's accessibility by both canoe and motorized watercraft. When accessibility was limited, the team maneuvered the vessel as close to the obstacles as possible while ensuring their safety and that of other lake users. When not using canoes, shallow bottom low draft aluminum boats used for this project worked well for these situations, but an outboard motor with electric trim was critical. However, even with this setup some areas were still inaccessible by boat. As a result of these accessibility limitations, the maps produced for this report may not provide a complete representation of the aquatic vegetation in each lake or pond – especially for shallow areas near shore. Areas unable to be accessed have been identified by hatch marks and labeled "Not Surveyed" in each map's legend.

Photo 11: *Research technician Mark Privee with a rake of coontail and brittle naiad on a waterbody in the Capital Region, July 2020.*

Technology

Various technologies were deployed over the course of this project to improve survey effectiveness and efficiency. The Esri ArcGIS Collector App ran on a cellular iPad Mini 4 tablet with an internal GPS antenna. This set-up was used to map invasive plant beds and mark locations, but spatial accuracy was often limited to around 16 feet due to terrain and insufficient satellite signals. Therefore, spatial data collected over the course of the project is potentially affected by this 16-foot variance. The team did their best to hold the boat stationary and reduce any drifting of the canoe or motorboat while collecting GPS data. Even with this care, the team had difficulty mapping the area of smaller plant beds.

The Lowrance Chartplotter and ReefMaster platform were not new to survey protocol in 2021. This same setup was utilized in 2020. During the 2020 and 2021 seasons, the team identified potential sources of error associated with the Lowrance HDS Live Chartplotter and ReefMaster platform. First, when navigating through dense beds of vegetation, the sonar was not able to accurately detect the lake or pond bottom to map sediment hardness and bathymetry. To eliminate this error, surveys focused on bathymetry and bottom hardness should be done in spring or early summer or in areas with less

vegetation. When the transducer is in less than 2 feet of water, the sonar is not able to collect data. This results in data gaps that can only be corrected with visual confirmation or estimation of bottom hardness and bathymetry. Outputs may show areas of no bottom hardness because of these limitations. These limitations are also identified by hatch marks and labeled "Not Surveyed" in each map's legend.

Future deployment of the Lowrance Chartplotter, transducer and ReefMaster platform will likely improve over time as the early detection teams become more familiar with the intricacies and limitations of these technologies.

Survey Thoroughness

The zig-zag search pattern used by the team increased the total area surveyed per lake, but it is not the most comprehensive technique to identify every species in a waterbody. Since the main goal of this project was to detect and identify invasive species, specifically European frog-bit, documenting overall abundance of native vegetation was not a priority, and therefore, the serpentine search pattern offered the most effective method to meet project goals. With the serpentine search pattern, not every section of water is covered, but the likelihood of missing invasive plant beds is minimized while significantly increasing survey efficiency and reducing cost. There is the possibility that some small invasive plant beds (or single plants) were missed using the serpentine search pattern, but future repeat surveys will help ensure any missed small or isolated infestations will be detected. Survey techniques aside, other factors can influence survey thoroughness including seasonal survey timing, water clarity, or weather conditions. Day to day and year to year changes in survey condition may result in minor variations in documented plant species and abundance.

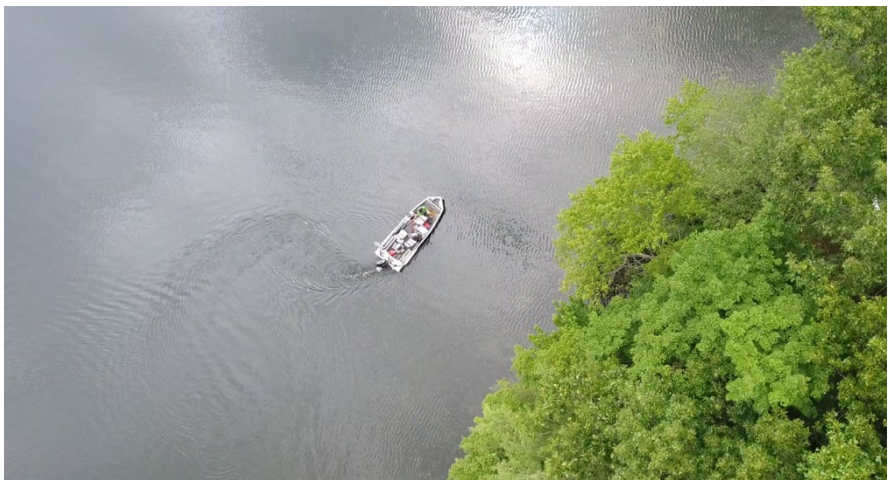


Photo 12: *Research vessel performing 'zig-zag' patterns on Lake Sunnyside, June 2020.*

Recommendations

Adirondack Research provides the following set of recommendations to improve future project effectiveness and techniques used to detect AIS infestations as they relate to informing management decisions.

Crew Size and Training

Optimal early detection team size is dependent on the project scope of work. If deploying the ReefMaster platform or C-Map BioBase to produce detailed lake characteristic maps becomes a higher priority, a larger crew will be necessary, as this component of the survey protocol adds considerably to the time/resources required to survey and map each lake. This especially applies to larger lakes and ponds that have larger surface areas to map. In 2021, the team of six was able to complete serpentine

search surveys as well as complete ReefMaster throughout the littoral zones of on nine waterbodies in which data was used to produce complete lake maps and AIS infestation beds delineated out.

Setup and maintenance of the technology used for this project are vital to collecting accurate, reliable data. Familiarity with the equipment is not a penultimate prerequisite, but it does keep the short field season running smooth. With new technologies comes troubleshooting and periods of trial and error. Understanding intricacies, nuisances, and common issues with the system will prove invaluable in the field.

Technology

With regard to the ReefMaster platform, the data and maps produced by this technology will be a tremendous asset to lake associations and communities looking to monitor or manage AIS. The data provide detailed waterbody-specific characteristic information with increased accuracy and at reduced cost than top-water or diver-assisted surveys. Utilizing these data to develop geospatial vulnerability models of aquatic invasive plant establishment and spread for individual lakes can help target future early detection surveys and to direct regional AIS spread prevention measures. For example, the bottom hardness data produced may allow for predictions of lake vulnerability to aquatic invasive plants, or even invasive mollusk establishment.

Survey Prioritization

We chose nine lakes in coordination with recommendations by the Capital Region PRISM staff based upon whether lakes have active management or whether they were in areas of high Ecological Significance Score as well as a high Comprehensive Score as determined by NYNHP in the NYSDEC Environmental Resource Mapper tool (https://gisservices.dec.ny.gov/gis/erm/). Additional selection criteria that can be used in subsequent years could include surveying lakes with requests by lake associations or by utilizing other criteria related to proximity of known invasive species infestations. In the Adirondacks, the regional PRISM is attempting to survey all publicly accessible lakes and ponds, so they have a prioritization plan that favors certain lakes over others based upon the last data of survey, whether it has public access, and whether it is surveyed by lake associations or citizen scientists. For the Capital Region, it makes more sense to use predictors of new infestations in a lake rather than access or survey history. I think a combination of Ecological Significance scores (mentioned above) combined with a GIS analysis of proximity to infested waterbodies by utilizing iMapInvasives data could yield a prioritized list of lakes in which to perform surveys in 2022.

Photo 13: *Research vessel, 'Predator' on Lake Sunnyside performing transects during June 2020.*

Lake Access

Lake access is often a challenge to performing surveys. This year, we attempted access to Kyser Lake, which straddles the Fulton/Herkimer County line. We are optimistic that we can gain access to this lake for a survey in a subsequent year. The amount of time needed to gain access to some lakes is long, and we recommend reaching out to lakes in February to gain access. For some lakes with difficulty, a letter

from the PRISM Coordinator works well to explain the program and the scope and use of the AIS surveys. We have generally had good luck with this approach.

Conclusions

The 2021 AIS Early Detection Team surveyed nine waterbodies in the Capital Region PRISM and did find several infestations of AIS on most of waterbodies surveyed, Dyken Pond did not have any AIS that were discovered by the team. AIS recorded include: Eurasian watermilfoil, variable leaf milfoil, and curly leaf pondweed.

Maps

The following section includes lake survey maps and description narratives of the nine waterbodies surveyed in 2021. Each lake map includes either invasive plant beds delineated using the Collector for Arc GIS app, lake bathymetry, or lake bottom hardness.

Invasive Species Maps

Each lake description is followed by 1-2 maps. The first map, if aquatic invasive species were detected in the lake, is the "AIS Map" and shows presence of aquatic invasive species (AIS) beds and points overlayed on a bathymetry map. Points are labeled directly on the map and consist of individual plants. Polygons denote beds of invasive species. These polygons are labeled with numbers that correspond to a bed density and size in both acres and square feet in the facing table. The tables have only polygon data and do not include individual plant occurrences, which are denoted only with a point and acronym on the map. The acronym is listed in each map legend.

Aquatic Invasive Species Acronyms—The maps contain acronyms for invasive species occurrences. These occur when a polygon or point record for an invasive species are labeled directly on a map. The following acronyms and their full common names occur throughout.

Aquatic Invasive Species	*Acronym*
Curly Leaf Pondweed	CLP
Brittle Naiad	BN
Variable Leaf Milfoil	VLM
Eurasian Watermilfoil	EWM
Zebra Mussel	ZM
Water Chestnut	WC
Phragmites	Phrag

Bottom Hardness

The second map, if the central area of a lake was covered by sonar, is the bottom hardness map. The values of bottom hardness range from 0 to 255 and are an interpretation of sonar made by ReefMaster. The values are linear in hardness and range from the low end of 0, denoting a mucky bottom to 255, denoting a sandy or hard bottom.

Excessive Interpolation

We create the bathymetry and bottom hardness layers on the lake maps on the following pages by utilizing ReefMaster output (csv files of grid formatted values) and then interpolate them with one another to form a matrix raster image. This raster image estimates the values between each of the points. One issue we face with performing this type of interpolation of these data is that sometimes we interpolate over large distances. This results in errors of over guessing. For example, we can interpolate across a lake, but we will not take into consideration changes in depth or bottom hardness that exist in areas where we did not collect data directly with sonar. While these interpolations are inaccurate, it can help make a map look much nicer. For that reason, we have interpolated across larger areas, but we show these areas as being “excessively interpolated” by denoting their areas with a hatch marking. These can be seen over the centers of several of the lakes that follow.

Ballston Lake

Survey Date: June 23, 2021
Survey Team: P. Bly, J. Young

Lake Description

Ballston Lake is a 274-acre lake and has 6.8-miles of shoreline. It is located in the town of Ballston in Saratoga County in the Hudson River Watershed. The team launched a motorboat from a public launch, located on the eastern shore of the lake.

Aquatic Invasive Plant Presence

Dense beds of *Myriophyllum spicatum* (Eurasian watermilfoil) and *Potamogeton crispus* (curly leaf pondweed) were located along the entire shoreline of the lake. *Trapa natans* (water chestnut) was in 3 patches, one along the western shore and the other two along the southern shore. The team attempted removal on the western and one of the southern patches.

Native Plant Biota

Comprehensive surveys were not prioritized in 2021 as invasive species were the primary focus of the surveys. The following native plants were found: *Nymphaea odorata* (white water lily), *Typha sp.* (cattail sp.), *Sagittaria latifolia* (broadleaf arrowhead), *Ceratophyllum demersum* (coontail), *Ceratophyllum demersum* (common bladderwort), *Nuphar variegate* (spatterdock), *Brasenia schreberi* (water shield).

Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. Three plankton tows were also conducted with no invasive zooplankton detected.

Invasive Species Percent Cover (See map on adjacent page)

% cover NR = not recorded

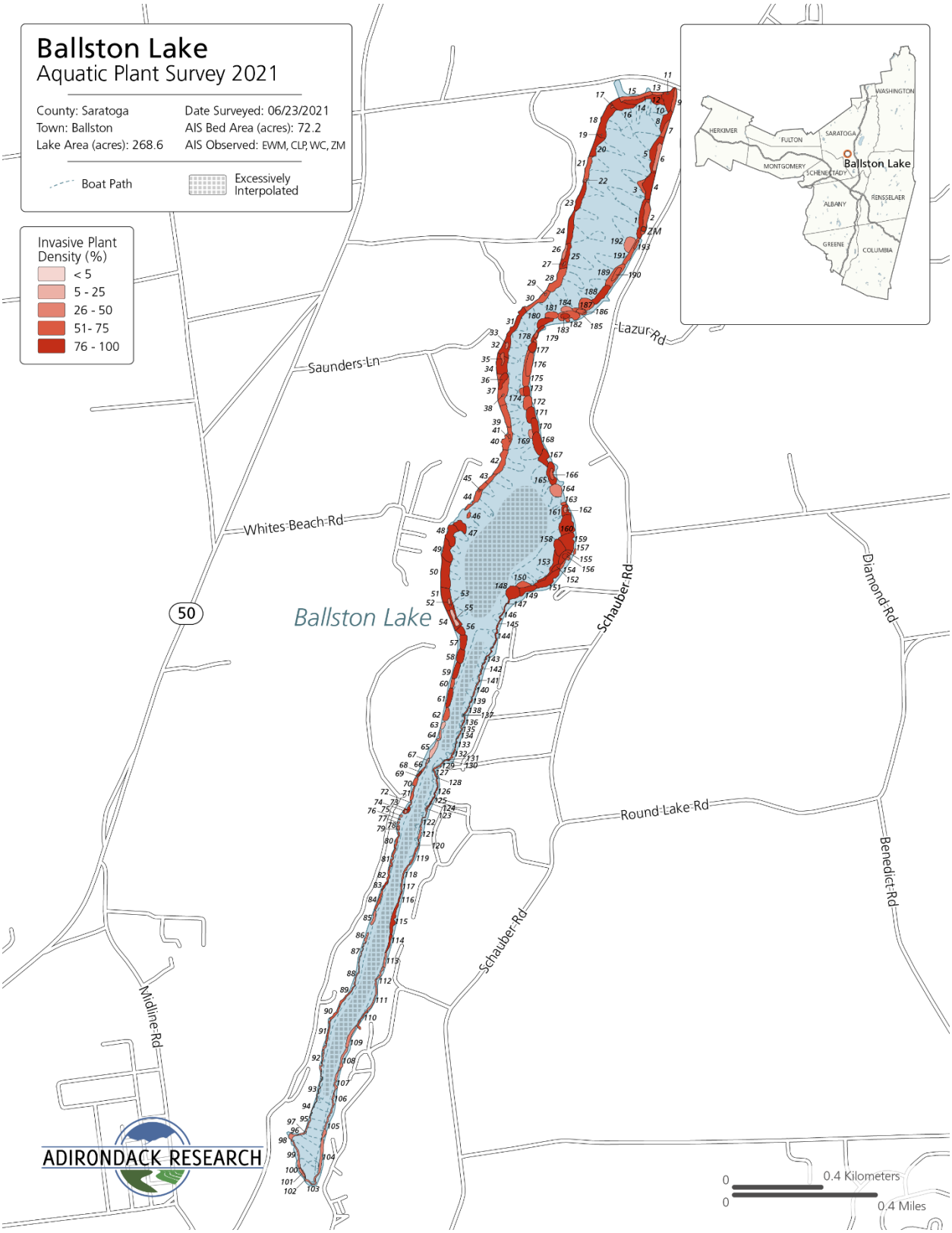
Eurasian Watermilfoil				Eurasian Watermilfoil				Eurasian Watermilfoil			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	1.68	73387.82	76%-100%	75	0.03	1377.06	26%-50%	133	0.05	2039.04	51%-75%
3	1.24	53815.53	51%-75%	76	0.02	798.25	26%-50%	134	0.04	1643.93	51%-75%
5	1.57	68494.84	76%-100%	77	0.03	1174.40	26%-50%	136	0.05	2145.38	76%-100%
8	0.85	37202.56	76%-100%	78	0.08	3358.80	26%-50%	137	0.01	496.24	26%-50%
10	1.25	54533.61	76%-100%	79	0.03	1410.08	26%-50%	138	0.07	2894.15	51%-75%
12	0.93	40710.00	76%-100%	80	0.15	6333.69	51%-75%	140	0.19	8430.62	51%-75%
14	0.94	40867.60	NOT RECORDED	81	0.20	8673.92	51%-75%	143	0.09	3706.08	76%-100%
16	0.80	34702.43	76%-100%	82	0.10	4507.23	51%-75%	144	0.20	8541.10	76%-100%
18	1.42	61716.03	76%-100%	83	0.09	3964.59	76%-100%	146	0.09	3746.47	76%-100%
20	0.63	27513.04	NOT RECORDED	84	0.21	9311.13	51%-75%	147	0.01	380.27	51%-75%
21	0.58	25261.34	51%-75%	85	0.18	7850.04	26%-50%	148	0.80	34924.85	76%-100%
23	0.73	31632.64	76%-100%	86	0.10	4176.80	26%-50%	149	0.54	23543.59	76%-100%
24	0.82	35828.60	76%-100%	87	0.07	3241.09	26%-50%	150	0.38	16399.85	51%-75%
25	0.89	38685.85	76%-100%	88	0.13	5452.41	26%-50%	151	1.00	43431.80	76%-100%
28	1.00	43724.19	51%-75%	89	0.19	8327.12	51%-75%	152	0.23	9881.16	76%-100%
30	0.69	30176.76	51%-75%	90	0.16	6818.09	51%-75%	153	0.93	40434.16	76%-100%
31	0.75	32762.86	76%-100%	91	0.17	7242.51	51%-75%	154	0.18	7810.93	51%-75%
32	0.87	37708.48	76%-100%	92	0.20	8826.83	26%-50%	155	0.53	22922.81	76%-100%
34	1.07	46549.86	NOT RECORDED	93	0.11	4797.58	26%-50%	158	0.71	30891.03	76%-100%
37	1.62	70485.37	NOT RECORDED	94	0.04	1863.13	26%-50%	159	1.15	50276.36	76%-100%
39	0.70	30605.00	51%-75%	98	0.15	6440.86	26%-50%	160	1.38	59998.50	76%-100%
40	0.84	36393.20	NOT RECORDED	99	0.24	10330.46	26%-50%	161	0.50	21830.40	76%-100%
42	0.72	31417.91	51%-75%	101	0.10	4302.20	26%-50%	163	0.07	3161.09	51%-75%
43	0.24	10321.94	51%-75%	103	0.16	7039.06	26%-50%	164	0.66	28636.77	26%-50%
44	0.72	31201.62	51%-75%	104	0.56	24519.27	26%-50%	165	0.79	34231.07	76%-100%
46	0.09	3869.67	51%-75%	105	0.21	9230.67	26%-50%	167	0.61	26508.02	76%-100%
47	0.52	22704.38	76%-100%	106	0.04	1719.88	26%-50%	168	0.95	41386.93	76%-100%
48	0.99	43024.31	76%-100%	107	0.21	9105.11	26%-50%	169	0.24	10630.00	26%-50%
49	0.90	39122.59	76%-100%	108	0.27	11577.67	26%-50%	170	0.55	23878.03	76%-100%
50	1.40	60812.37	76%-100%	109	0.32	13836.60	26%-50%	171	0.72	31146.50	76%-100%
51	1.04	45432.62	76%-100%	110	0.18	7628.55	51%-75%	172	0.56	24365.48	51%-75%
54	0.85	37014.98	NOT RECORDED	111	0.26	11137.10	26%-50%	174	0.31	13365.27	51%-75%
56	0.33	14209.60	76%-100%	112	0.12	5284.15	26%-50%	175	1.72	75100.24	51%-75%
57	0.49	21513.29	76%-100%	113	0.15	6379.46	26%-50%	177	0.35	15118.98	76%-100%
58	0.50	21588.36	76%-100%	114	0.20	8797.50	76%-100%	178	0.38	16451.43	76%-100%
59	0.43	18538.03	76%-100%	115	0.53	23084.42	76%-100%	180	0.51	22060.20	76%-100%
60	0.17	7594.65	51%-75%	116	0.08	3549.72	76%-100%	181	0.40	17370.54	51%-75%
61	0.46	20136.75	76%-100%	117	0.07	2849.01	51%-75%	182	0.89	38894.32	51%-75%
62	0.34	14632.75	51%-75%	118	0.13	5603.20	51%-75%	183	0.20	8599.78	76%-100%
63	0.12	5401.74	5%-25%	119	0.20	8599.05	51%-75%	184	0.33	14325.76	26%-50%
64	0.11	4967.60	26%-50%	121	0.13	5649.38	26%-50%	185	0.43	18843.82	51%-75%
65	0.34	14664.05	5%-25%	122	0.12	5204.46	26%-50%	187	0.78	34115.63	51%-75%
66	0.08	3685.56	26%-50%	123	0.02	721.34	76%-100%	188	0.78	33953.56	76%-100%
69	0.13	5727.92	51%-75%	125	0.07	3065.81	76%-100%	189	1.00	43760.39	51%-75%
70	0.16	7038.08	51%-75%	126	0.06	2410.00	76%-100%	191	0.58	25323.82	51%-75%
71	0.16	6828.64	51%-75%	127	0.15	6342.17	51%-75%	192	0.75	32786.08	26%-50%
72	0.04	1532.63	51%-75%	129	0.18	7841.55	51%-75%				
73	0.17	7436.64	76%-100%	131	0.02	1048.07	76%-100%				

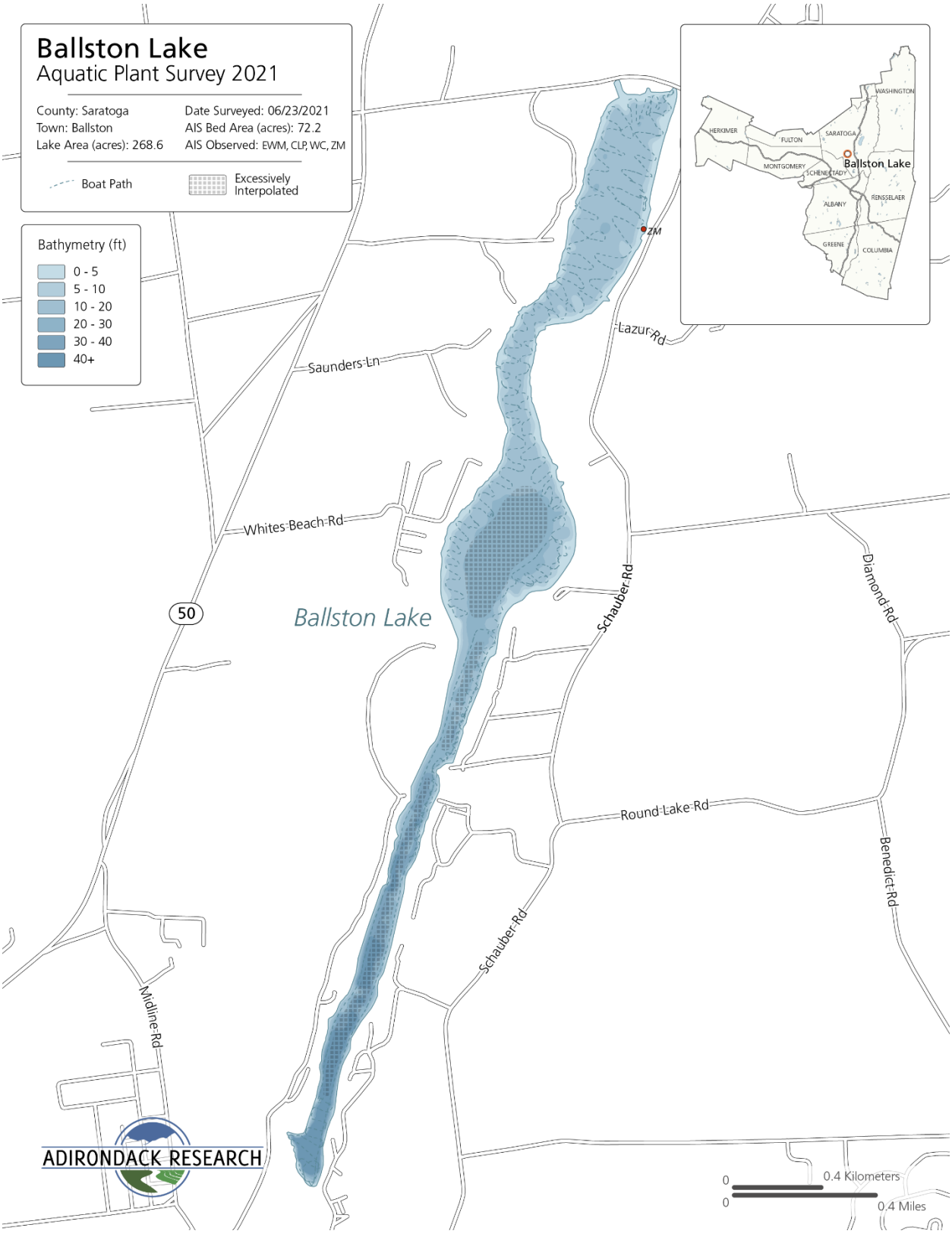
Curly-leaf Pondweed			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
2	0.80	34755.63	51%-75%
4	0.97	42201.36	76%-100%
6	0.55	24107.74	26%-50%
7	0.31	13509.46	NOT RECORDED
9	0.37	16270.18	NOT RECORDED
11	0.02	740.01	26%-50%
13	0.15	6640.52	51%-75%
15	0.62	26956.40	NOT RECORDED
17	0.04	1640.14	51%-75%
19	0.01	396.72	26%-50%
22	0.00	153.07	26%-50%
26	0.20	8853.74	26%-50%
27	0.04	1735.45	51%-75%
29	0.02	992.51	26%-50%
33	0.08	3285.34	26%-50%
35	0.17	7452.26	51%-75%
36	0.42	18234.04	76%-100%
38	0.02	942.92	26%-50%
41	0.06	2772.67	51%-75%
45	0.03	1164.61	51%-75%
52	0.06	2790.22	26%-50%
55	0.30	13025.67	5%-25%
67	0.04	1866.27	5%-25%
68	0.05	2039.57	76%-100%

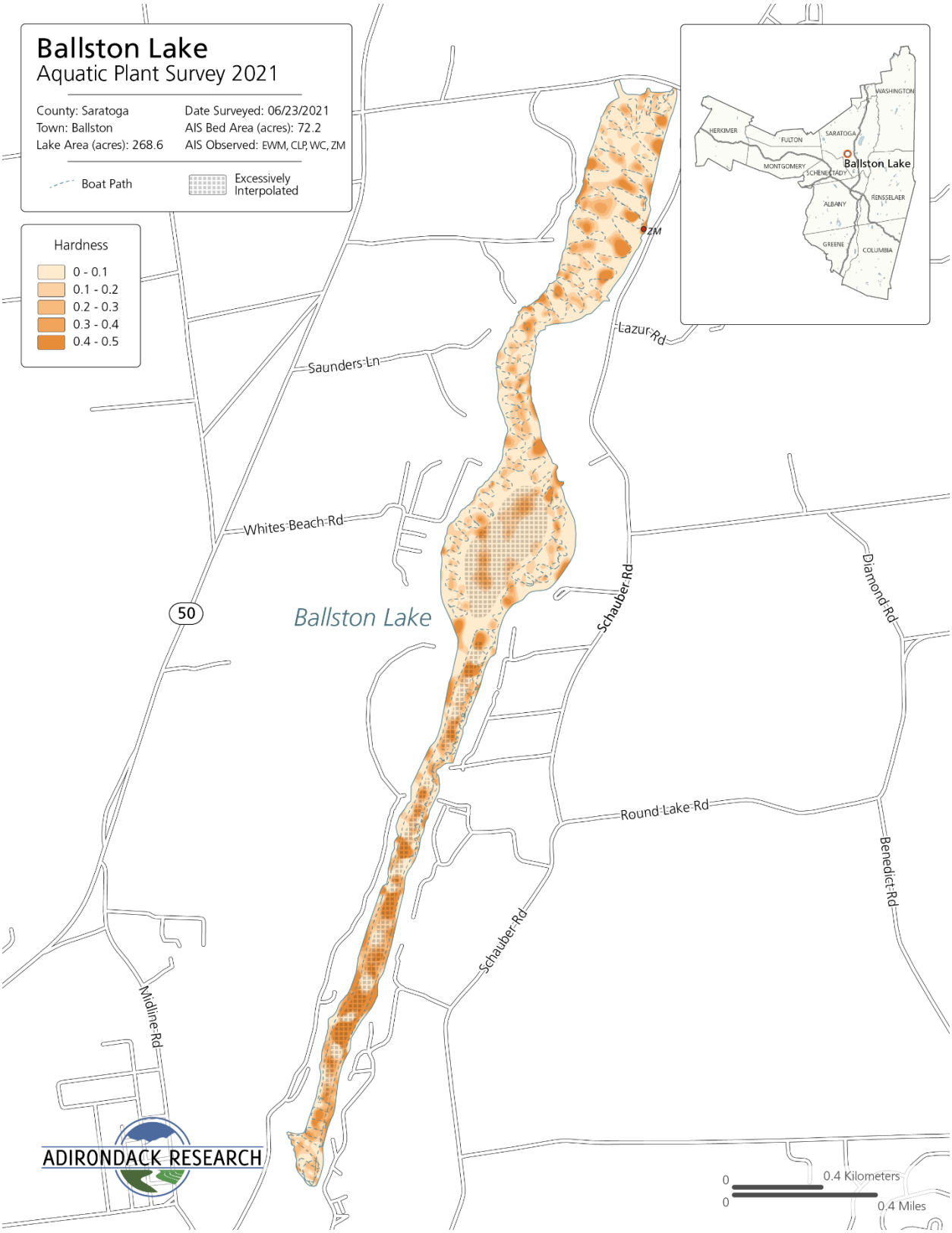
Curly-leaf Pondweed			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
74	0.03	1502.94	5%-25%
95	0.00	189.36	5%-25%
96	0.02	697.40	5%-25%
97	0.16	6836.22	26%-50%
100	0.20	8798.11	51%-75%
120	0.01	543.19	5%-25%
124	0.02	729.46	51%-75%
128	0.01	586.68	26%-50%
130	0.01	568.25	51%-75%
132	0.03	1181.12	26%-50%
135	0.03	1104.03	26%-50%
139	0.02	813.14	76%-100%
141	0.01	554.87	51%-75%
142	0.01	509.34	26%-50%
145	0.02	677.45	26%-50%
156	0.12	5279.74	76%-100%
162	0.08	3622.95	26%-50%
166	0.18	7839.24	51%-75%
173	0.33	14467.00	76%-100%
176	0.69	30111.19	51%-75%
179	0.08	3691.43	51%-75%
186	0.17	7232.36	51%-75%
190	0.29	12516.65	51%-75%
193	0.10	4280.24	51%-75%

Water Chestnut			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
53	0.01	329.44	5%-25%
102	0.02	836.56	5%-25%

Phragmites			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
157	0.06	2472.87	51%-75%


Ballston Lake
Aquatic Plant Survey 2021
County: Saratoga
Town: Ballston
Lake Area (acres): 268.6
Date Surveyed: 06/23/2021
AIS Bed Area (acres): 72.2
AIS Observed: EWM, CLP, WC, ZM
Boat Path
Excessively Interpolated
Invasive Plant Density (%)
< 5
5 - 25
26 - 50
51 - 75
76 - 100
Ballston Lake
Saunders Ln
Whites Beach Rd
Lazur Rd
Schauber Rd
Diamond Rd
Round Lake Rd
Benedict Rd
Midline Rd
50
ZM
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
RENSSELAER
ALBANY
GREENE
COLUMBIA
0
0.4 Kilometers
0
0.4 Miles
ADIRONDACK RESEARCH


Ballston Lake
Aquatic Plant Survey 2021
County: Saratoga
Town: Ballston
Lake Area (acres): 268.6
Date Surveyed: 06/23/2021
AIS Bed Area (acres): 72.2
AIS Observed: EWM, CLP, WC, ZM
Boat Path
Excessively Interpolated
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
ZM
Lazur Rd
Saunders Ln
Whites Beach Rd
50
Ballston Lake
Schauber Rd
Diamond Rd
Round Lake Rd
Benedict Rd
Schauber Rd
Midline Rd
ADIRONDACK RESEARCH
0
0.4 Kilometers
0
0.4 Miles
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
Ballston Lake
ALBANY
RENSSELAER
GREENE
COLUMBIA


Ballston Lake
Aquatic Plant Survey 2021
County: Saratoga
Town: Ballston
Lake Area (acres): 268.6
Date Surveyed: 06/23/2021
AIS Bed Area (acres): 72.2
AIS Observed: EWM, CLP, WC, ZM
Boat Path
Excessively Interpolated
Hardness
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
ZM
Lazur Rd
Saunders Ln
Whites Beach Rd
50
Ballston Lake
Schauber Rd
Diamond Rd
Round Lake Rd
Benedict Rd
Schauber Rd
Midline Rd
ADIRONDACK RESEARCH
0
0.4 Kilometers
0
0.4 Miles
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
Ballston Lake
RENSSELAER
ALBANY
GREENE
COLUMBIA

Champlain Canal

Survey Date: June 9, 2021, June 10, 2021
Survey Team: P. Bly, L. Johnson, T. Murphy, M. Privee, J. Young

Lake Description

Champlain Canal is located in the town of Whitehall in Washington County within the Lake Champlain Watershed. The team was able to launch motorboats from a public launch on South Bay.

Aquatic Invasive Plant Presence

Dense beds of *Potamogeton crispus* (curly leaf pondweed), *Trapa natans* (water chestnut), and*Myriophyllum spicatum* (Eurasian watermilfoil) were recorded.

Native Plant Biota

Comprehensive surveys were not prioritized in 2021 as invasive species were the primary focus of the surveys. The following native plants were found: *Sparganium angustifolium* (narrow-leaf burr reed), *Ceratophyllum demersum* (coontail), *Nymphaea odorata* (white-water lily), *Potamogeton amplifolius* (large leaf pondweed), *Nuphar variegate* (spatterdock), *Potamogeton robbinsii* (Robbin's pondweed), *Lemna minor* (common duckweed), *Potamogeton natans* (floating-leaf pondweed), *Elodea nuttallii* (slender waterweed), *Potamogeton perfoliatus* (clasping-leaf pondweed), *Zostera marina* (common eelgrass), *Pontedaria cordata* (pickerelweed).

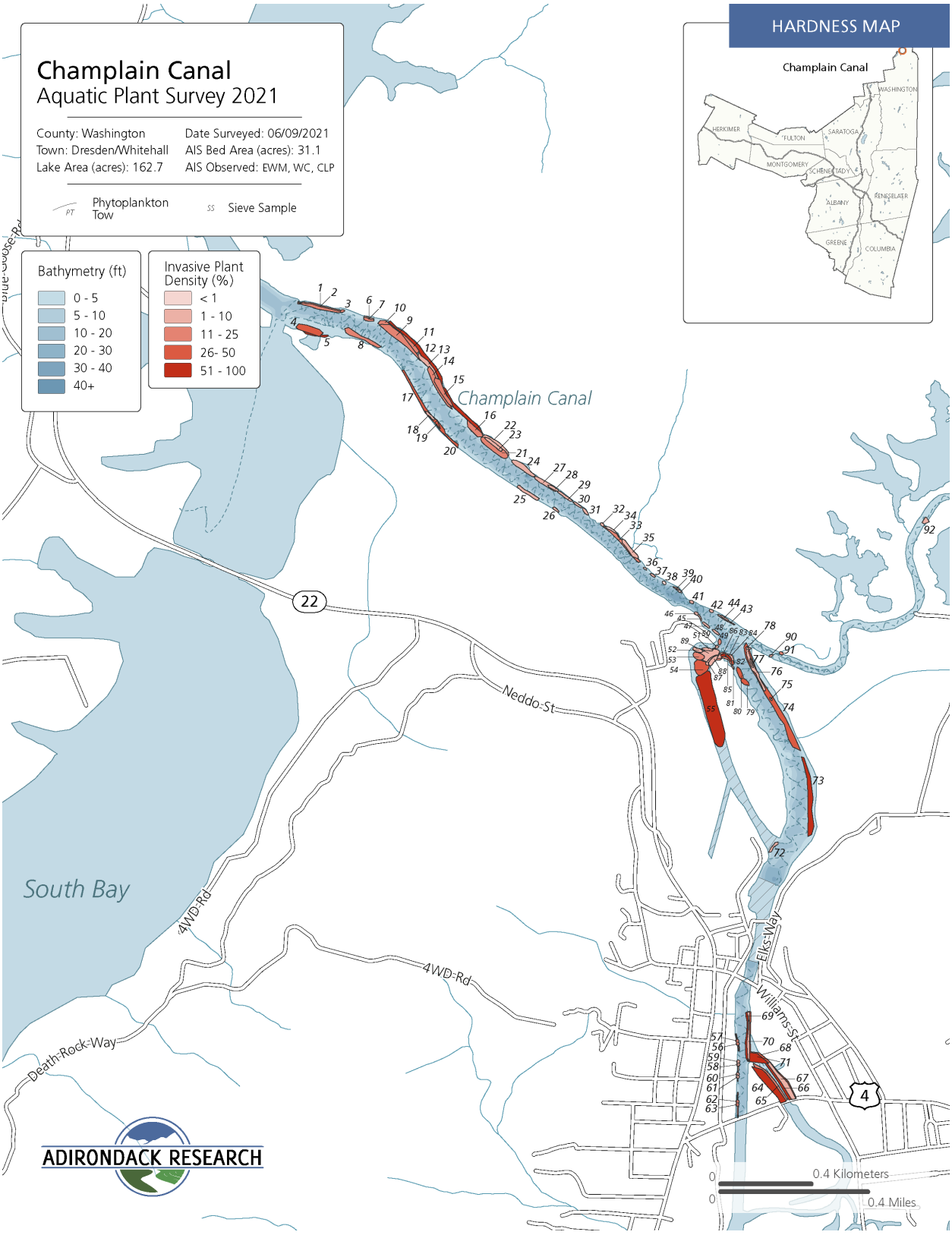
Aquatic Invasive Animal Presence

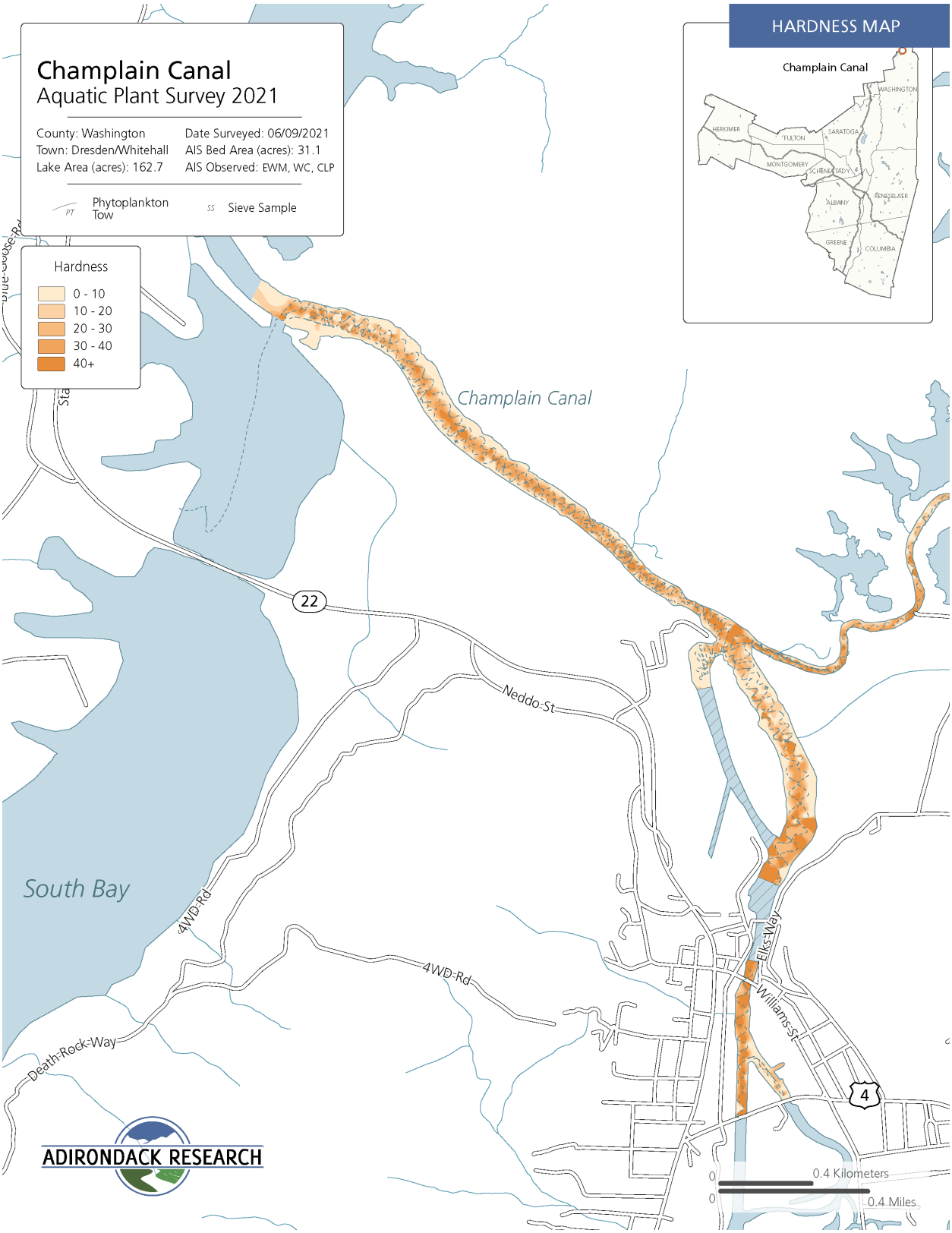
Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. Three plankton tows were also conducted with no invasive zooplankton detected.

Curly-leaf Pondweed				Water Chestnut				Water Chestnut			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
3	0.05	2009.09	26%-50%	1	0.52	22855.64	26%-50%	43	0.14	6207.86	5%-25%
6	0.12	5357.75	26%-50%	7	0.12	5357.75	5%-25%	45	0.05	2361.36	5%-25%
10	0.96	41875.41	26%-50%	11	1.29	56192.55	26%-50%	47	0.09	4004.99	5%-25%
15	0.68	29481.30	26%-50%	13	1.25	54274.67	5%-25%	56	0.05	2328.98	26%-50%
22	1.06	46027.95	5%-25%	18	0.14	5880.80	5%-25%	58	0.03	1174.66	5%-25%
30	0.10	4205.14	5%-25%	23	0.31	13431.62	5%-25%	62	0.12	5270.50	26%-50%
36	0.03	1376.37	less than 5%	24	0.61	26483.44	5%-25%	64	1.48	64562.97	76%-100%
57	0.05	2256.61	26%-50%	26	0.07	3211.38	5%-25%	66	0.91	39460.75	76%-100%
59	0.03	1155.36	5%-25%	27	0.48	20996.84	5%-25%	69	0.42	18442.92	76%-100%
61	0.06	2492.17	5%-25%	29	0.20	8661.44	5%-25%	71	0.69	30144.84	76%-100%
63	0.14	6256.45	26%-50%	32	0.01	300.02	5%-25%	72	0.15	6511.72	5%-25%
65	1.49	64934.08	26%-50%	34	0.26	11378.60	less than 5%	73	1.69	73559.27	76%-100%
67	0.92	40219.17	5%-25%	35	0.44	19223.26	5%-25%	76	0.67	28984.65	
70	0.44	18995.30	5%-25%	38	0.01	289.29	less than 5%	84	0.40	17278.34	5%-25%
75	0.03	1176.02	5%-25%	40	0.04	1838.15	less than 5%	88	0.26	11506.64	5%-25%
77	0.06	2422.57	5%-25%	41	0.00	178.12	5%-25%	89	0.90	39061.92	5%-25%
78	0.03	1256.57	5%-25%	42	0.01	273.72	5%-25%	92	0.14	6010.37	5%-25%

Eurasian Watermilfoil				Eurasian Watermilfoil				Eurasian Watermilfoil			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
2	0.52	22824.09	26%-50%	37	0.05	2308.21	5%-25%	79	0.19	8410.82	51%-75%
4	0.84	36770.14	51%-75%	39	0.04	1901.24	5%-25%	80	0.23	9841.86	51%-75%
5	0.40	17248.98	76%-100%	44	0.07	2893.60	5%-25%	82	0.05	2093.43	51%-75%
8	0.78	34012.46	26%-50%	46	0.00	192.58	5%-25%	83	0.09	3966.00	76%-100%
9	1.31	56898.94	26%-50%	48	0.09	3860.28	5%-25%	85	0.39	17150.67	26%-50%
14	0.93	40632.58	26%-50%	49	0.08	3305.89	26%-50%	86	0.07	2848.03	76%-100%
16	0.62	26910.18	26%-50%	50	0.02	712.49	5%-25%	87	0.39	17042.84	5%-25%
17	0.80	34756.35	51%-75%	51	0.13	5603.60	5%-25%	90	0.04	1564.42	5%-25%
19	0.08	3321.89	51%-75%	52	0.16	6927.30	5%-25%	91	0.01	486.45	26%-50%
20	0.39	17050.18	51%-75%	53	0.32	14050.01	26%-50%				
21	1.11	48472.34	26%-50%	54	0.86	37417.55	51%-75%				
25	0.38	16359.77	5%-25%	55	5.02	218656.16	76%-100%				
28	0.13	5863.23	5%-25%	60	0.06	2713.28	5%-25%				
31	0.10	4424.89	5%-25%	68	2.07	90010.50	51%-75%				
33	0.75	32569.83	26%-50%	74	2.93	127765.11	51%-75%				

Phragmites			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
12	2.07	90028.64	76%-100%
81	0.03	1433.15	5%-25%


Champlain Canal
Aquatic Plant Survey 2021
County: Washington
Town: Dresden/Whitehall
Lake Area (acres): 162.7
Date Surveyed: 06/09/2021
AIS Bed Area (acres): 31.1
AIS Observed: EWM, WC, CLP
Phytoplankton Tow
Sieve Sample
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
Invasive Plant Density (%)
< 1
1 - 10
11 - 25
26- 50
51 - 100
HARDNESS MAP
Champlain Canal
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
ALBANY
RENSSELAER
GREENE
COLUMBIA
Champlain Canal
South Bay
Neddo St
4WD Rd
4WD Rd
Death Rock Way
Elks Way
Williams St
22
4
0.4 Kilometers
0.4 Miles
ADIRONDACK RESEARCH


Champlain Canal
Aquatic Plant Survey 2021
County: Washington
Town: Dresden/Whitehall
Lake Area (acres): 162.7
Date Surveyed: 06/09/2021
AIS Bed Area (acres): 31.1
AIS Observed: EWM, WC, CLP
PT Phytoplankton Tow
SS Sieve Sample
Hardness
0 - 10
10 - 20
20 - 30
30 - 40
40+
HARDNESS MAP
Champlain Canal
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
ALBANY
RENSSELAER
GREENE
COLUMBIA
Champlain Canal
South Bay
22
Neddo St
4WD Rd
4WD Rd
Death Rock Way
Elks Way
Williams St
4
0.4 Kilometers
0.4 Miles
ADIRONDACK RESEARCH

Dead Lake

Survey Date: July 5th, 2021
Survey Team: L. Johnson, J. Young

Lake Description

Dead Lake is 10-acres. It is located in the town of Cambridge, Washington County, and lies in the Upper Hudson River watershed. The team launched a canoe from NY-22 at the Burger Den Restaurant. The lake had a significant amount of algae present on the aquatic plants. The weather was hot and sunny.

Aquatic Invasive Plant Presence

Scattered beds of *Myriophyllum spicatum* (Eurasian watermilfoil) were found near the shore of the lake.

Native Plant Biota

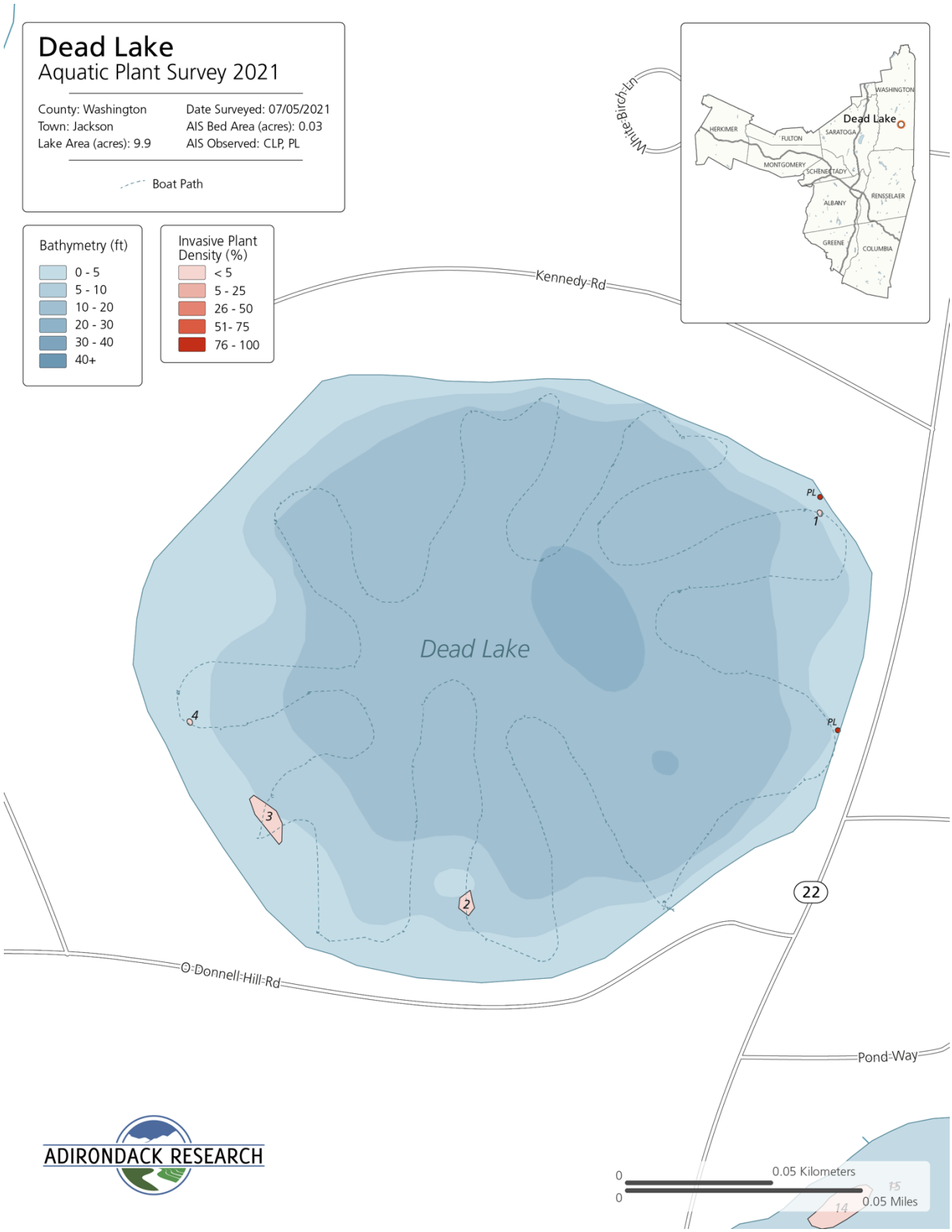
The following native plants were found: *Potamogeton natans* (floating leaf pondweed), *Brasenia schreberi* (watershield), *Elodea sp.* (Elodea), and *Najas gracillima* (thread-like naiad). Plant growth was sparse.

Aquatic Invasive Animal Presence

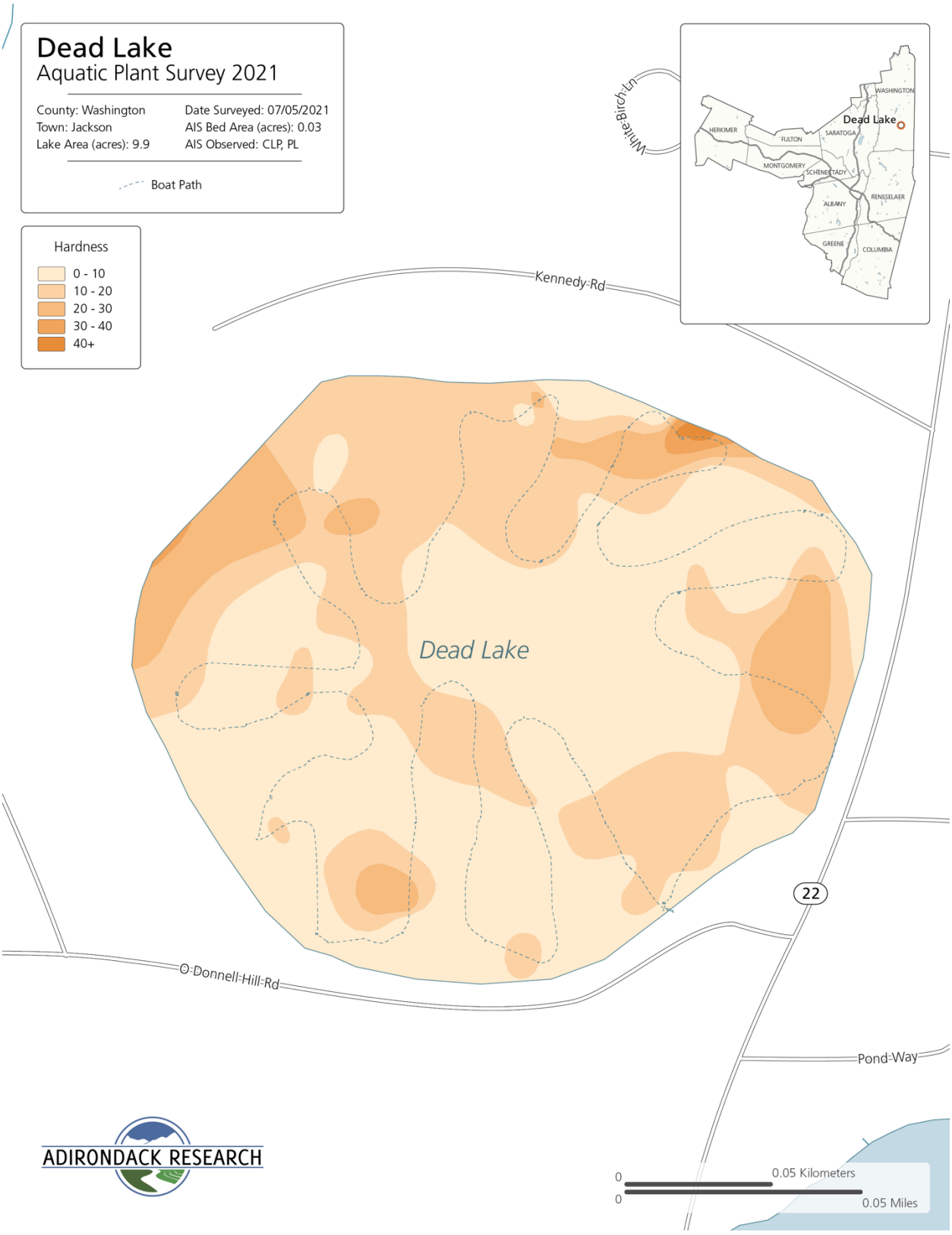
Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. *Viviparus georgianus* (banded mystery snails) were also found.

Invasive Species Percent Cover (See map on adjacent page)

Eurasian Watermilfoil			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	0.000002	0.11	less than 5%
2	0.007145	311.23	less than 5%
3	0.020901	910.44	less than 5%
4	0.000156	6.80	less than 5%



ADIRONDACK RESEARCH



ADIRONDACK RESEARCH

Dyken Pond

Survey Date: June 24, 2021
Survey Team: P. Bly, J. Young

Lake Description

Dyken Pond is a 134-acre lake and has 5.1 miles of shoreline. It is in the towns of Grafton and Berlin in Rensselaer County and lies within the Hudson River Watershed. The team launched a canoe at a public launch at Dyken Pond Environmental Education Center on the western shore of the lake. The launch was located along a narrow gravel road and had little room to maneuver the car with the motor boat hitched.

Aquatic Invasive Plant Presence

Phragmites Australis was recorded on the shoreline, but no aquatic invasive species were recorded.

Native Plant Biota

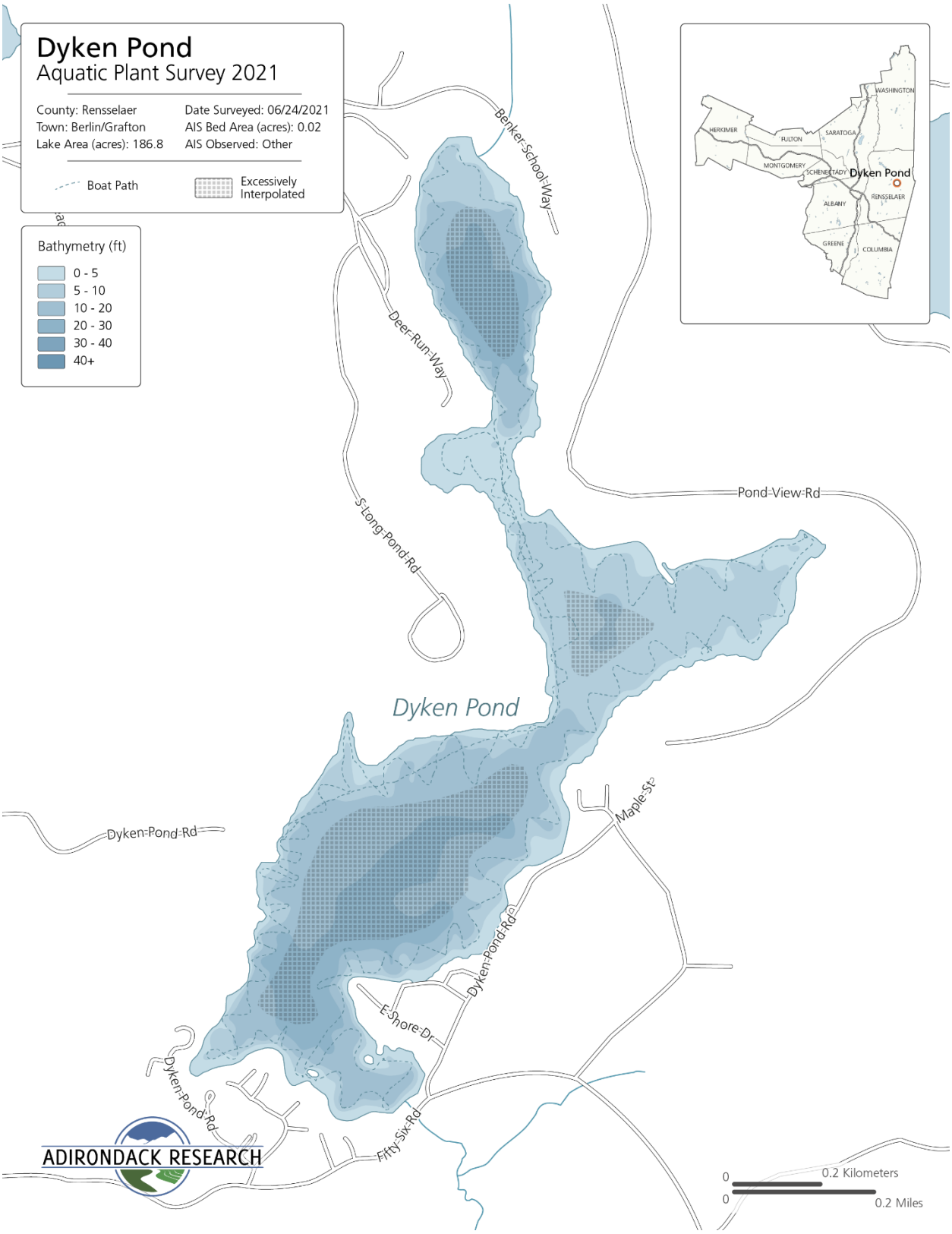
Comprehensive surveys were not prioritized in 2021 as invasive species were the primary focus of the surveys. The following native species were found: *Nymphaea odorata* (white-water lily), *Zostera marina* (common eelgrass), *Nymphoides cordata* (little floating heart), *Brasenia schreberi* (water shield), *Potamogeton amplifolius* (large leaf pondweed), *Sparganium angustifolium* (narrow-leaf burr reed), *Dulichium arundinaceum* (three-way sedge), *Potamogeton natans* (floating-leaf pondweed), *Iris versicolor* (blue flag iris), *Utricularia macrorhiza* (common bladderwort), *Nuphar variegate* (spatterdock).

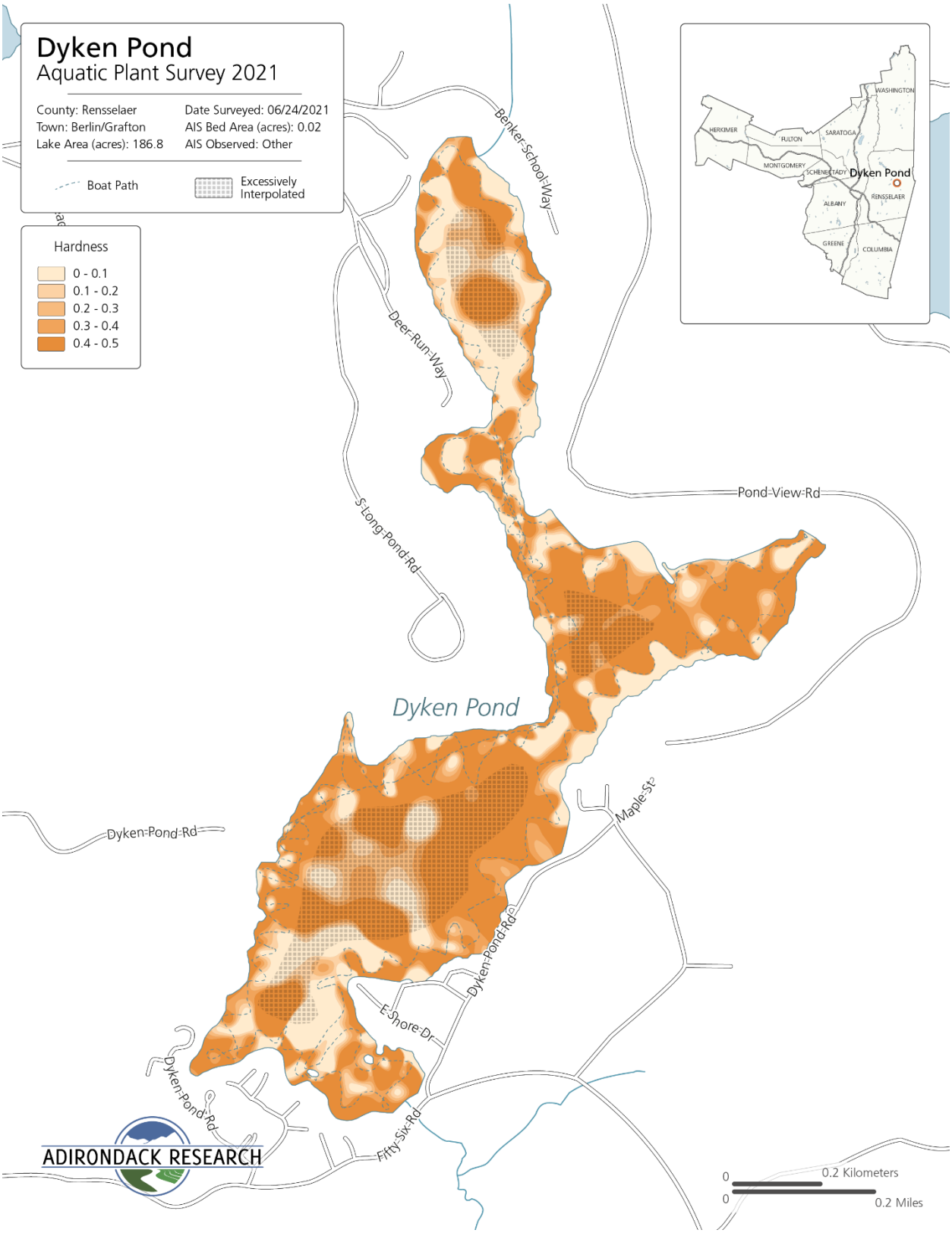
Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. Three plankton tows were also conducted with no invasive zooplankton detected.

Invasive Species Percent Cover (See map on adjacent page)

Note: *Phragmites Australis* was recorded on the shoreline.


Dyken Pond
Aquatic Plant Survey 2021
County: Rensselaer
Town: Berlin/Grafton
Lake Area (acres): 186.8
Date Surveyed: 06/24/2021
AIS Bed Area (acres): 0.02
AIS Observed: Other
Boat Path
Excessively Interpolated
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
Benker School Way
Deer Run Way
S Long Pond Rd
Pond View Rd
Dyken Pond
Dyken Pond Rd
Maple St
Dyken Pond Rd
E Shore Dr
Dyken Pond Rd
Fifty Six Rd
ADIRONDACK RESEARCH
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
Dyken Pond
RENSSELAER
ALBANY
GREENE
COLUMBIA
0
0.2 Kilometers
0
0.2 Miles


Dyken Pond
Aquatic Plant Survey 2021
County: Rensselaer
Town: Berlin/Grafton
Lake Area (acres): 186.8
Date Surveyed: 06/24/2021
AIS Bed Area (acres): 0.02
AIS Observed: Other
Boat Path
Excessively Interpolated
Hardness
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
Benker School Way
Deer Run Way
S Long Pond Rd
Pond View Rd
Dyken Pond
Dyken Pond Rd
Maple St
Dyken Pond Rd
E Shore Dr
Dyken Pond Rd
Fifty Six Rd
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
Dyken Pond
RENSSELAER
ALBANY
GREENE
COLUMBIA
0
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH

Glen Lake

Survey Date: August 4, 2021
Survey Team: M. Privee, T. Murphy

Lake Description

Glen Lake is 320-acres and has 5.1-miles of shoreline. It is located in the town of Queensbury, Warren County and lies in the Upper Hudson River watershed. The team launched a motorboat at the southwestern end of the lake.

Aquatic Invasive Plant Presence

Myriophyllum spicatum (Eurasian watermilfoil), *Najas minor* (brittle naiad), and *Potamogeton crispus* (curly-leaf pondweed) were detected.

Native Plant Biota

The following native plants were found:) *Sparaganium angustifolium* (narrow-leaf bur-reed), *Potamogeton perfoliatus* (clasping leaf pondweed), *Elodea spp.* (elodea), *Nymphaea odorata* (white water lily), *Naiad spp.* (naiad), *Eriocaulon aquaticum* (pipewort), *Utricularia vulgaris* (bladderwort), and *Potamogeton praelongus* (white stemmed pondweed).

Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. Zebra mussels have been found in the past but none were detected on this survey. Chinese banded mystery snail was detected.

Invasive Species Percent Cover (See map on adjacent page)

Curly-leaf Pondweed			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	0.01	444.26	less than 5%
2	3.86	168022.90	5%-25%
3	0.62	26914.38	5%-25%
4	0.01	444.12	None recorded
5	0.40	17530.68	76%-100%
8	0.37	16256.62	26%-50%
13	0.01	444.03	None recorded
16	0.01	444.06	None recorded
17	0.26	11194.83	26%-50%
18	0.01	444.13	less than 5%
19	0.01	444.14	less than 5%
20	0.59	25753.79	26%-50%
21	1.89	82405.80	26%-50%
22	0.76	33207.22	5%-25%
23	0.77	33470.97	5%-25%
24	0.02	879.16	5%-25%
25	0.06	2472.93	5%-25%

Curly-leaf Pondweed			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
9	0.01	444.03	None recorded
10	0.13	5661.31	5%-25%

Brittle Naiad			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
6	0.33	14244.74	5%-25%
7	0.39	17079.04	5%-25%
11	0.17	7488.75	5%-25%
12	0.25	10958.91	5%-25%
14	0.47	20498.56	5%-25%
15	0.26	11439.87	5%-25%

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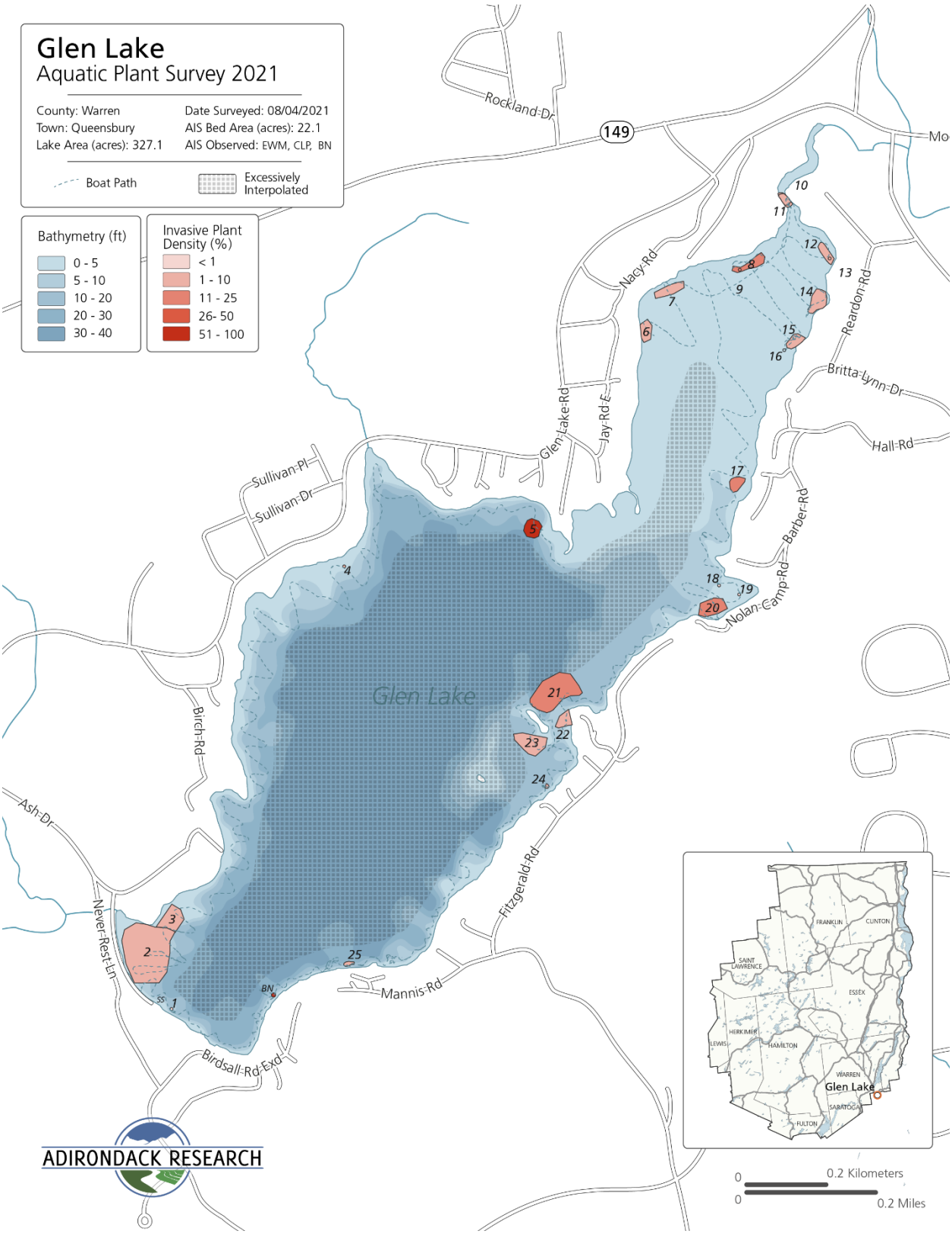
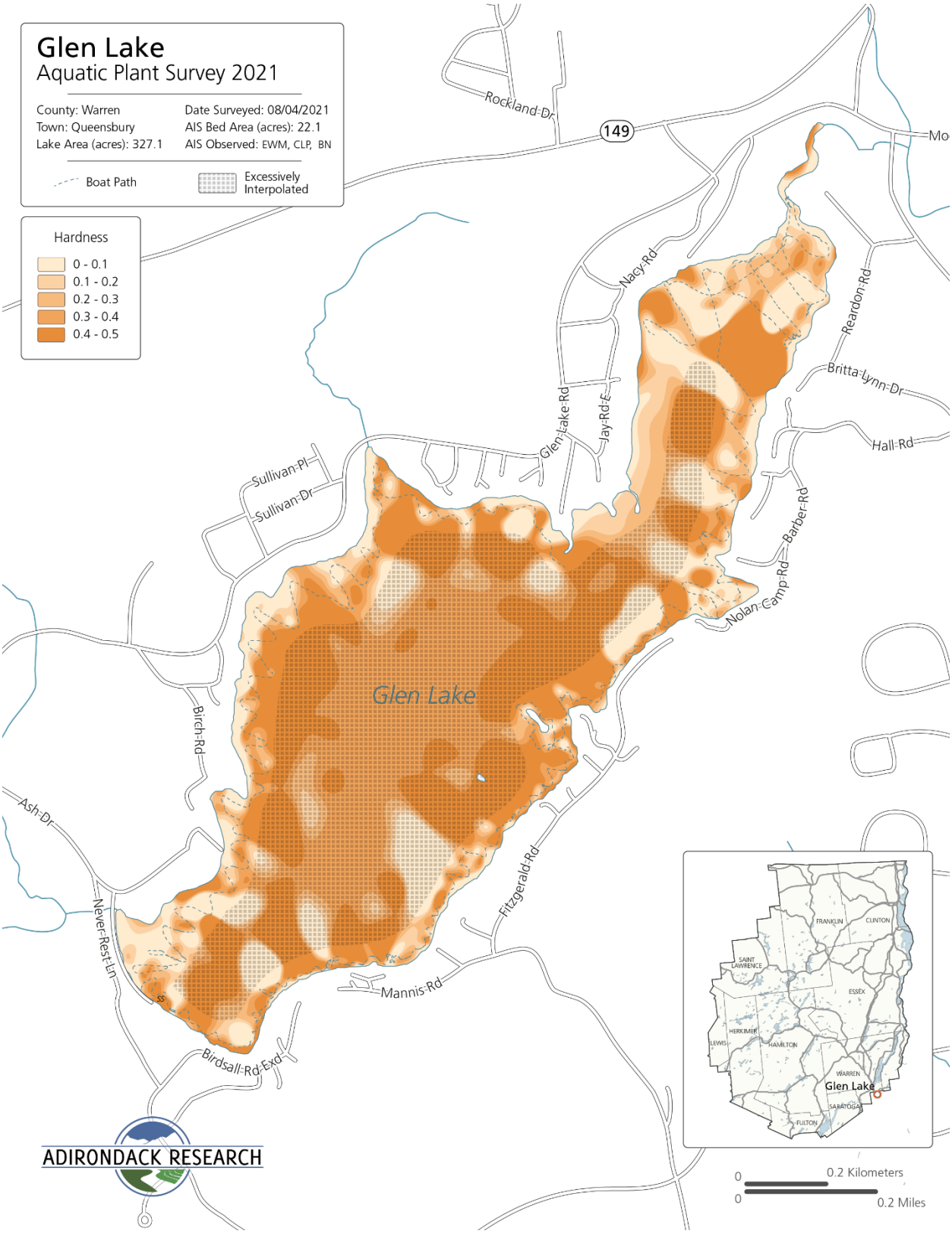

Glen Lake
Aquatic Plant Survey 2021
County: Warren
Town: Queensbury
Lake Area (acres): 327.1
Date Surveyed: 08/04/2021
AIS Bed Area (acres): 22.1
AIS Observed: EWM, CLP, BN
Boat Path
Excessively Interpolated
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
Invasive Plant Density (%)
< 1
1 - 10
11 - 25
26- 50
51 - 100
Rockland-Dr
149
Nacy-Rd
Reardon-Rd
Britta-Lynn-Dr
Hall-Rd
Glen-Lake-Rd
Jay-Rd-E
Sullivan-Pl
Sullivan-Dr
Barber-Rd
Nolan-Camp-Rd
Glen Lake
Birch-Rd
Ash-Dr
Never-Rest-Ln
Fitzgerald-Rd
Mannis-Rd
Birdsall-Rd-Ext
BN
SS
ADIRONDACK RESEARCH
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
Glen Lake
SARATOGA
FULTON
0
0.2 Kilometers
0
0.2 Miles


Glen Lake
Aquatic Plant Survey 2021
County: Warren
Town: Queensbury
Lake Area (acres): 327.1
Date Surveyed: 08/04/2021
AIS Bed Area (acres): 22.1
AIS Observed: EWM, CLP, BN
Boat Path
Excessively Interpolated
Hardness
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
Rockland Dr
149
Nacy Rd
Reardon Rd
Britta Lynn Dr
Hall Rd
Glen Lake Rd
Jay Rd E
Sullivan Pl
Sullivan Dr
Barber Rd
Nolan Camp Rd
Glen Lake
Birch Rd
Ash Dr
Never Rest Ln
Fitzgerald Rd
Mannis Rd
Birdsall Rd Extd
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
Glen Lake
SARATOGA
FULTON
0
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH

Hedges Lake

Survey Date: July 6th, 2021
Survey Team: L. Johnson, J. Young

Lake Description

Hedges Lake is 117-acres. It is in the town of Cambridge, Washington County, and lies in the Upper Hudson River watershed. The team launched a motorboat from the private launch on Nesbitt Rd. with permission from the Hedges Lake Camper's Association. Residents informed the team that aquatic vegetation is often removed by the residents or a private company for recreation purposes. It was an overcast and rainy day.

Aquatic Invasive Plant Presence

Scattered beds of *Myriophyllum spicatum* (Eurasian watermilfoil) were found in several bays of the lake.

Native Plant Biota

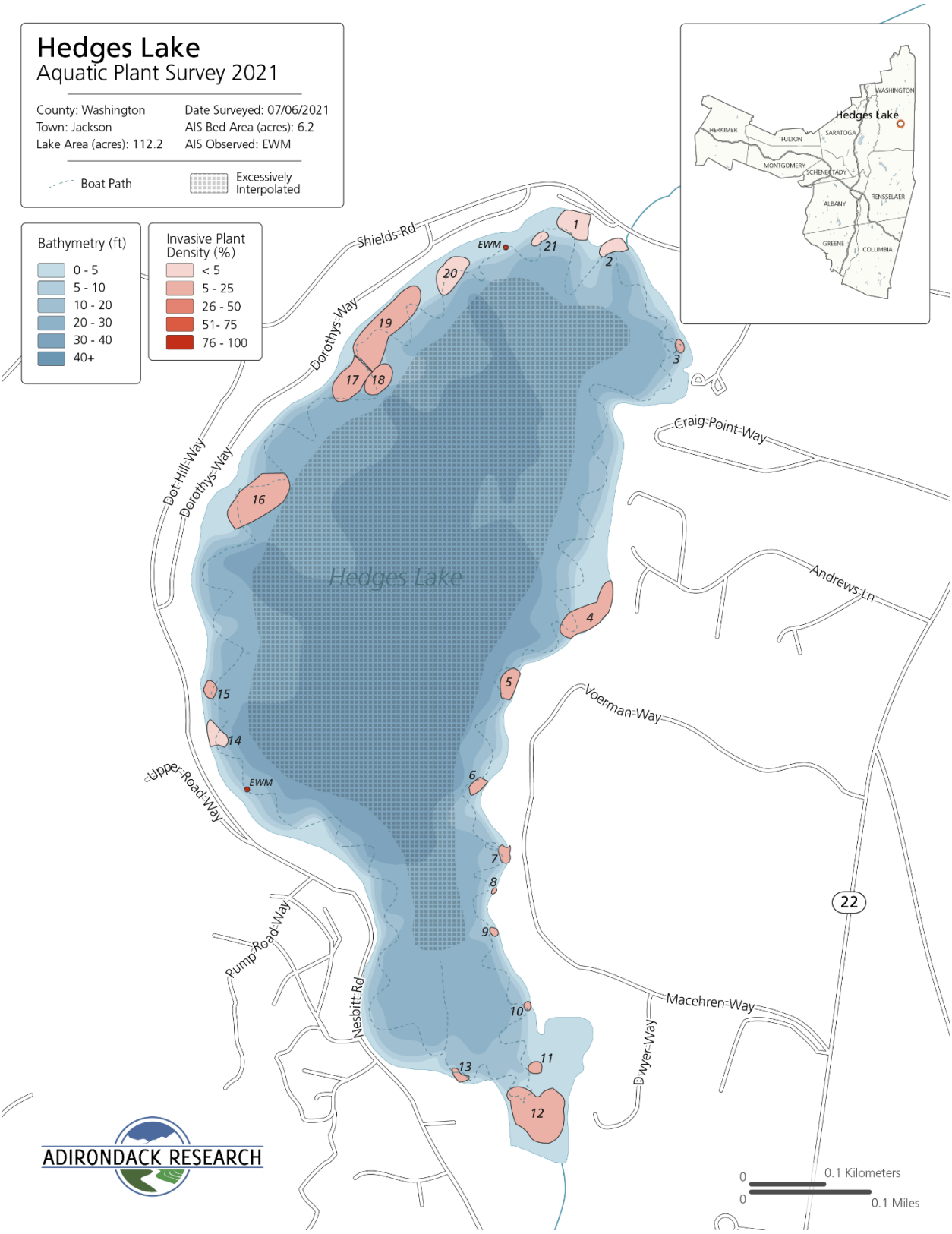
The following native plants were found: *Nuphar variegata* (spatterdock), *Nymphaea odorata* (white water lily), *Elodea*, *Najas gracillima* (thread-like naiad), *Zostera* (eel grass), *Potamogeton perfoliatus* (clasping leaf pondweed), *Ceratophyllum demersum* (coontail), *Typha* (cattail species), and *Potamogeton amplifolius* (large leaf pondweed).

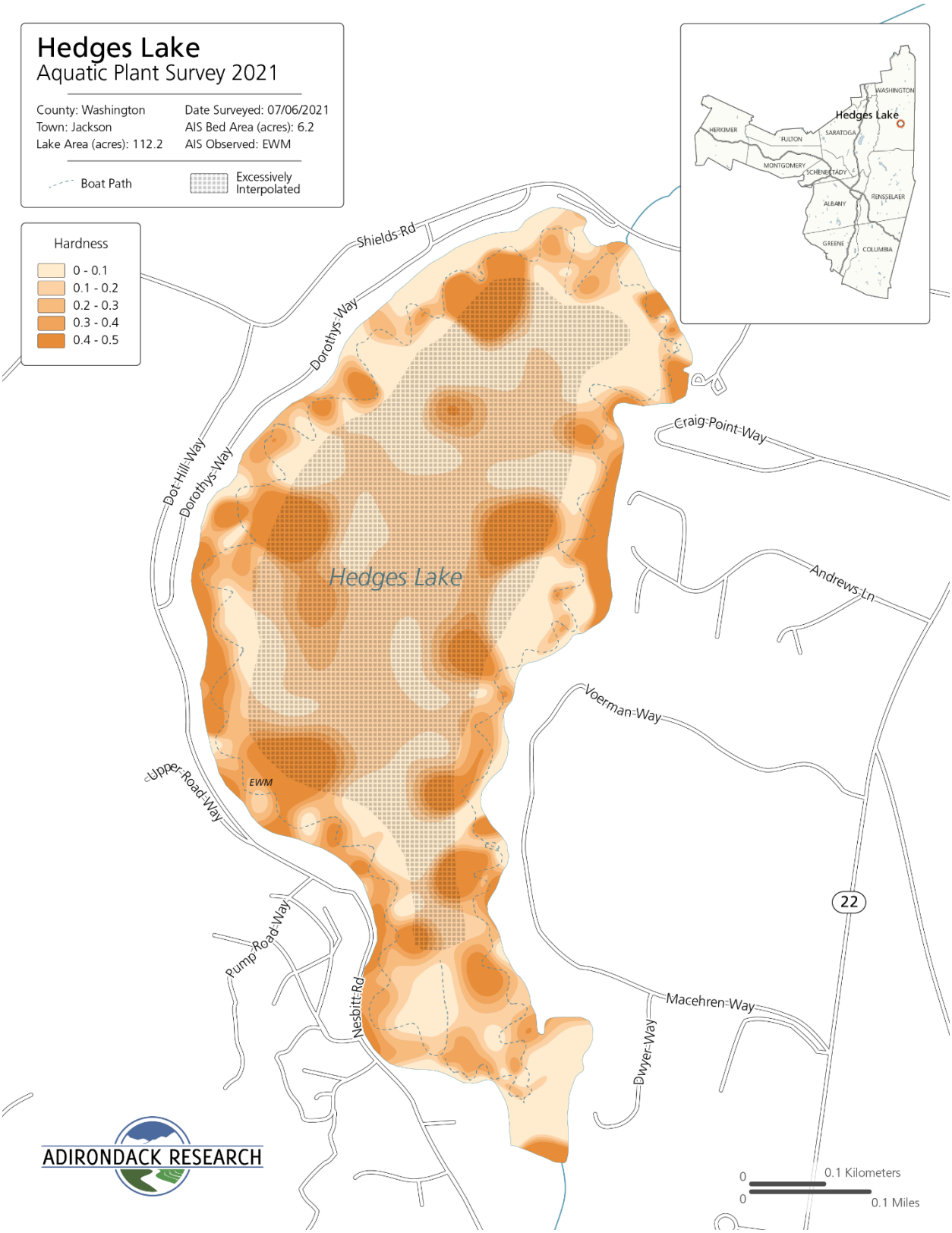
Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found.

Invasive Species Percent Cover (See map on adjacent page)

Eurasian Watermilfoil			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	0.34	14771.33	less than 5%
2	0.15	6555.30	less than 5%
3	0.04	1884.46	5%-25%
4	0.66	28795.29	5%-25%
5	0.20	8749.82	5%-25%
6	0.08	3691.83	
7	0.08	3428.68	
8	0.01	448.71	5%-25%
9	0.03	1108.69	
10	0.02	1016.30	5%-25%
11	0.06	2776.33	5%-25%
12	1.08	47256.53	5%-25%
13	0.06	2515.98	5%-25%
14	0.17	7339.31	less than 5%
15	0.08	3480.86	5%-25%
16	0.95	41413.56	5%-25%
17	0.45	19685.71	5%-25%
18	0.28	12022.78	5%-25%
19	1.06	46063.67	5%-25%
20	0.36	15749.18	less than 5%
21	0.07	2931.99	less than 5%


Hedges Lake
Aquatic Plant Survey 2021
County: Washington
Town: Jackson
Lake Area (acres): 112.2
Date Surveyed: 07/06/2021
AIS Bed Area (acres): 6.2
AIS Observed: EWM
Boat Path
Excessively Interpolated
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
Invasive Plant Density (%)
< 5
5 - 25
26 - 50
51- 75
76 - 100
Hedges Lake
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
ALBANY
RENSSELAER
GREENE
COLUMBIA
Shields Rd
Dorothys Way
Dot Hill Way
Craig Point Way
Andrews Ln
Voerman Way
Upper Road Way
Pump Road Way
Nesbitt Rd
Macehren Way
Dwyer Way
22
EWM
0.1 Kilometers
0.1 Miles
ADIRONDACK RESEARCH


Hedges Lake
Aquatic Plant Survey 2021
County: Washington
Town: Jackson
Lake Area (acres): 112.2
Date Surveyed: 07/06/2021
AIS Bed Area (acres): 6.2
AIS Observed: EWM
Boat Path
Excessively Interpolated
Hardness
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
Hedges Lake
EWM
Shields Rd
Dorothys Way
Dot Hill Way
Dorothys Way
Craig Point Way
Andrews Ln
Voerman Way
Upper Road Way
Pump Road Way
Nesbitt Rd
Macehren Way
Dwyer Way
22
0 0.1 Kilometers
0 0.1 Miles
WASHINGTON
Hedges Lake
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
RENSSELAER
ALBANY
GREENE
COLUMBIA
ADIRONDACK RESEARCH

Lake Lauderdale

Survey Date: July 5th, 2021
Survey Team: L. Johnson, J. Young

Lake Description

Lake Lauderdale is 70-acres. It is located 4.7-miles from the town of Jackson, Washington County, and lies in the Upper Hudson River watershed. The team launched a canoe from the public beach at the Lake Lauderdale country park. The lake had a significant amount of algae present on the aquatic plants. The weather was hot and sunny.

Aquatic Invasive Plant Presence

Scattered beds of *Myriophyllum spicatum* (Eurasian watermilfoil) and *Potamogeton crispus* (curly leaf pondweed) were found in several bays of the lake.

Native Plant Biota

The following native plants were found: *Nuphar variegata* (spatterdock), *Nymphaea odorata* (white water lily), *Elodea sp.* (Elodea), *Najas gracillima* (thread-like naiad), *Zostera* (eel grass), *Potamogeton perfoliatus* (clasping leaf pondweed), *Potamogeton natans* (floating leaf pondweed), *Potamogeton robbinsii* (Robbin's pondweed), *Typha* (cattail species), *Potamogeton pusillus* (slender pondweed), *Lemnoideae* (duckweed), and *Potamogeton amplifolius* (large leaf pondweed). Thick beds of *Najas gracillima* (thread-like naiad) were prevalent, with *Nuphar variegata* (spatterdock) and *Nymphaea odorata* (white water lily) lining the shores.

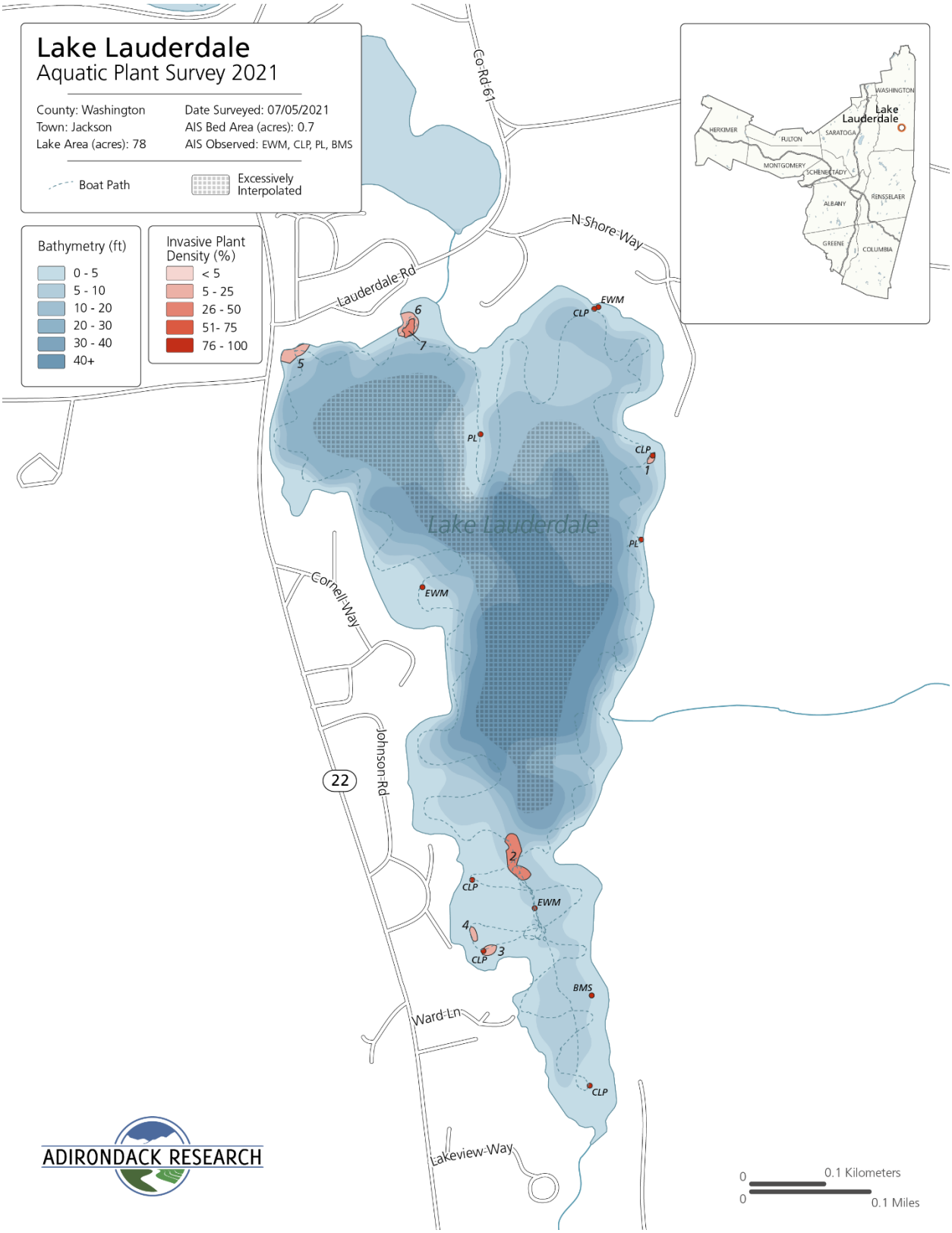
Aquatic Invasive Animal Presence

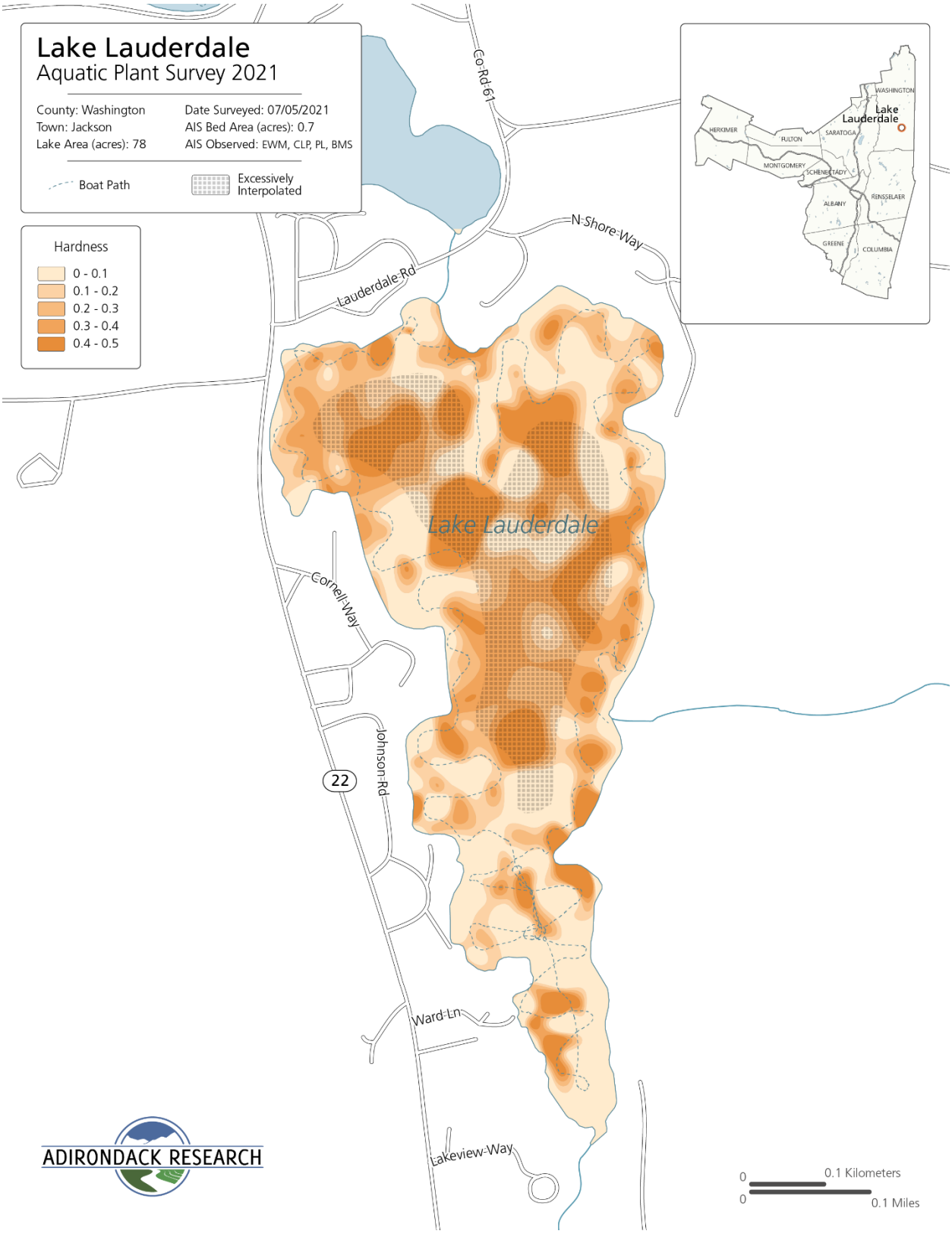
Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. *Viviparus georgianus* (banded mystery snails) were found.

Invasive Species Percent Cover (See map on adjacent page)

% cover NR = not recorded

Curly-leaf Pondweed				Eurasian Watermilfoil			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	0.026414	1150.61	5%-25%	2	0.27	11950.62	26%-50%
3	0.054001	2352.29	NOT RECORDED	5	0.13	5723.50	5%-25%
4	0.035594	1550.45	5%-25%	6	0.11	4716.56	5%-25%
7	0.064448	2807.37	NOT RECORDED				


Lake Lauderdale
Aquatic Plant Survey 2021
County: Washington
Town: Jackson
Lake Area (acres): 78
Date Surveyed: 07/05/2021
AIS Bed Area (acres): 0.7
AIS Observed: EWM, CLP, PL, BMS
Boat Path
Excessively Interpolated
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
Invasive Plant Density (%)
< 5
5 - 25
26 - 50
51- 75
76 - 100
Co Rd 61
N Shore Way
Lauderdale Rd
Cornell Way
Johnson Rd
22
Ward Ln
Lakeview Way
Lake Lauderdale
EWM
CLP
PL
BMS
1
2
3
4
5
6
7
WASHINGTON
Lake Lauderdale
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
ALBANY
RENSSELAER
GREENE
COLUMBIA
0
0.1 Kilometers
0
0.1 Miles


Lake Lauderdale
Aquatic Plant Survey 2021
County: Washington
Town: Jackson
Lake Area (acres): 78
Date Surveyed: 07/05/2021
AIS Bed Area (acres): 0.7
AIS Observed: EWM, CLP, PL, BMS
Boat Path
Excessively Interpolated
Hardness
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
Co Rd 61
N Shore Way
Lauderdale Rd
Lake Lauderdale
Cornell Way
Johnson Rd
22
Ward Ln
Lakeview Way
WASHINGTON
Lake Lauderdale
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
ALBANY
RENSSELAER
GREENE
COLUMBIA
0
0.1 Kilometers
0
0.1 Miles

Mayfield Lake

Survey Date: June 24, 2021
Survey Team: P. Bly, J. Young

Lake Description

Mayfield Lake is 150-acres and has 3 miles of shoreline. It is located in the town of Mayfiled in Fulton County within the Hudson River Watershed. The team launched a motorboat from a public launch on the northern shore of the lake off of School Street and parked at a private marina free of charge.

Aquatic Invasive Plant Presence

Scattered beds of *Myriophyllum spicatum* (Eurasian watermilfoil) *Potamogeton crispus* (curly leaf pondweed) were located throughout the lake.

Native Plant Biota

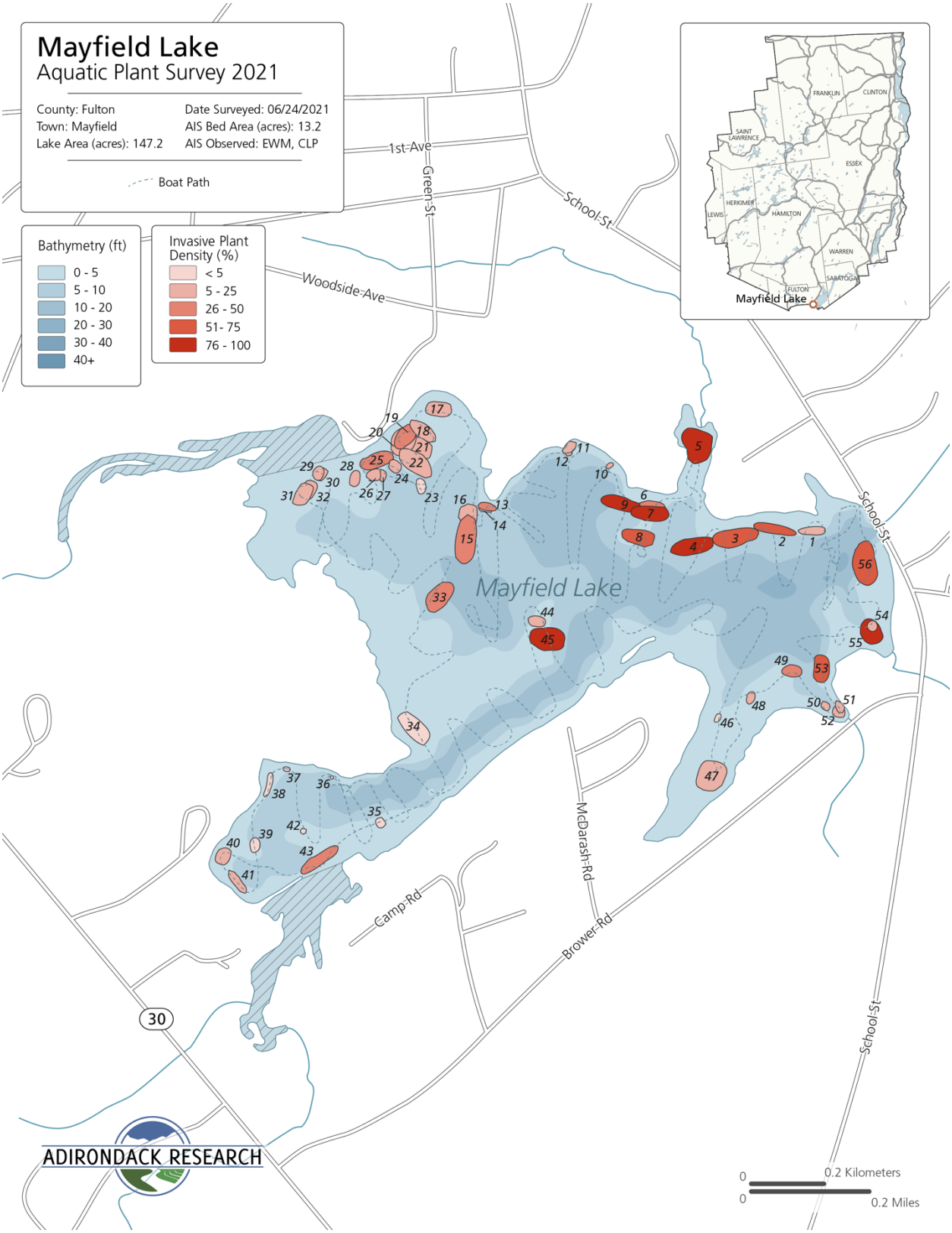
Comprehensive surveys were not prioritized in 2021 as invasive species were the primary focus of the surveys. The following native species were found: *Elodea nuttallii* (slender waterweed), *Nymphaea odorata* (white-water lily), *Brasenia schreberi* (water shield), *Potamogeton amplifolius* (large leaf pondweed), *Typha sp.* (cattail sp.), *Utricularia macrorhiza* (common bladderwort), *Sparganium angustifolium* (narrow-leaf burr reed), *Potamogeton natans* (floating-leaf pondweed), *Zostera marina* (common eelgrass), *Ceratophyllum demersum* (coontail), *Potamogeton robbinsii* (Robbin's pondweed).

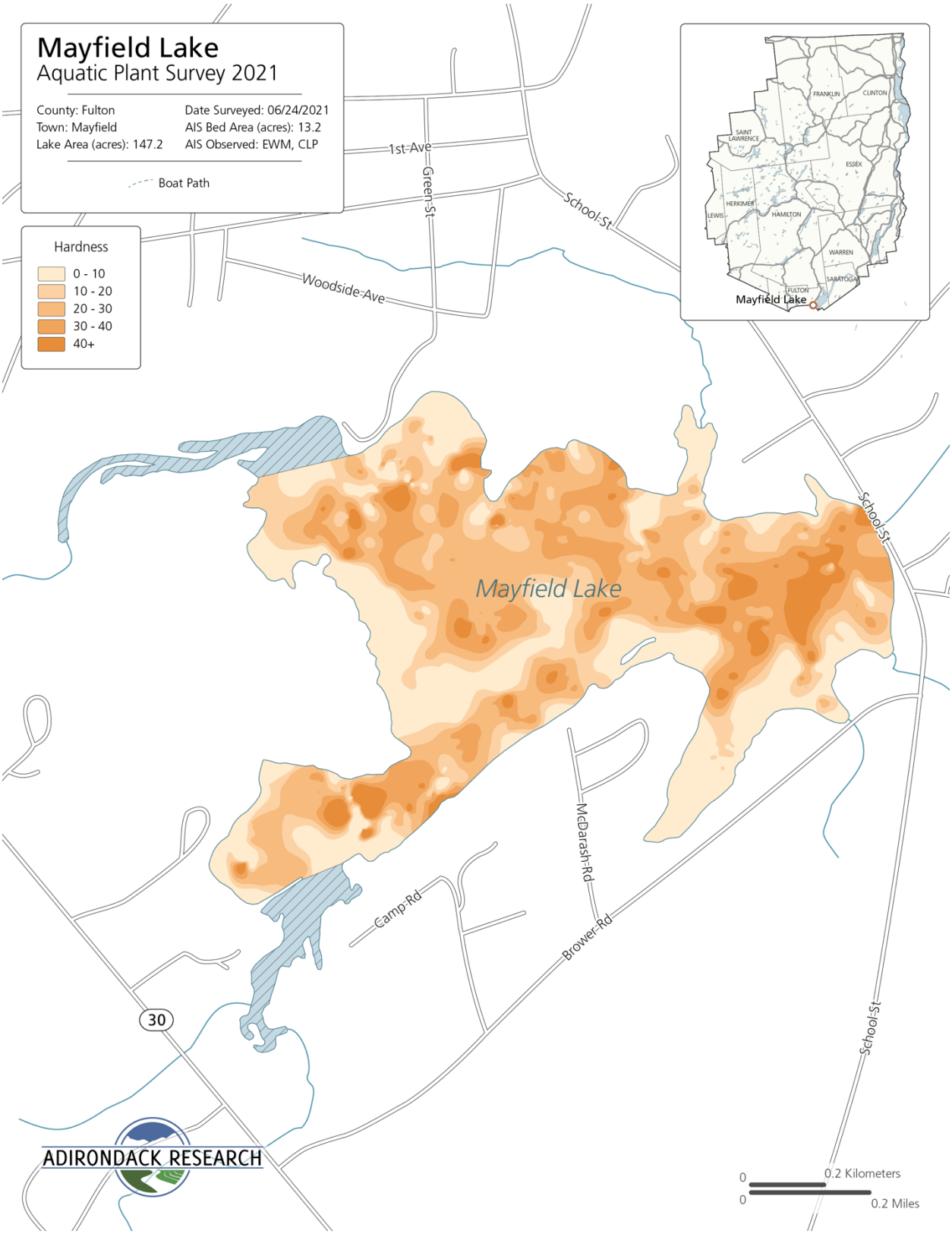
Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. Three plankton tows were also conducted with no invasive zooplankton detected. Though, it should be noted that Mayfield Lake is connected directly to the Great Sacandaga Lake, which has a known *Bythotrephes longimanus* (spiny water flea) infestation.

Invasive Species Percent Cover (See map on adjacent page)

Eurasian Watermilfoil				Curly-leaf Pondweed			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	0.15	6551.96	5%-25%	11	0.09	4041.07	5%-25%
2	0.28	12048.79	51%-75%	14	0.04	1793.81	5%-25%
3	0.54	23456.78	51%-75%	16	0.30	13072.93	5%-25%
4	0.48	20748.00	76%-100%	18	0.28	12084.07	5%-25%
7	0.39	16968.30	76%-100%	19	0.29	12660.38	26%-50%
5	0.67	28982.91	76%-100%	22	0.49	21257.67	5%-25%
6	0.15	6706.95	26%-50%	23	0.10	4248.79	less than 5%
8	0.35	15274.48	51%-75%	24	0.10	4527.72	5%-25%
9	0.37	15976.86	76%-100%	27	0.06	2682.61	5%-25%
10	0.03	1126.61	5%-25%	30	0.09	3745.63	5%-25%
12	0.02	958.88	5%-25%	32	0.18	8025.69	5%-25%
13	0.09	4119.65	26%-50%	34	0.47	20660.01	less than 5%
15	0.67	29280.21	26%-50%	35	0.06	2765.39	less than 5%
17	0.27	11567.08	5%-25%	42	0.02	898.85	less than 5%
20	0.46	19825.37	5%-25%	37	0.02	978.63	less than 5%
21	0.27	11681.91	5%-25%	38	0.10	4271.85	less than 5%
25	0.35	15031.83	26%-50%	39	0.10	4217.89	less than 5%
26	0.11	4911.80	5%-25%	41	0.15	6610.74	5%-25%
28	0.11	4860.04	5%-25%	46	0.03	1437.52	less than 5%
29	0.10	4345.87	5%-25%	48	0.07	2924.11	5%-25%
31	0.26	11120.44	5%-25%	50	0.05	2188.79	5%-25%
33	0.45	19815.39	26%-50%	51	0.06	2773.97	5%-25%
36	0.01	292.47	less than 5%	54	0.07	3036.18	5%-25%
40	0.17	7341.24	5%-25%				
43	0.34	14620.13	26%-50%				
44	0.13	5485.91	5%-25%				
45	0.55	24047.34	76%-100%				
47	0.59	25888.93	5%-25%				
49	0.16	6876.28	26%-50%				
52	0.10	4156.28	5%-25%				
53	0.30	13265.70	51%-75%				
55	0.36	15504.03	76%-100%				
56	0.69	29868.58	51%-75%				


Mayfield Lake
Aquatic Plant Survey 2021
County: Fulton
Town: Mayfield
Lake Area (acres): 147.2
Date Surveyed: 06/24/2021
AIS Bed Area (acres): 13.2
AIS Observed: EWM, CLP
Boat Path
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
Invasive Plant Density (%)
< 5
5 - 25
26 - 50
51- 75
76 - 100
1st Ave
Green St
School St
Woodside Ave
McDarash Rd
Brower Rd
Camp Rd
30
Mayfield Lake
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
Mayfield Lake
0
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH


Mayfield Lake
Aquatic Plant Survey 2021
County: Fulton
Town: Mayfield
Lake Area (acres): 147.2
Date Surveyed: 06/24/2021
AIS Bed Area (acres): 13.2
AIS Observed: EWM, CLP
Boat Path
Hardness
0 - 10
10 - 20
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30 - 40
40+
1st Ave
Green St
School St
Woodside Ave
Mayfield Lake
McDarash Rd
Brower Rd
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30
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
HAMILTON
LEWIS
WARREN
SARATOGA
FULTON
Mayfield Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
0
0.2 Miles

Schoolhouse Lake

Survey Date: July 5th, 2021
Survey Team: L. Johnson, J. Young

Lake Description

Schoolhouse Lake is 14-acres. It is located in the town of Cambridge, Washington County, and lies in the Upper Hudson River watershed. The team launched a canoe from NY-22 at the Burger Den Restaurant. The lake had a significant amount of algae present on the aquatic plants. The weather was hot and sunny.

Aquatic Invasive Plant Presence

Scattered beds of *Myriophyllum spicatum* (Eurasian watermilfoil) and *Potamogeton crispus* (curly leaf pondweed) were found in several bays of the lake.

Native Plant Biota

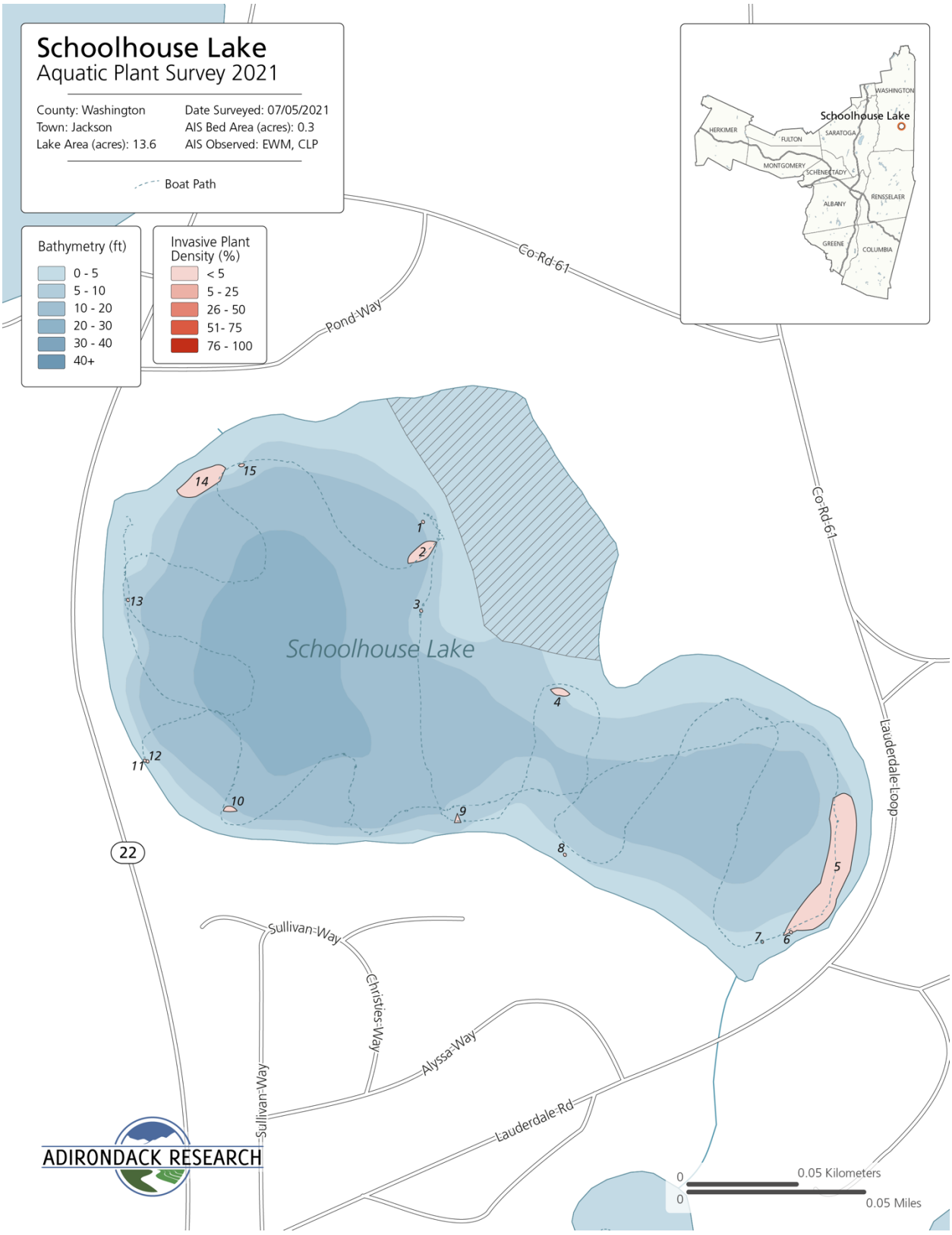
The following native plants were found: *Nuphar variegata* (spatterdock), *Nymphaea odorata* (white water lily), *Elodea*, *Najas gracillima* (thread-like naiad), *Zostera* (eel grass), *Potamogeton pusillus* (slender pondweed), *Typha* (cat tail species), and *Potamogeton amplifolius* (large leaf pondweed). Thick beds of *Najas gracillima* (thread-like naiad) were prevalent, with *Nuphar variegata* (spatterdock) and *Nymphaea odorata* (white water lily) lining the shores.

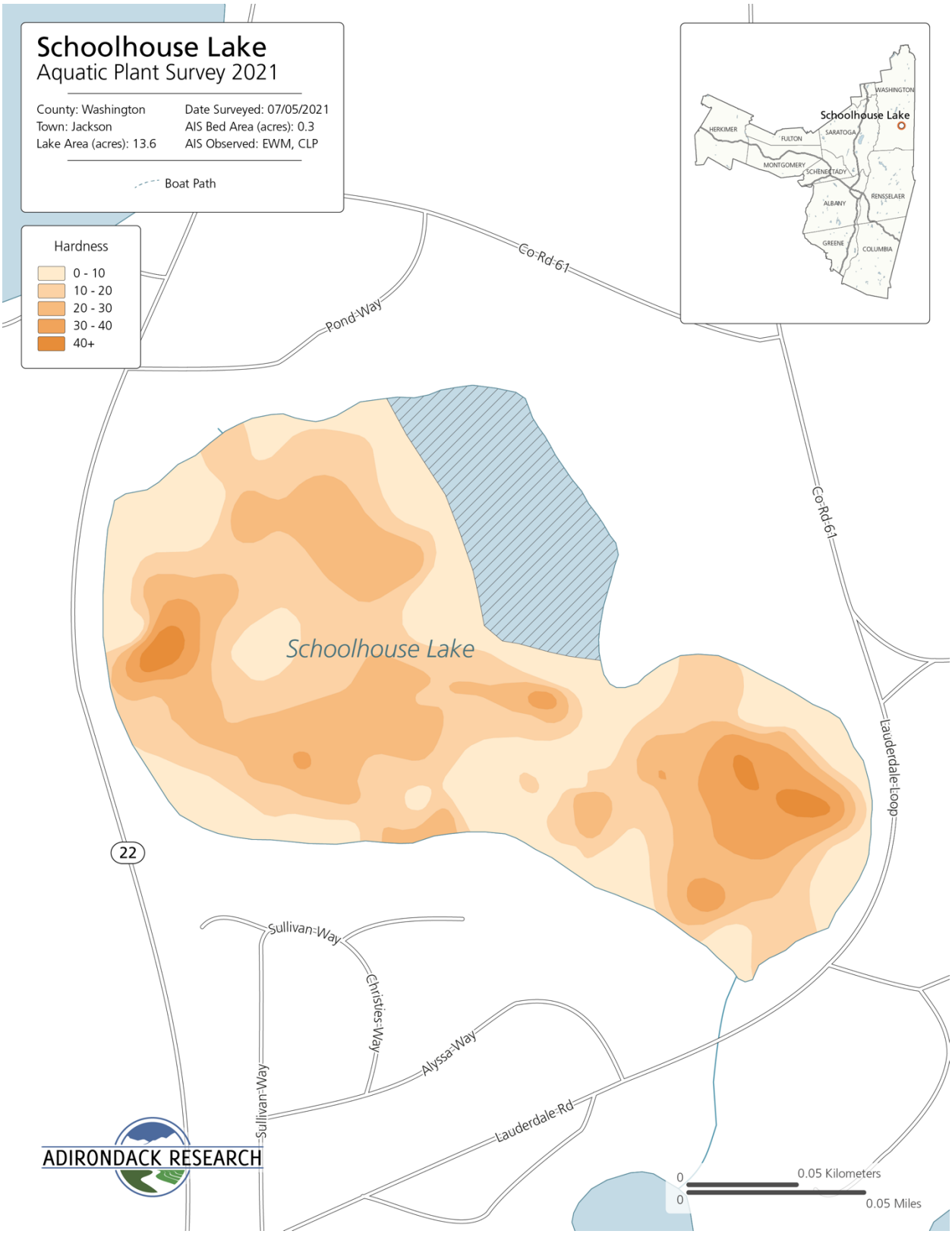
Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. *Viviparus georgianus* (banded mystery snails) were found.

Invasive Species Percent Cover (See map on adjacent page)

Curly-leaf Pondweed				Eurasian Watermilfoil			
Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover	Bed	Size (Ac.)	Size (Sq. Ft.)	% Cover
1	0.00004	1.56	less than 5%	2	0.01745	760.12	less than 5%
3	0.00009	4.05	less than 5%	4	0.00535	233.04	less than 5%
6	0.00001	0.35	less than 5%	5	0.18901	8233.38	less than 5%
7	0.00014	6.07	less than 5%	8	0.00013	5.45	less than 5%
9	0.00159	69.29	less than 5%	11	0.00003	1.12	5%-25%
10	0.00282	122.80	less than 5%	15	0.00071	30.77	less than 5%
12	0.00001	0.64	5%-25%				
13	0.00003	1.21	5%-25%				
14	0.04321	1882.03	less than 5%				


Schoolhouse Lake
Aquatic Plant Survey 2021
County: Washington
Town: Jackson
Lake Area (acres): 13.6
Date Surveyed: 07/05/2021
AIS Bed Area (acres): 0.3
AIS Observed: EWM, CLP
Boat Path
Bathymetry (ft)
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40+
Invasive Plant Density (%)
< 5
5 - 25
26 - 50
51- 75
76 - 100
Schoolhouse Lake
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
ALBANY
RENSSELAER
GREENE
COLUMBIA
Co Rd 61
Pond Way
Lauderdale Loop
22
Sullivan Way
Christies Way
Alyssa Way
Lauderdale Rd
ADIRONDACK RESEARCH
0
0.05 Kilometers
0
0.05 Miles


Schoolhouse Lake
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Town: Jackson
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10 - 20
20 - 30
30 - 40
40+
Schoolhouse Lake
WASHINGTON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
RENSSELAER
ALBANY
GREENE
COLUMBIA
Co Rd 61
Pond Way
Lauderdale Loop
22
Sullivan Way
Christies Way
Alyssa Way
Lauderdale Rd
0
0.05 Kilometers
0
0.05 Miles
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