Request for Quotes
2022-23 Within-Lake Invasive Species Vulnerability Spatial Analysis
June 17, 2022

Request for Quotes

The Nature Conservancy (TNC) is soliciting quotes for a contractor to conduct an analysis of biotic and abiotic spatial data by building a model that predicts which areas within a lake are potentially more vulnerable to aquatic invasive species establishment. Quotes for delivering the "Scope of Services" and meeting the "Additional Service Expectations" below should be sent to Brian Greene (brian.greene@tnc.org) by July 20, 2022.

Project Description

TNC administers the Adirondack Park Invasive Plant Program (APIPP). APIPP is one of eight Partnerships for Regional Invasive Species Management (PRISM) funded by the New York State (NYS) Environmental Protection Fund as administered by the NYS Department of Environmental Conservation (DEC). APIPP's mission is to protect the Adirondack region from the negative impacts of non-native invasive species.

APIPP collects spatial data on aquatic invasive species (AIS) presence, location, and percent cover (for plants) in Adirondack lakes. This data includes information on both animals (Asian clam, zebra mussels, spiny waterflea) and plants (with Eurasian watermilfoil, variable leaf milfoil, and curly leaf pondweed being the three most common species). In addition, APIPP has collected sonar data on lakes and used BioBase software to create derivative products to map the physical (depth and substrate hardness) and biotic (biovolume, which is the height of plants in the water column) characteristics of lakes. From third party sources, APIPP has aggregated some manmade features such as boat launches, marinas, public beaches, campgrounds, and adjacent landcover from the National Land Cover Database (NLCD).

The APIPP dataset contains data from over 100 lakes across the Adirondack Park and approximately 25% of these lakes have AIS present. See Appendix A for a visual example of maps and data. You can also find more information about the lakes that have been surveyed in the annual Aquatic Program Early Detection reports on APIPP's website.

TNC is seeking a contractor to conduct a spatial statistical analysis of the abiotic, biotic, and manmade feature data to identify correlations and predict areas within a lake that are more vulnerable to AIS establishment. The specific questions TNC

would like to have answered as a result of this project are as follows.
1. Using data from lakes that already have AIS present, what factors have the strongest spatial correlation with established AIS locations?
2. Can the data be used to predict/model where AIS are most likely to establish within lakes that do not currently have AIS present?

Past studies have used landscape level variables (lake elevation, distance from other invaded lakes, distance from major roads, etc.) to predict which lakes are most vulnerable to AIS invasion. This project will add on to this past work and look within a lake to identify areas that are most vulnerable to AIS establishment. The analysis created by this project will aid lake managers, volunteers, and AIS professionals by providing information about which areas within a lake should be prioritized for AIS early detection surveys.
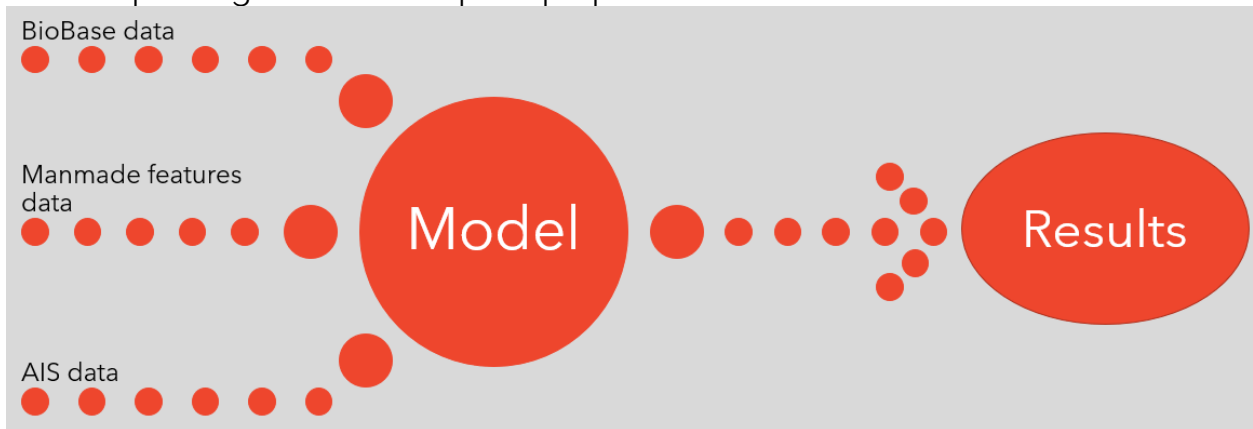
An example of the available data has been compiled and can be accessed via this link in the event potential contractors wish to view and test example data.

Scope of Services
Phase 1: Due by November 30, 2022 – Conducting the analysis on lakes that currently have AIS present
1. The contractor will work with TNC to identify the data variables, sources, and formats to include in the analysis. At a minimum. TNC expects the following APIPP-provided data to be included in the analysis. (TNC is open to suggestions about additional types, sources, or forms of data that the contractor thinks will be useful.)
    a. BioBase (sonar-derived data in raster format)
        i. Abiotic
            1. Depth
            2. Substrate hardness
        ii. Biotic
            1. Biovolume (height of plants in the water column). [Note: This data does not distinguish between native or invasive plants.]
    b. Manmade Features
        i. Boat launches (point)
        ii. Marinas (point)
        iii. Public beaches (point)
        iv. Campgrounds (point and polygon)
        v. National Land Cover Database landcover data for the lake and the single raster cell adjacent to the lake shoreline (raster)
    c. AIS Extent (in vector polygon format that includes non-spatial attributes such as):
        i. Species identification
        ii. Percent cover of the species within the polygon feature
2. The contractor will work with TNC to assemble, source, and compile all needed data for the analysis.
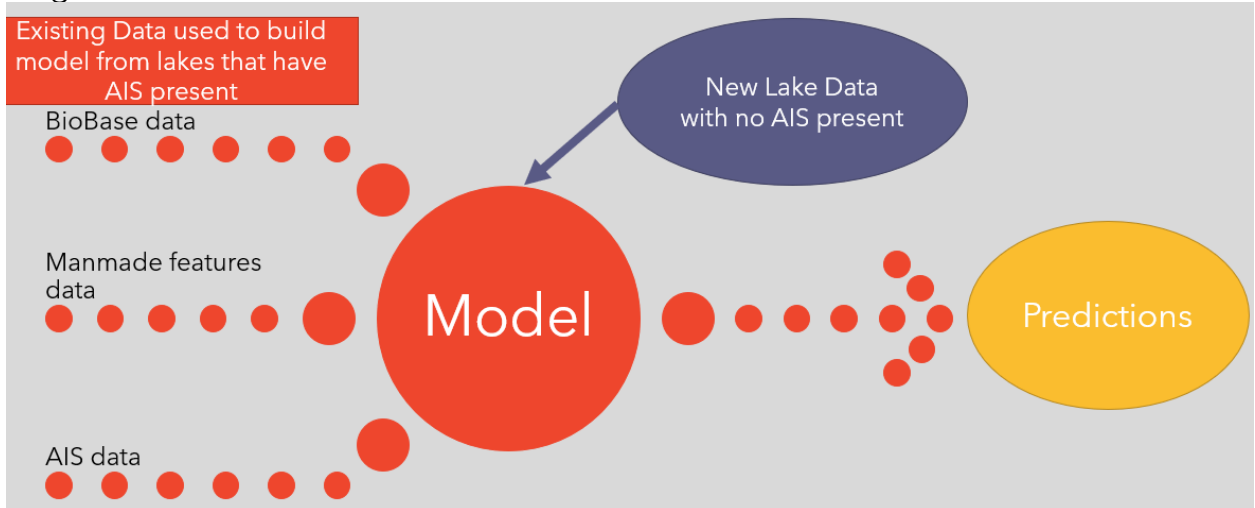
3. The contractor will create a framework to analyze the data, using spatial statistics, habitat suitability modeling, and/or established geospatial techniques, to ascertain the correlations, factors, or weights of the input data to explain spatial relationships of the data to areas of AIS establishment in the lakes. The framework will be reviewed by TNC to ensure that assumptions are reasonable prior to progressing to step 4.
4. The contractor will run the analysis using a subset of the data from lakes that have AIS present in accordance with industry and statistical standards. Below is an example diagram for conceptual purposes.

BioBase data
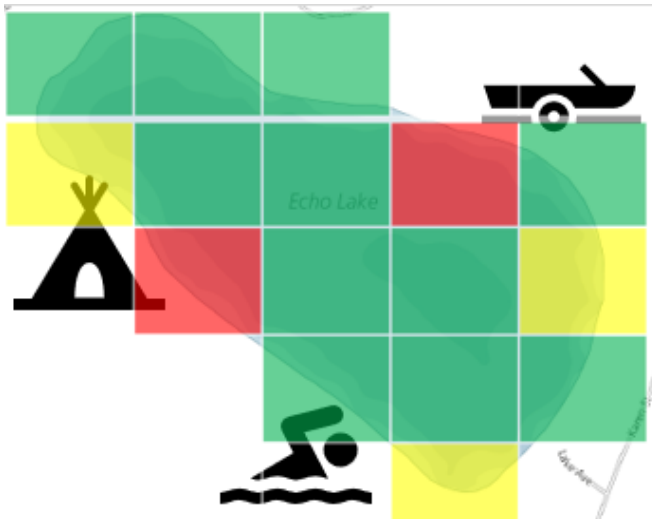
Manmade features data

Model

AIS data

Results

5. The contractor will validate the analysis with data from the remaining subset of lakes that have AIS present (that was not used in the original analysis) to validate and test the accuracy and fitness of the analysis.
6. The contractor will provide the results of the analysis, indicating the data variables that are related to AIS establishment and their corresponding statistical analysis, as the deliverable for Phase 1. TNC must confirm that phase 1 was satisfactorily completed before the contractor can proceed to phase 2. Phase 1 must be completed no later than November 30, 2022.

1. After phase 1 is complete, the contractor will run the analysis on a subset of the lakes that APIPP has data for that do not have AIS currently present. An example diagram is shown below.

2. The results of this phase will create predictions of areas within a lake that are most vulnerable to AIS establishment. Results should be presented in multiple forms, including but not limited to, tables, reports, and raster heat maps that identify the areas that are at the highest risk of AIS establishment. An example of a heat map with red blocks indicating the most vulnerable locations for future AIS establishment within a lake is shown below.

3. The contractor will provide the analysis and a graphic user interface that does not require significant technical programming expertise (such as a tool in ArcToolbox, open-source web-based GUI, etc.) and that allows TNC and others to input new data and run the analysis for data collected on lakes in the future.
4. The contractor will provide a summary report, which may be publicly shared on the APIPP website, that describes the work completed, the analysis tool, the

accuracy of the analysis, and the means by which APIPP can input future data into the analysis to predict new results.

Additional Service Specifications

The contractor for this project must have demonstrated prior experience in spatial analysis, statistical analysis and building models that assess patterns of spatial correlation. If any work is to be done by a sub-contractor, this needs to be clearly stated in the proposal and the sub-contractor's experience and qualifications must also be provided.

Timeline

- June 17, 2022: Request For Quotes released
- July 20, 2022: Quotes submitted to TNC
- August 5, 2022: Contractor selected
- November 30, 2022: Phase 1 complete
- May 1, 2023: Phase 2 complete

General Contract Terms for The Nature Conservancy and NYSDEC

DATA AND EQUIPMENT. All data collected or purchased for the project during the term of the contract is the property of TNC. Any equipment acquired with funds from this contract and having a useful life of more than one year is the property of NYSDEC and will be retained by TNC for future use in similar projects. The Contractor must supply a list of all equipment purchased to TNC. Equipment meeting this definition must be delivered to TNC immediately upon contract termination or completion.

WORK PRODUCT/INTELLECTUAL PROPERTY. Contractor retains all right, title, and interest in works, inventions, and other intellectual property original to or owned by Contractor prior to the execution of this Contract or created outside the scope of this Contract. If the Services involve the creation of intellectual property including, but not limited to, inventions, concepts, processes, reports, derivative works, studies, photographs, software (including in both object code and source code form), drawings, designs, writings, related drafts, supporting materials, or data (collectively, the "Works"), TNC will own all right, title, and interest, including copyrights, and, if applicable, patent rights, in and to the Works. Contractor agrees that all copyrightable Works are "works made for hire" as defined under the copyright laws of the United States. To the extent that any of the Works are not works made for hire, Contractor unconditionally assigns to TNC and TNC's successors and assigns all right, title, and interest, including copyright, and other intellectual property rights, in and to the Works in all media (whether now known or later developed) worldwide and in perpetuity. Contractor grants to TNC a worldwide, non-exclusive, royalty-free, perpetual license to use, reproduce, distribute, modify, exercise, practice, perform, and exploit any assets subject to Contractor's patents, copyrights, or other

intellectual property rights, to the extent that such license is necessary for TNC to enjoy all rights associated with ownership of the Works. Upon request of TNC, Contractor will deliver to TNC all tangible copies (including digital copies) of the Works and will execute and complete all documentation necessary to establish TNC's ownership of the Works. Contractor warrants and covenants that the Works will not infringe on the patent rights, copyrights, or other intellectual property rights of Contractor or third parties.

CODE OF CONDUCT AND HELPLINE. TNC expects itself and everyone with whom it does business to conduct themselves in ways that are consistent with TNC's Code of Conduct found at https://www.nature.org/en-us/about-us/who-we-are/accountability/code-of-conduct. Anyone (whether an employee of TNC or not) may contact the TNC Helpline (anonymously, if desired) with questions, concerns, or suspected violations.

WORKFORCE DATA REPORTING. The Contractor must submit quarterly workforce demographic and salary data required by NYSDEC to TNC and/or NYSDEC.

LIABILITY/INSURANCE. The work to be performed shall be performed entirely at the Contractor's risk and subject to liability/insurance requirements, including $4,000,000 in Comprehensive General Liability Insurance, $1,000,000 in Comprehensive Business Automobile Liability Insurance. Certificates of insurance must be provided prior to signing the contract.

CONFLICTS OF INTEREST. The Contractor must complete a conflict-of-interest disclosure form prior to signing the contract.

To Submit a Quote
All quotes with a total project cost in the $20,000-$35,000 range will be evaluated. [Important Notes: Phase 1 must be completed by November 30, 2022. Phase 2 must be completed by May 1, 2023. The budget for Phase 2 may not exceed $15,000.] Interested contractors should submit the following, no later than 5:00pm, July 20, 2022, to:
> The Nature Conservancy
> Brian Greene, Aquatic Invasive Species Coordinator
> P.O. Box 65
> Keene Valley, New York 12943
> or by email to brian.greene@tnc.org.
1. A statement of interest in serving as the contractor to conduct the "Within-Lake Invasive Species Vulnerability Spatial Analysis" that includes the following items.
   a. A detailed description of services and products to be provided, and a specific timeline for the completion of each phase of the project.
   b. A statement of the qualifications and experience of each member of the team working on the project and the contractor's experience

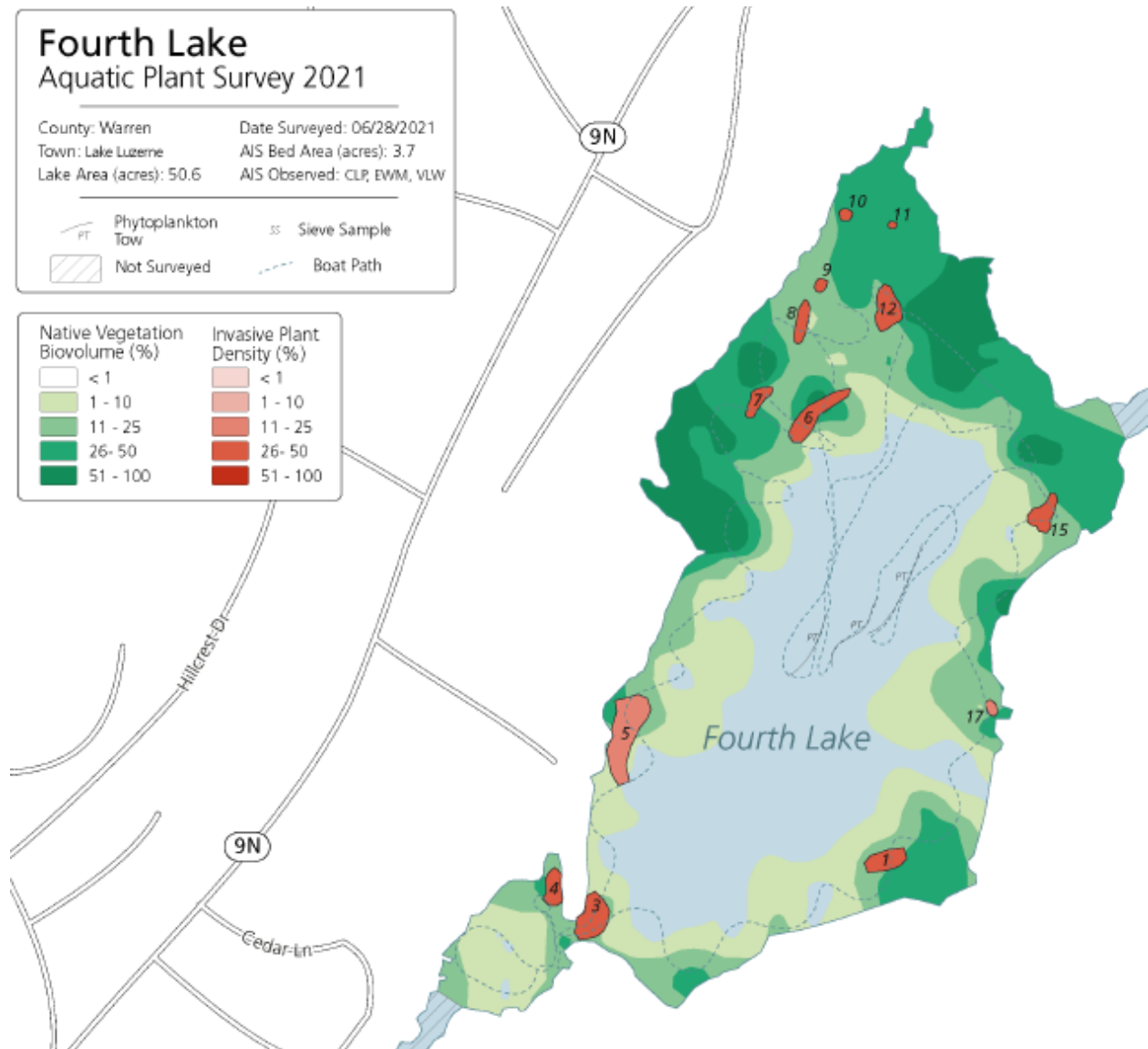performing the requested services. (Links to prior work may be included.)
2. A detailed quote with a budget for the proposed services with an itemization of personnel costs (and the rate used to estimate costs), subcontract costs (if any), and other expenses for each phase of the scope of work.
3. At least three (3) references with the contact name, phone number and email. All references must be contacted by the contractor and must give permission for TNC to make contact.
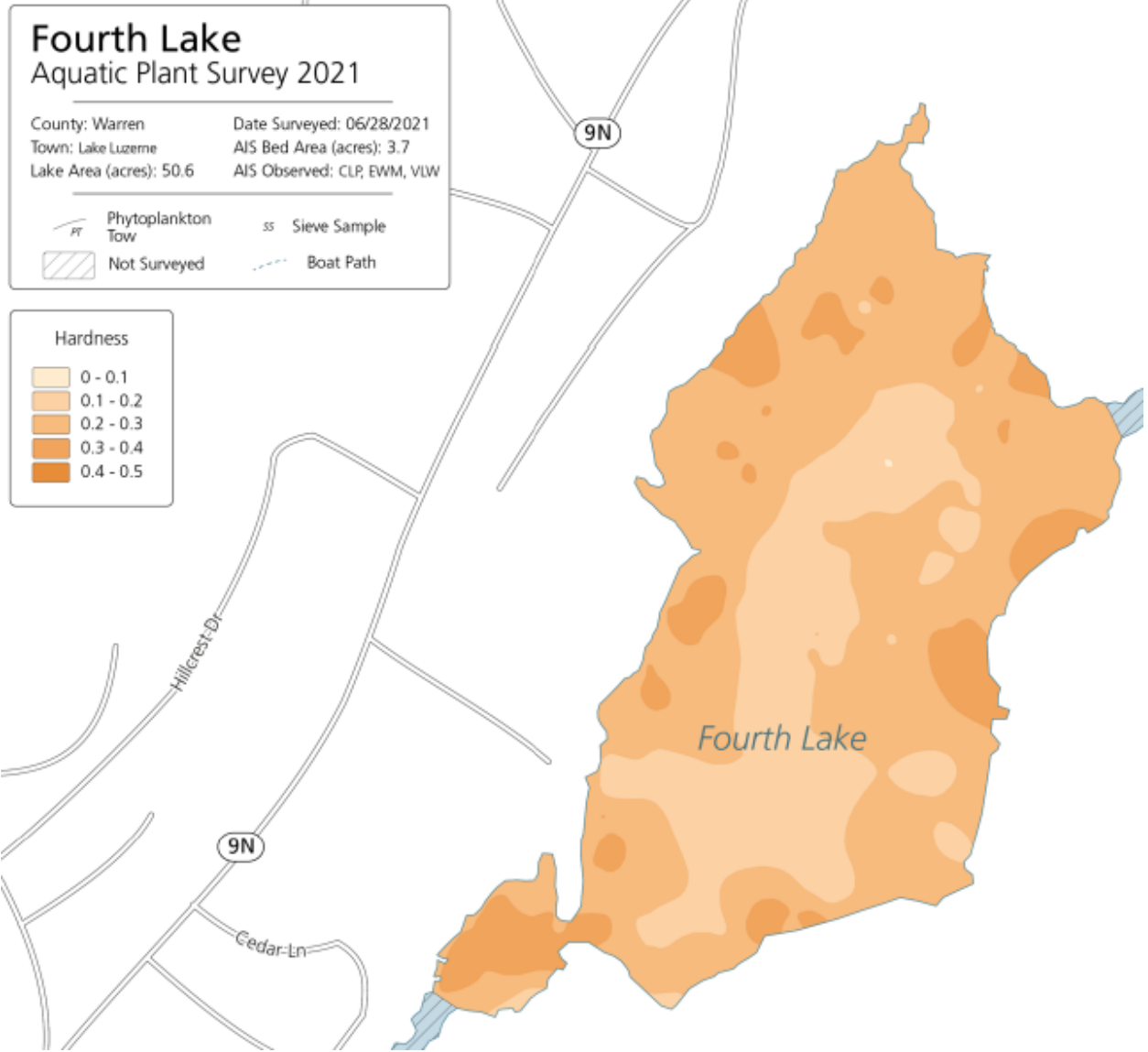
Selection Process
TNC will review the responses to this request for quotes and make its selection based on a combination of the project description, final negotiated price, the contractor's experience completing similar work, and contractor references. It is expected that the contractor will be selected by August 5, 2022. The contractor selection will be reviewed by the NYSDEC and the final contract with the contractor must meet state requirements.
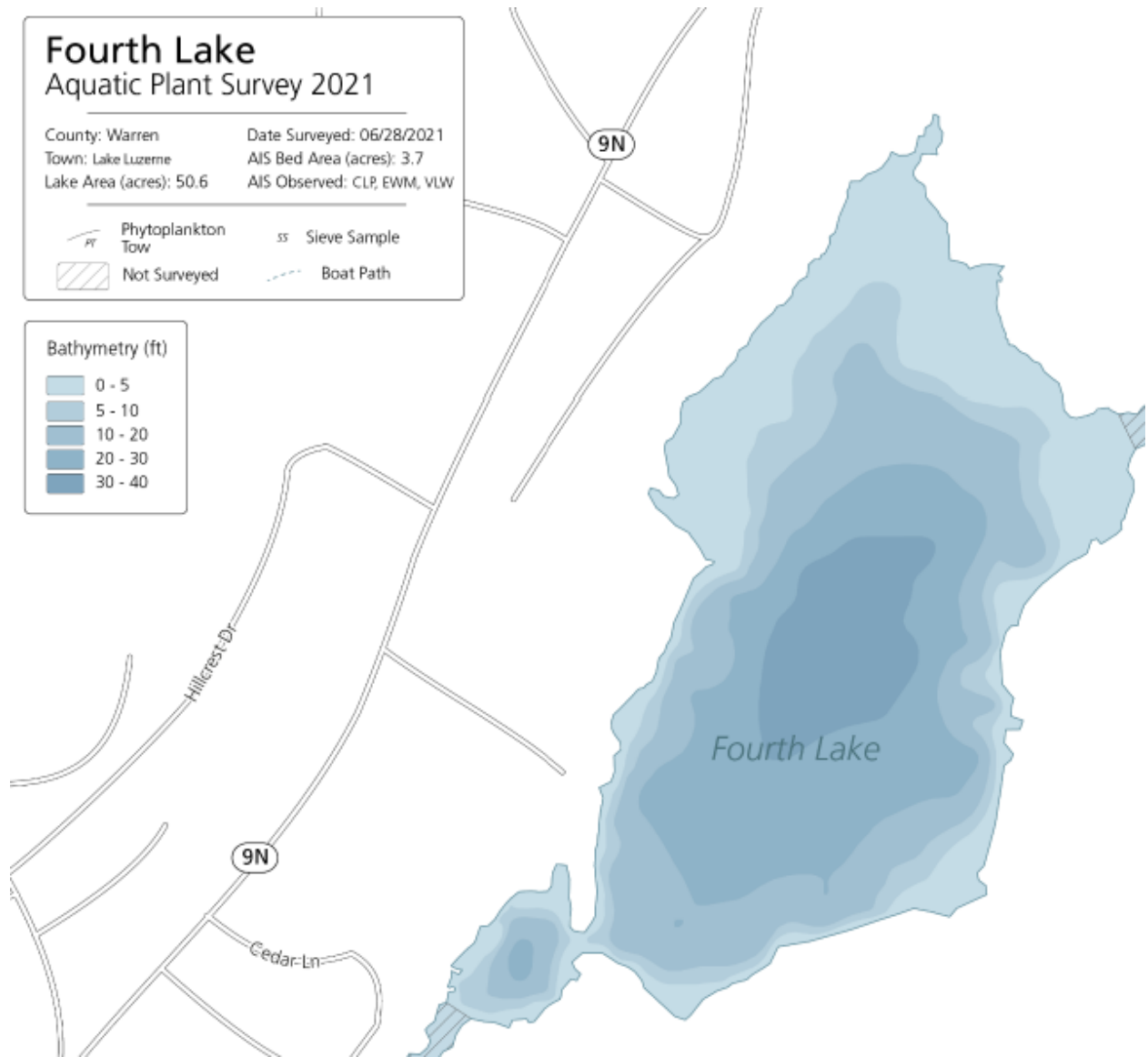
Appendix A
Example of maps and data from previously collected data in 2021 on Fourth Lake in Warren County.
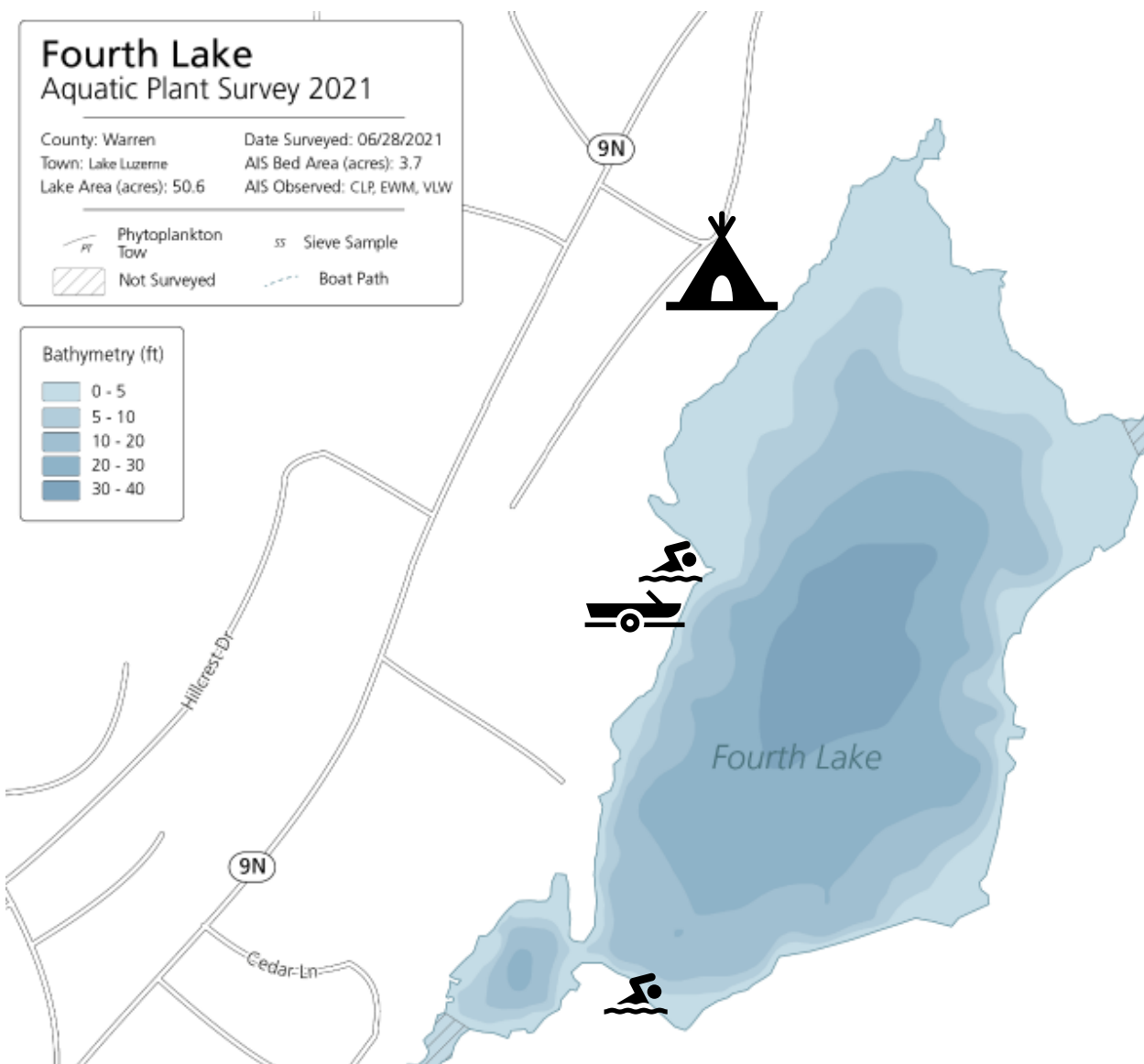
Example of red polygons showing location and density of invasive species. Shades of green are BioBase smoothed and interpolated Biovolume (plant height in the water column) data from sonar raster data.

Substrate bottom hardness data from BioBase smoothed and interpolated from sonar raster data.

Depth data from BioBase smoothed and interpolated from sonar raster data.

Example of known human locations (point data) on Fourth Lake.