New York State
Adirondack
Park Agency

KATHY HOCHUL
Governor

BARBARA RICE
Executive Director

NOTICE OF INCOMPLETE PERMIT APPLICATION

APA Project No.: 2023-0045

Project Sponsor:	**Authorized Representative:**
Town of Lake Luzerne Eugene Merlino, Supervisor 539 Lake Avenue Lake Luzerne, NY 12846	Solitude Lake Management Glenn Sullivan, Project Manager 28 Vassar Road Great Meadows, NJ 07838

Date Permit Application Received: March 10, 2023
Type of Project: application of aquatic herbicide involving wetlands
Location of Project: Town of Lake Luzerne, Warren County
Land Use Area: Underwater Lands

Dear Glenn Sullivan:

Thank you for your permit application, received by the Agency on March 10, 2023. The application provided important information on the proposed project. As listed below, initial evaluation by Agency staff indicates that additional information is necessary to review the project and complete the application.

Please submit your response to this notice by e-mail to aaron.ziemann@apa.ny.gov and reference Project Number 2023-0045 in the subject line.

You will receive a notice in writing informing you when staff has received the information necessary to complete the application. At the time the application is deemed complete, the required time period for Agency action on the proposed project will begin.

The proposal may not be undertaken until a permit has been issued by the Agency. "Undertake" means any commencement of a material disturbance of land preparatory to the proposed project, including but not limited to road construction, grading, installation of utilities, excavation, clearing of building sites, or other landscaping, or in the case of subdivision, the conveyance of any lots.

If you have any questions regarding this Notice of Incomplete Permit Application or the project review process, please contact **Aaron Ziemann** at the Agency.

March 21, 2023
Date

/s/ John M. Burth
John M. Burth
Environmental Program Specialist 3

Attachment: List of Requested Information

REQUESTED INFORMATION
APA Project No. 2023-0045

Please submit your response to this notice by e-mail to aaron.ziemann@apa.ny.gov All application submissions should be in PDF or similar format and be legible. Electronic copies of plans must be fully scalable.

1. **GIR Item 14c – New York State Department of Environmental Conservation (NYSDEC):** Please provide copies of any comments or authorizations received from the NYSDEC for the proposed activity going forward.

2. **SIR Item 2 (D) – Plant Survey Report**: The provided survey data include one record of *Myriophyllum alterniflorum* (alternate flowered milfoil, or little milfoil) in the southern portion of treatment area E. *Myriophyllum alterniflorum* is a protected species listed as Threatened in the State of New York and is noted as having a likely high susceptibility to ProcellaCorEC. Please provide a discussion of any actions proposed to be undertaken to avoid or limit impacts to *Myriophyllum alterniflorum*.

3. **SIR Item 2 (D)(2) – Plant Survey Maps**: The survey points depicted on the map titled, "2023 Eurasian Watermilfoil Treatment Areas," prepared by KM of Solitude Lake Management, received by the Agency on March 10, 2023, appear to be a composite of data recorded in the 2021 Eichler survey and the 2022 Sullivan survey. Given the differences in the described methodologies for each of these surveys, please provide a narrative explanation clarifying how the survey points on the proposed treatment map were derived.

cc: Brian Primeau, DEC

Please send all application materials to apasubmissions@apa.ny.gov.

ADIRONDACK PARK AGENCY Division of Regulatory Programs PO Box 99, 1133 NYS Route 86 Ray Brook, New York 12977 Telephone (518) 891-4050 www.apa.ny.gov	NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency	APPLICATION FOR MAJOR PROJECTS General Information Request

Applicability: This General Information Request, together with a Supplemental Information Request, is the application for an Adirondack Park Agency permit for a variety of Major Projects. The General Information Request seeks general information about the project site and proposal while the Supplemental Information Request is specific to the type of project being proposed. The Agency may also request pertinent additional information based on the information contained in the application.

Instructions: Please answer all of the questions in each numbered section and provide all applicable attachments. Type or print clearly in ink. **Submit three completed copies of each of the following: this General Information Request, a Supplemental Information Request specific to your project, and all required attachments to the Agency at the above address.** A site visit by Agency staff will also be required. The Adirondack Park Agency Act provides that the time period for review of the proposed project will not begin until the Agency determines that the application is complete. If the application is not complete, a request for missing and/or additional information will be issued within 15 days of receipt of the application, indicating what information is still required for a complete application. The proposed project may not be undertaken until a permit has been issued by the Agency.

Assistance: For assistance in completing this application or to request a pre-application meeting, please contact the Agency's Regulatory Programs division at the above address/telephone number and/or refer to the Agency's website.

1. Project Sponsor(s)*:

Name(s): Town of Lake Luzerne
Eugene Merlino, Supervisor
Mailing Address:
539 Lake Avenue
Lake Luzerne, NY 12846
Telephone (Daytime): 518-696-2711
Fax/E-mail: supervisorlakeluzerne@hotmail.com

2. Current Property Owner(s):** (if different than Project Sponsor)

Name(s): ____
Mailing Address: ____
Telephone (Daytime): ____
Fax/E-mail: ____

* A project sponsor is a person having a legal interest in property who makes application to the Agency for the review of a project proposed on such property. Documentation demonstrating such legal interest must be provided, such as a current deed or purchase contract.

** List all names on the current deed of record.

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency
RECEIVED
Date: March 10, 2023

3. **Project Sponsor's Authorized Representative:**

By filling in the name and address below and signing this application, the project sponsor is authorizing the person named below to act as his/her agent in all matters relating to this permit application before the Adirondack Park Agency. The project sponsor acknowledges that all contact regarding the application will be through his/her Authorized Representative. The project sponsor is, however, ultimately responsible for the accuracy of the information contained in this application and for compliance with all terms and conditions of any permit issued to him/her by the Agency.

Name: Solitude Lake Management, Glenn Sullivan, Project Manager
Mailing Address: 310 East Washington Ave., Washington, NJ 07882
Telephone (daytime): 908-310-8775 Fax/E-mail: gsullivan@solitudelake.com

4. **Project Site Location/Identification** (a project site is generally considered to be all adjoining properties owned by the current landowner(s) including properties separated by a public road):

Road/Highway: Rt. 9N
Nearby Waterbody: Lake Luzerne
Town(s): Lake Luzerne County: Warren
Size: 99 acres

Tax Map Designation (from the tax bill for the property):
Section: n/a Block: ________ Parcel: ________
Section: ________ Block: ________ Parcel: ________
Section: ________ Block: ________ Parcel: ________

5. **Project Sponsor's Legal Interest in Project Site** (check the one that applies):

X owner ______ signed purchase agreement holder
____ lessee ______ option holder ______ other (Identify: ________________)

6. **Deed(s):**

Provide, as **Attachment A**, a complete copy of the current recorded deed(s) for the project site containing the recording information. Copies are available from the County Clerk's Office. Also, if the project sponsor has an executed contract or agreement to purchase or lease the project site, please provide a copy in order to establish the project sponsor's legal interest in the project site. (The purchase price and other confidential information may be blackened out.)

7. **Project Description:**

Provide a brief description of the proposed project:
The Town of Lake Luzerne is proposing the use of ProcellaCOR EC in areas of Lake Luzerne to control the invasive plant eurasian watermilfoil. The Town has been conducting manual removal efforts for years which have not been sufficient to keep up with milfoil growth.

Which of the following types of new land use and development does the project include? Check all that apply and attach the appropriate completed Supplemental Information Request.

____ Single Family Dwelling
____ Multiple Family Dwelling
____ Individual Mobile Home
____ Mobile Home Court
____ Subdivision
____ Commercial Use
____ Public or Semi-Public Building
____ Industrial Use
____ Forestry Use
____ Forestry Use Structure
____ Sawmill, Chipping Mill, Pallet Mill or similar Wood Using Facility
____ Agricultural Use or Structure
____ Agricultural Service Use
____ Tourist Accommodation
____ Tourist Attraction
____ Ski Center
____ Golf Course
____ Campground
____ Commercial Sand and Gravel Extraction
____ Private Sand and Gravel Extraction
____ Mineral Extraction or Structure
____ Group Camp
____ Cemetery
____ Open Space Recreational Use
____ Game Preserve or Private Park
____ Hunting and Fishing Cabin or other Private Club Structure
____ Watershed Management or Flood Control Project
____ Marina, Boat Yard & Boat Launching Site
____ Commercial Seaplane Base
____ Commercial or Private Airport
____ Sewage Treatment Plant
____ Waste Disposal Area
____ Junkyard
____ Private Road
____ Municipal Road
____ Public Utility Use
____ Major Public Utility Use
____ Accessory Use or Accessory Use Structure to any of the above
____ Construction in or adjacent to a jurisdictional wetland
__x__ Other: Aquatic herbicide application

8. Prior Agency Contact:

a) Has there been any previous contact or discussions with Agency staff regarding this project or project site, or has Agency staff visited the project site?
____No
__X__Yes. Staff person's name: Leigh Walrath
Date of Contact: September 15, 2021

b) Has the project or project site been the subject of a past Agency action (e.g., permit, variance, jurisdictional inquiry, enforcement case or wetland flagging)?
____No
__X__Yes. If yes, provide the following number and date:

Permit/Variance/Order Number: P2016- 79 date: 4/15/2016
Jurisdictional Inquiry Number: ________ date: ________
Enforcement Case Number: ________ date: ________
Wetland Boundary Flagging: ________ date: ________

9. Adjacent Properties:

Provide, as **Attachment B**, a complete and current list of the names and addresses of all landowners whose property adjoins the project site with the tax map references (tax map section, block, and parcel numbers) based on the latest completed tax assessment roll. This list must include landowners whose property would otherwise adjoin the project site but is located across a public road or right-of-way from the site. Attached is a sheet which should be used to provide the required list of adjoining landowners. (This information is typically available from the Real Property Tax Services at County Offices or from the Town/Village assessors.)

10. Project Site History:

As part of its review of the project, Agency staff must understand the history of the project site. If the project site was part of a larger parcel on May 22, 1973 (the enactment date of the Adirondack Park Agency Land Use and Development Plan), the exact property boundaries of the larger parcel and the size of all buildings on that date must be established.

a) State the current acreage of all connected lands owned by the current landowner, even if the parcels have different deeds and/or tax map numbers and even if they are larger than the project site: ______________acres

b) As of May 22, 1973, did the owner at that time own any adjoining property, including properties on the opposite sides of public roads?
____No
____Yes. If yes, provide the Tax Map References of these adjoining properties:
Section: _____ Block: _____ Parcel:_____
Section: _____ Block: _____ Parcel:_____
Section: _____ Block: _____ Parcel:_____
Section: _____ Block: _____ Parcel:_____

c) Has any portion of the total as it existed on May 22, 1973 been conveyed, sold, given away or otherwise subdivided since that date?
____No
____Yes. If yes, provide the following information for those lots or parcels. (Use a separate 8-1/2"x11" sheet of paper if necessary.):

Lot Number (from current tax map)	Date of Conveyance	Lot Size (sq. ft. or acres)	Was Conveyance by Gift or Sale?

Provide, as **Attachment C,** a complete copy of all recorded deeds (not just abstracts) for the above conveyances back through May 22, 1973.

Provide, as **Attachment D**, a full scale copy of a survey map or the current real property tax map clearly showing the property boundaries of the project site and any tax parcel or lot that the project site was part of on May 22, 1973.

d) Are there buildings on the total contiguous landholding now owned by the present landowner?

_X_ No

____Yes. If yes, provide the following information. Attach additional sheets if necessary.

Date of Construction	Size (sq. ft.)	Height (ft.)	Type/Use (e.g., single family dwelling, store, garage)

Describe any other structures which existed on the property as of August 1, 1973 which have since been removed or destroyed and their use (e.g., residential, commercial). Include the date that the structure was removed or destroyed:

Check if no buildings or structures removed or destroyed since August 1, 1973 ____

11. Historic Resources:

Does the project site have any buildings that are more than 50 years old, or does the project site or surrounding area contain any structures or districts which are listed or deemed eligible to be listed on the State or National Register of Historic Places or does the project site involve any known archeological resources?

_X_ No

____Yes to any of the above criteria

If yes, provide a location map, project description, site plan map, and recent photographs keyed to the location map to the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) as part of consultation required by the State Historic Preservation Act. Please be advised that the Agency cannot deem an application as complete until the OPRHP's determination and/or recommendations for historic resource impact mitigation have been provided to the Agency.

12. Shoreline:

Shoreline means that line at which land adjoins water of lakes or ponds or navigable (by boat or canoe) rivers and streams. There are minimum shoreline vegetation cutting restrictions, lot widths, structure setbacks, sewage disposal system setbacks and shoreline access requirements under the Adirondack Park Agency Act and regulations implementing the NYS Wild, Scenic and Recreational Rivers Act. These shoreline protection standards are measured from the mean high water mark (MHWM - the average of the annual high water levels). Please contact Agency staff for requirements. If the project site has shoreline and you propose construction of any kind within 100 feet of the shoreline (150 feet for Recreational Rivers, 250 feet for Scenic Rivers), the MHWM will have to be established and shown on a site plan map in order to have a complete application. At the project sponsor's request, Agency staff will determine the MHWM at the project site or you can have the determination made by a NYS licensed land surveyor. If you are unsure of navigability, please contact Agency staff.

a) Does the project site contain any navigable water?
____No (If no, go to Section 13-Wetlands)
__X__Yes. Name of water body: __Lake Luzerne__________________________
Length of shoreline on the project site (as it winds and turns):__n/a____feet

b) Is any portion of the shoreline currently being used or proposed for use by others for deeded or contractual access to the water body?
__x__No
____Yes. If yes, identify and describe all shoreline access parcels, the number of lots having access to each parcel and the dates access was granted. Also, please provide a complete copy of all deeds for all properties which have been granted access to the water body via a shoreline access parcel:

c) Will any vegetation be cut or removed within 35 feet of a lake or pond or navigable river or stream or within 100 feet of a designated NYS Wild, Scenic or Recreational River? (If you are uncertain whether the shoreline is along a designated river, check the Adirondack Park Land Use and Development Plan Map, or the APA Regulations Appendix Q-6, or contact Agency staff.)
____No
__X__Yes. If yes, describe type, amount and location of vegetation to be removed:
The herbicide will remove the invasive plant eurasian watermilfoil from the treatment area:

13. Wetlands:

a) Are there any wetlands on the project site?

____No (If no, go to Section 14-Other Regulatory Permits and Approvals)

_X_Yes. If yes, answer the following questions. The wetland boundaries as delineated and/or confirmed by Agency staff must be shown and labeled on the Site Plan Map.

b) Are any of the activities listed below proposed to occur within the boundaries of a freshwater wetland?

____No

_X_Yes. If yes, check all that apply:

- ____ Draining; dredging; excavation; removing soil, peat, muck, sand, shells or gravel
- ____ Dumping or filling with soil, stone, sand, gravel, mud, or fill of any kind
- ____ Erecting structures, building roads or driveways, driving pilings, or placing any other obstructions
- ____ Clearcutting of more than three acres: state number of acres ____
- _X_ Applying pesticides or fertilizers
- ____ Constructing a wastewater treatment system or discharging a sewer outfall

If yes, please also provide a detailed written description of the measures taken to avoid or minimize wetland impacts:

The herbicide ProcellaCOR EC has been chosen to target the invasive plant specifically and minimize any impact to the native plants in the wetland. ProcellaCOR EC is acts on dicots (broad-leaf species) and does not impact monocots such as pondweeds, sedges and grasses. To further reduce impacts, the herbicide will only be applied below the water surface.

c) Will the project result in the temporary or permanent loss of any wetland acreage by filling or draining?

_X_No

____Yes. If yes, amount of acreage to be lost: ____________ square feet.

d) Will any of the activities listed below occur within 100 feet of a wetland?

____No

_X_Yes. If yes, check all that apply:

- ____ Constructing a wastewater treatment leaching or absorption facility
- _X_ Applying pesticides
- ____ Conducting other activities that could impair the functions or benefits derived from wetlands, including any diversion of water or change in hydrology, or substantial increase of erosion or sedimentation

If "Yes" was checked for any of the questions in this section, a compensatory wetland mitigation plan prepared in accordance with the "New York State Adirondack Park Agency Compensatory Mitigation Guidelines" may be required. A copy of these guidelines is available on the Agency's website (www.apa.ny.gov) or upon request.

14. Other Regulatory Permits and Approvals:

The Agency cannot approve a project which has been denied a permit or which is a prohibited use under local zoning requirements and other local laws or ordinances. The Agency will also recognize community goals expressed in a formally adopted land use plan. The project should be designed to the regulatory requirements of other involved agencies.

a) Local Government Notice Form:
Provide, as **Attachment E**, a completed copy of the enclosed Local Government Notice Form to the municipality in which your project is located. Have it filled out and signed by an appropriate official (e.g., Zoning Administrator, Planning Board Chairman or Supervisor, if no Zoning Administrator or Planning Board Chairman) and return it with the project application. Please read the form for instructions.

b) Municipal Approval Documents:
If local approval has been obtained for the proposed project, then provide, as **Attachment F**, documentation (e.g., permit, site plan approval or final subdivision plat) to the Agency which confirms that the project has been approved pursuant to all applicable town and county laws including any necessary approvals from the planning and zoning boards. Also, please provide a copy of the relevant minutes of all local meetings at which the project has been discussed. (This last request is continuous; the information should be provided to the Agency as it becomes available.)

c) State and Federal Agency Contacts:
Complete the following table and indicate whether any of the following agencies or departments have been contacted. Your APA application may remain incomplete until all state agency applications are complete, to allow a coordinated review.

Agency	No	Yes	Date	Contact Person & Phone Number
NYS Department of Health	X			
NYS Department of Transportation	X			
NYS Department of Environmental Conservation		X	2/22/23 ~~2/14/23~~	Brian Primeau 518-623-1267
NYS Office of Parks, Recreation & Historic Preservation		X	2/14/23	R. Daniel Mackay 518-237-8643
NYS Department of Law	X			
U.S. Army Corps of Engineers	X			
Lake George Park Commission	X			
Other Office of General Services		X	2/13/23	Ralph Hill, 518-474-2195

d) State and Federal Permits, Approvals and Determinations:
Provide, as **Attachment G**, copies of all permits, approvals and determinations received from the above agencies.

15. Deed Restrictions and Easements:

Describe and provide, as **Attachment H,** any current deed restrictions or easements associated with the project site.

Attach, as **Attachment I**, any proposed deed language that will restrict further subdivision or development on the project site and any other proposed deed restrictions or easements.

16. **Required Signatures:**

I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED IN THIS APPLICATION, INCLUDING ALL ATTACHMENTS. I BELIEVE THIS INFORMATION TO BE TRUE, ACCURATE AND COMPLETE. IN ADDITION, IN THE CASE OF ANY PROJECT SPONSOR CORPORATION, LIMITED LIABILITY CORPORATION, PARTNERSHIP OR OTHER LEGAL ENTITY, I ALSO AFFIRM THAT I AM AUTHORIZED TO SUBMIT THIS APPLICATION ON BEHALF OF THAT ENTITY.

I HEREBY AUTHORIZE THE ADIRONDACK PARK AGENCY AND MEMBERS OF ITS STAFF TO ENTER ON THE PROPERTY DESCRIBED HEREIN FOR THE PURPOSES OF CONDUCTING SUCH INVESTIGATIONS, EXAMINATIONS, TESTS AND SITE EVALUATIONS AS IT DEEMS NECESSARY, AT REASONABLE TIMES AND WITH ADVANCE NOTICE WHERE POSSIBLE, TO VERIFY INFORMATION CONTAINED IN OR RELATED TO THIS APPLICATION FOR A PROJECT PERMIT.

Signature of all Project Sponsors (if not the landowners):
(Required for all applications)

Signature	Print Name/Title	Date
Eugene J. Merlino	Gene Merlino, Supervisor	2/24/2023

Signature(s) of all Landowner(s) from current deed:
(Required for all applications)

Signature	Print Name	Date

Signature of Authorized Representative:
(Required if designated in Section 3 of this application)

Signature	Print Name	Date
Glenn Sullivan	Glenn P. Sullivan	3/2/23

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RECEIVED
Date: March 10, 2023

LOCAL GOVERNMENT NOTICE FORM
for Project/Variance Application to the Adirondack Park Agency

The Adirondack Park Agency will not deem an application complete until the appropriate municipal official in the Town/Village where a project is located has completed, signed and returned this form to the Agency.

If the Town/Village where the project site is located has zoning or other regulations which apply to the proposal, the Adirondack Park Agency will be unable to issue a permit if: (a) the Town/Village has either refused to grant a necessary permit or variance, or (b) the proposal is a prohibited use in that jurisdiction.

To be completed by the Applicant: APA Project Number (if available): ______

Applicant Name: Town of Lake Luzerne Landowner Name: Town of Lake Luzerne

Project site location: Town/Village: Lake Luzerne Tax Map Number: none

Project type/description: ProcellaCor permit application to control Eurasian milfoil in Lake Luzerne

If the project involves a subdivision, please provide the appropriate local official a copy of the proposed plat as part of the project description with the plan title and date recorded in the space provided above.

To be completed by the Town/Village:

Does the Town/Village have land use controls? ☑ Yes ☐ No

If Yes, please complete 1-9 below. If No, please skip to #9 below.

1) If the Town/Village has zoning, provide Zoning District Name(s): HR, HC, HI, R-RE, RT, R-RU, RC, OS.
2) How is the "use" defined under the local code? ______
   Is the "use" allowed in the zoning district(s)? N-A ☐ Yes ☐ No
3) Is the project prohibited by any local law or ordinance? ☐ Yes ☑ No
4) Does this project require a municipal permit? ☐ Yes ☑ No
   a) If Yes, is the required permit a building permit only? ☐ Yes ☑ No
   b) If No, identify the type of permit required: ______
5) Does this project require a municipal variance? ☐ Yes ☑ No
   If Yes, identify the type of variance required (e.g., area, setback, etc.) ______
6) Does the project require any other municipal approval? ☑ Yes ☐ No
   If Yes, identify the approval required: Town Board Approval
7) Has the municipality received an application for this project? ☐ Yes ☑ No
   If Yes, has the municipality issued any decision on this project? ☐ Yes ☑ No
8) Provide explanation for any decisions on this project or inconsistencies the project may have with local laws or any comments you wish to provide to the Agency about the project: None
9) Please provide a daytime contact telephone number with the best days/times to be reached, and/or an email address for the official signing this form, should Agency staff have further questions regarding municipal review of this project: (518) 696-2711 best times 10 AM- 3 PM
   e-mail: supervisorlakeluzerne@hotmail.com

Eugene J. Merlino

Signature of Zoning Official or Planning Board Chair (or Supervisor/Mayor if no such official exists)

Eugene Merlino Town Supervisor — 2-15-23

Name and Title (Print) — ***Date***

Please return this completed & signed form to the address or fax number below.

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency

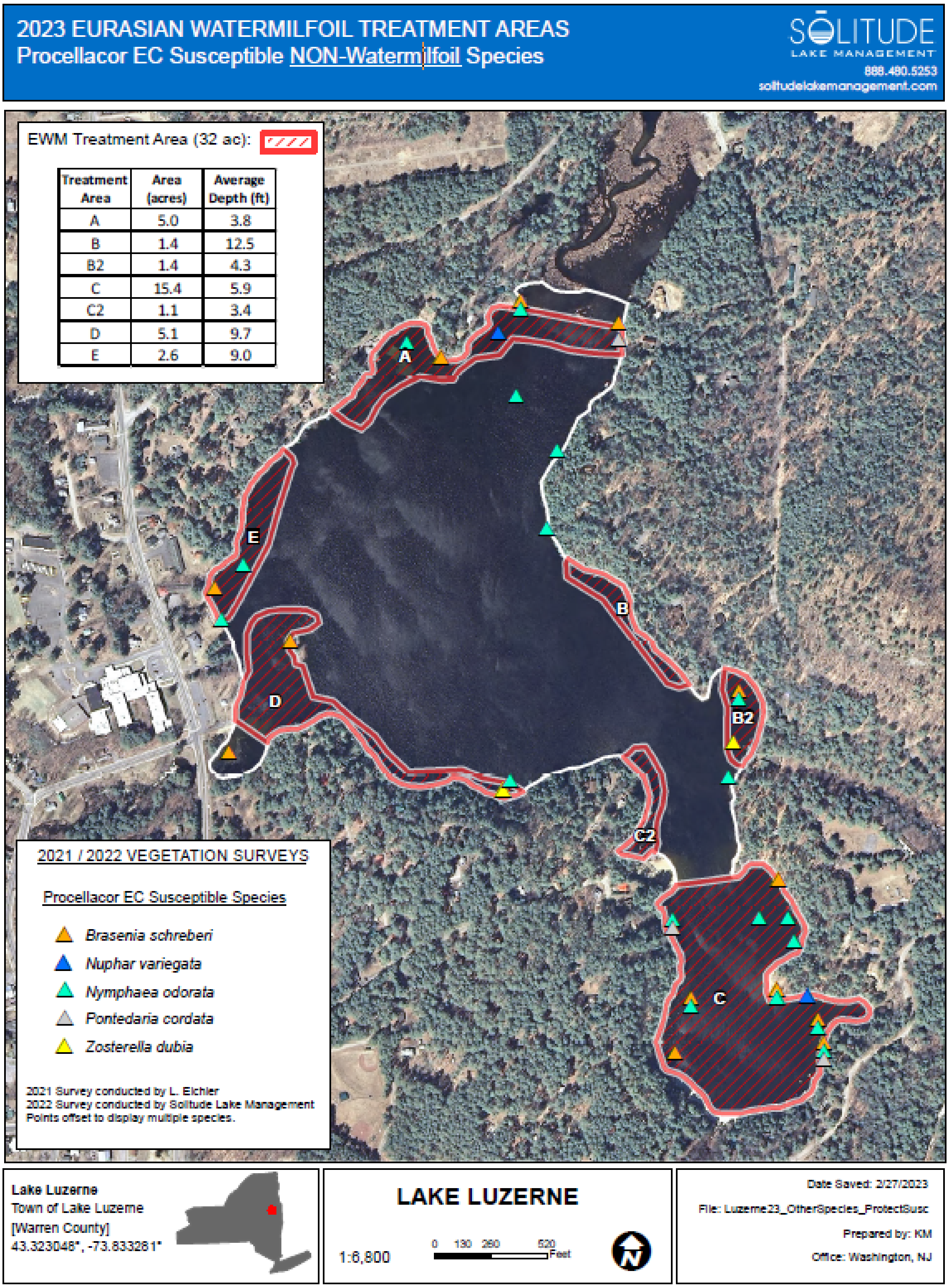
RECEIVED

Date: March 10, 2023

Lake Luzerne Supplemental Information Request - Responses

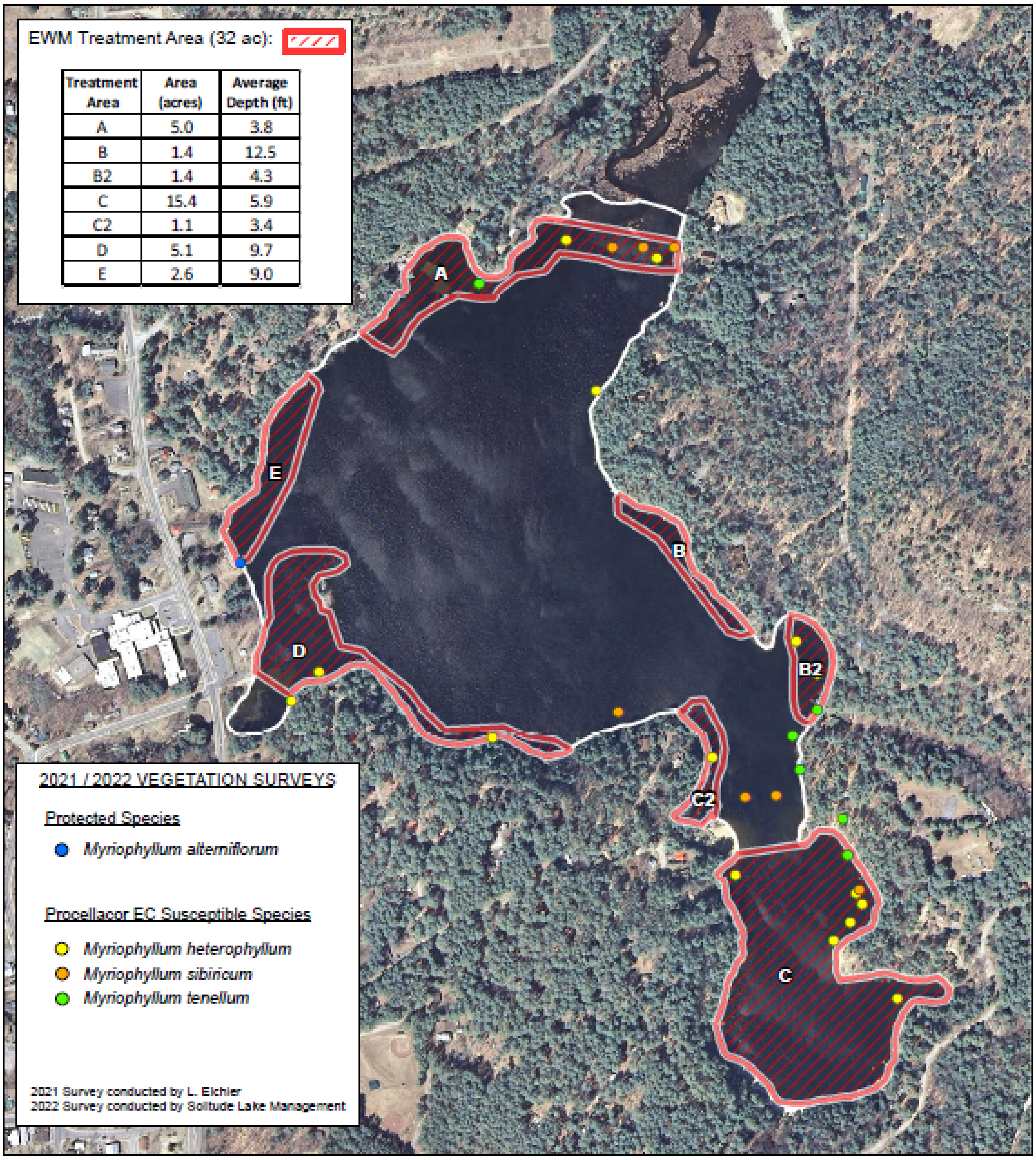
1. **NYSDEC AQV:** A copy of the NYSDEC Permit application form (AQV) is included with this submission.

2. **Plant Survey:** A copy of the plant survey report is included with this submission. Two maps of the Susceptible and Protected species and relation to treatment areas appear below and on the next page. A table of species susceptibility and a discussion follows the maps.



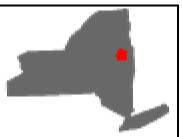
2023 EURASIAN WATERMILFOIL TREATMENT AREAS
Protected and Procellacor EC Susceptible Watermilfoil Species

SOLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Treatment Area	Area (acres)	Average Depth (ft)
A	5.0	3.8
B	1.4	12.5
B2	1.4	4.3
C	15.4	5.9
C2	1.1	3.4
D	5.1	9.7
E	2.6	9.0

Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°



LAKE LUZERNE

1:6,800

Date Saved: 2/24/2023
File: Luzerne23_Milfoil_ProtectSusc
Prepared by: KM
Office: Washington, NJ

Susceptibility of plant species in Lake Luzerne to ProcellaCOR EC

Species	Common Name	Susceptibility
Brasenia schreberi	**Watershield**	**Moderate to High**
Chara sp.	Muskgrass	Low
Elatine minima	Little Elatine	Low
Eleocharis acicularis	Spike Rush	Low
Elodea canadensis	Waterweed	Low
Eriocaulon septangulare	Pipewort	Low
Fontinalis sp.	Water Moss	Low
Isoetes echinospora	Quillwort	Low
Lindernia sp.	False Pimpernel	Unknown - Presumed Low
Megalodonta beckii	Water Marigold	Low
Myriophyllum alterniflorum	**Little watermilfoil**	**Unknown-presumed High**
Myriophyllum sibiricum	**Northern watermilfoil**	**High**
Myriophyllum tenellum	**Leafless watermilfoil**	**High**
Myriophyllum spicatum	**Eurasian watermilfoil**	**High**
Myriophyllum heterophyllum	**Variable watermilfoil**	**High**
Najas flexilis	Bushy Pondweed	Low
Najas guadalupensis	Southern Naiad	Low
Najas minor	Brittle Naiad	Low
Nuphar variegata	**Yellow Waterlily**	**Low-Moderate**
Nymphaea odorata	**White Waterlily**	**Moderate**
Pontederia cordata	**Pickerelweed**	**Low-Moderate**
Potamogeton amplifolius	Large Leaf Pondweed	Low
Potamogeton crispus	Curly Leaf Pondweed	Low
Potamogeton epihydrus	Ribbon Leaf Pondweed	Low
Potamogeton gramineus	Variable Pondweed	Low
Potamogeton illinoensis	Illinois Pondweed	Low
Potamogeton perfoliatus	Heart Leaf Pondweed	Low
Potamogeton praelongus	White Stem Pondweed	Low
Potamogeton pusillus	Narrow leaf Pondweed	Low
Potamogeton richardsonii	Richardson's Pondweed	Low
Potamogeton robbinsii	Robbins Pondweed	Low
Potamogeton vaseyii	Vasey’s Pondweed	Low
Potamogeton zosteriformis	Flat stem Pondweed	Low
Sagittaria graminea	Arrowhead	Low
Scirpus sp.	Rush	Low
Sparganium sp.	Bur Reed	Low
Typha latifolia	Cattail	Low
Utricularia intermedia	Bladderwort	Low
Utricularia gibba	Humped Bladderwort	Low
Utricularia purpurea	Purple Bladderwort	Low
Utricularia vulgaris	Great Bladderwort	Low
Vallisneria americana	Duck Celery	Low
Zosterella dubia	**Water stargrass**	**Low - Moderate**

Sources: Selective Control of Invasive Watermilfoils with ProcellaCOR® Aquatic Herbicide and Response of Native Aquatic Plants. January 28, 2019 Mark Heilman, Ph.D., Jon Gosselin, SePRO Technical Specialist, Pers.Communication

Susceptible Species Notes

ProcellaCOR EC is an auxin-mimic herbicide that controls broadleaf (dicot) species, therefore no impacts to the majority of plants found in Lake Luzerne are expected. Five milfoil species found in Lake Luzerne are known to be or likely to be susceptible to ProcellaCOR EC. These are Eurasian watermilfoil, Little Watermilfoil, Northern watermilfoil, Leafless Watermilfoil and Variable Watermilfoil. Eurasian watermilfoil (EWM) is the target of the application, and ProcellaCOR EC treatment areas have been selected based on higher density infestations of this plant.

Little watermilfoil is a protected species in the State of New York. This plant was found at one location in the 2021 survey, adjacent to a small cove on the west shoreline. The 2019 plant survey (also by Larry Eichler) also found Little Watermilfoil at a single location. Based on anecdotal information by Leigh Walrath, a secondary survey was conducted by Solitude Lake Management in 2022 to search for Little Watermilfoil, which Mr. Walrath felt was more prevalent than the 2021 survey indicated. The 2022 survey did not find Little Watermilfoil, but documented 14 locations of Variable Watermilfoil, which was not documented in the 2021 survey. To ensure a correct identification, the Solitude biologist sent a plant sample to the University of Wisconsin, which confirmed the Variable Watermilfoil identification. A copy of that analysis is included with the supplemental materials.

Northern watermilfoil, Leafless Watermilfoil and Variable Watermilfoil are not listed on NY's Active inventory or Watch List for Rare and Threatened plants. Both Northern and Variable watermilfoil are known to be susceptible to ProcellaCOR EC, and anecdotal reports indicate Leafless Watermilfoil is as well. The distribution of these species spread throughout the proposed treatment zones for eurasian watermilfoil, so it is logistically unfeasible to protect these plants from ProcellaCOR EC impacts. Variable Watermilfoil is known to be invasive in parts of NY and much of New England, and as with eurasian watermilfoil, is likely responsible for taking habitat from the native Northern Watermilfoil.

A review of the watermilfoil species abundance surrounding the 2010 application of Renovate OTF to a sequestered section of Lake Luzerne may provide some insight on susceptibility to auxim-mimic herbicides in general. During the 2009 survey of the treatment site, eurasian watermilfoil was most abundant, and was found at 25 locations within the proposed treatment zone. In that zone, Northern watermilfoil was found at 6 locations, and Leafless watermilfoil was found at 3 locations. Post-treatment, Eurasian watermilfoil decreased to 1 site (2010) and 0 sites (2011), Northern watermilfoil decreased to 4 sites (2010 & 2011) and Leafless watermilfoil decreased to 1 site (2010) and 0 sites (2011).

Watershield, a small floating species, is the plant most susceptible to ProcellaCOR EC next to milfoil species. Watershield was found in more than a dozen locations of Lake Luzerne during the 2021 plant survey. Many of these locations are within or immediately adjacent to treatment areas. Based on response of watershield in Minerva Lake (ProcellaCOR EC, 2020), watershield is expected to drop down rapidly after treatment, and then reappear at the surface within 6-8 weeks. Some reduction in overall abundance may occur in the year of treatment, but the plant is expected to return to 75+% of its pretreatment range by the season after treatment.

Both **white waterlily and yellow waterlily** can be susceptible to ProcellaCOR EC at milfoil application rates. Only two locations of yellow waterlily were documented,both within treatment areas. White waterlily is widespread around the lake and present in multiple treatment zones. Plants within the treatment areas are expected to exhibit temporary, seasonal signs of

ProcellaCOR EC impact, based on observations in Minerva Lake. Neither species is expected to exhibit full seasonal control. Given the scope fo treatment and size of the lake, plant locations outside of the treatment zones are expected to exhibit some effects from the herbicide, but rebound more quickly than plants directly in treatment zones.

In a study by Beets and Netherland (2018, JAPM), the active ingredient caused a significant reduction in the above water biomass of **pickerelweed**, but not on the below surface biomass. Pickerelweed was not documented in several surveyed NY lakes (Snyders, Minerva, Cazenovia, Lamoka) before or after ProcellaCOR EC treatment, so local results do not shed any light on this species.

Water Stargrass response to ProcellaCOR EC appears to be variable. Beets et al indicated *Heteranthera* showed the most treatment related variability, with one treatment (3 ppb, 6 hr) showing a large increase in biomass and another (9 ppb, static) showing injury symptoms. In Snyders Lake, NY, water stargrass declined from 19% pre-treatment to 6% in the post-treatment survey. An opposite response occurred at Cazenovia Lake, which saw a significant increase in water stargrass lakeside following ProcellaCOR EC treatment.

3. **Site Visit:** A site visit to Horseshoe Pond has been performed by Aaron Ziemann of the APA on September 8, 2022.

4. **Assessment of Downstream Impacts**: A copy of the NYSDEC dilution model for Lake Luzerne is included with this submission. The model uses the application rate of 3.86ppb from the treatment located adjacent to the outlet, and calculates that the concentration of ProcellaCOR EC will drop below the 1 ppb threshold upon reaching the Hudson River approximately ⅓ mile downstream.

5. **Management Goals** -
   Eurasian watermilfoil growth has dominated several areas of Lake Luzerne for many years, including the outlet area, inlet area and the southeastern cove. The southeast cove of Lake Luzerne was treated with herbicide in 2010, and only a single stem of Eurasian watermilfoil was recorded in the post-treatment survey. Frequency of occurrence for Eurasian watermilfoil plants within the treatment zone declined from 58% of survey points pre-treatment to 3% post-treatment. The remainder of Lake Luzerne supported extensive growth of Eurasian watermilfoil in 2010. Since 2010, a general decline in relative abundance of Eurasian watermilfoil has occurred, most likely due to management efforts, while frequency of occurrence has increased slightly. The increase is almost exclusively found in the southeastern embayment due to Eurasian watermilfoil recovery since the 2010 herbicide treatment. The current survey results should continue to provide a baseline from which to assess future impacts of both Eurasian watermilfoil growth and management activities.

   To keep up with new growth, the Town of Lake Luzerne intensified the diver and suction harvesting program in 2022. Contractors kept detailed records of diver time, or hours of pumping and measuring the treatment area with changes in the plant community tracked using GPS. The location and amounts of vegetation were recorded. In addition, the contractor used a two-phased approach coming in for 3 weeks in July and approximately 3 additional weeks in September allowing them to treat the regrowth.

   The expected level of control from the ProcellaCor treatment is to completely control the milfoil in the highest density areas that have traditionally been difficult to control. It is anticipated that the herbicide treatment will dramatically reduce the amount of suction harvesting for a period of 3 or more years. This will eliminate the need for spot suction harvesting around the lake but it will reduce the overall costs of the entire AIS management program.

6. **Pesticide Selection**

Herbicide Options

There are at least a dozen active ingredients used in the control of aquatic plants and algae in the United States, and many more formulations of these ingredients, providing a much wider range of options than was available just 30 years ago. Most of the herbicide active ingredients provide some level of effective control of eurasian watermilfoil(EWM), be it contact or systemic control, as EWM is the northern US's most widely distributed aquatic invasive plant. For this reason testing of new herbicides are often studied against EWM in the development process, with the knowledge that a sufficient market for the product would exist to support the high cost of a new EPA pesticide registration. In the late 80's this process produced the systemic herbicide Sonar (fluridone), which at the time provided the best multi-year control of EWM with the possibility of selectivity to protect native plants. In the late 90's, triclopyr, an active ingredient widely used in forest management was developed for the aquatics market as Renovate, and was the first aquatic herbicide used in the Adirondack Park for EWM control at Loon Lake and Lake Luzerne. In 2019, NY registered the new systemic herbicide ProcellaCOR EC, which provides EWM control and excellent protection of native plants, and it was used effectively in Minerva Lake in 2000. As each new product was introduced to the market, it carried with it a better environmental profile, and a better margin of selectivity to protect desirable native plants. The Adirondack Park Agency recognized the advantages provided by ProcellaCOR EC and has been supportive of its use to curtail the expanding distribution of EWM in the Park.

Below is a description of the two feasible systemic herbicides used to control EWM in the Adirondack Park:

Best Option Herbicide - ProcellaCOR EC

Active Ingredient:
Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3- methoxy-phenyl)-5-fluoro-, phenyl methyl ester.
Application Rate Range: 1.93 - 9.65 ppb for *Myriophyllum* ("milfoil") species.
Formulation: liquid
Selectivity and Toxicity Profile:
Watershield, waterlily, and coontail are susceptible to injury but are expected to recover. No lethal toxicity to fish and aquatic invertebrates.
Site Selectivity: Moderately to highly site-specific
Expected duration of EWM control - At least 3 seasons projected from label recommended rates.
Water Use Restrictions: Limits irrigation(not turf), hydroponics, greenhouse, nursery and livestock watering uses until concentrations are below 1ppb. Prohibits composting of treated plant material.
Use in the Adirondack Park: Minerva Lake (2020)

Alternative Herbicide - Renovate 3

Active Ingredient:
Triclopyr: (2-[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid, triethylamine salt)
Application Rate Range: 1000 - 2500 ppb for *Myriophyllum* ("milfoil") species.
Formulation: both liquid and granular are available.
Selectivity and Toxicity Profile: Herbicide is used to control milfoil, waterlily, and watershield species which may sustain significant injury. Some toxicity to fish and aquatic invertebrates. Hazardous to humans and domestic animals.
Site Selectivity: Moderately to highly site-specific (in dense weed beds)
Expected duration of EWM control - At least 2 seasons projected from label recommended rates.
Water Use Restrictions:

Must comply with Section 24(c) Special Local Need labeling for Renovate® 3, SLN NY-060001.Use of water for irrigation is restricted for 120 days following application. Application must adhere to a minimum setback rule for potable water intakes and potable intakes must be turned off until intake water is determined to be 0.4 parts per million or less. No restrictions for recreational and livestock purposes.
Use in Adirondack Park: Lake Luzerne, Loon Lake.

Recommended Herbicide

ProcellaCOR EC is identified above as the recommended herbicide for use in Lake Luzerne. From an ecological perspective, ProcellaCOR EC provides better selectivity (protection of native plants) than other products, and breaks down and disappears rapidly. From a management perspective, ProcellaCOR EC requires a shorter contact time on the plant and is more site-selective, while providing multi-season control of EWM. Finally, from a logistical perspective, ProcellaCOR EC's lack of recreational water use restrictions and its low application rate provide for less impact to the community of lake users.

ProcellaCOR EC has been used in New York since 2019, with the first in-state application taking place at Snyder's Lake in North Greenbush, NY. An outer ring of littoral zone in this lake of approximately 100 acres was treated at 3.86 ppb ProcellaCOR EC. Professional plant surveys completed post-treatment and in 2020 did not find eurasian watermilfoil. In August, 2022, a group of amateur botanists surveyed the lake and found EWM scattered lightly around the lake's shoreline. Assuming these finds were accurately identified, the ProcellaCOR EC application provided 3 years of full control and a reduction in density (and possibly range) in the fourth season.

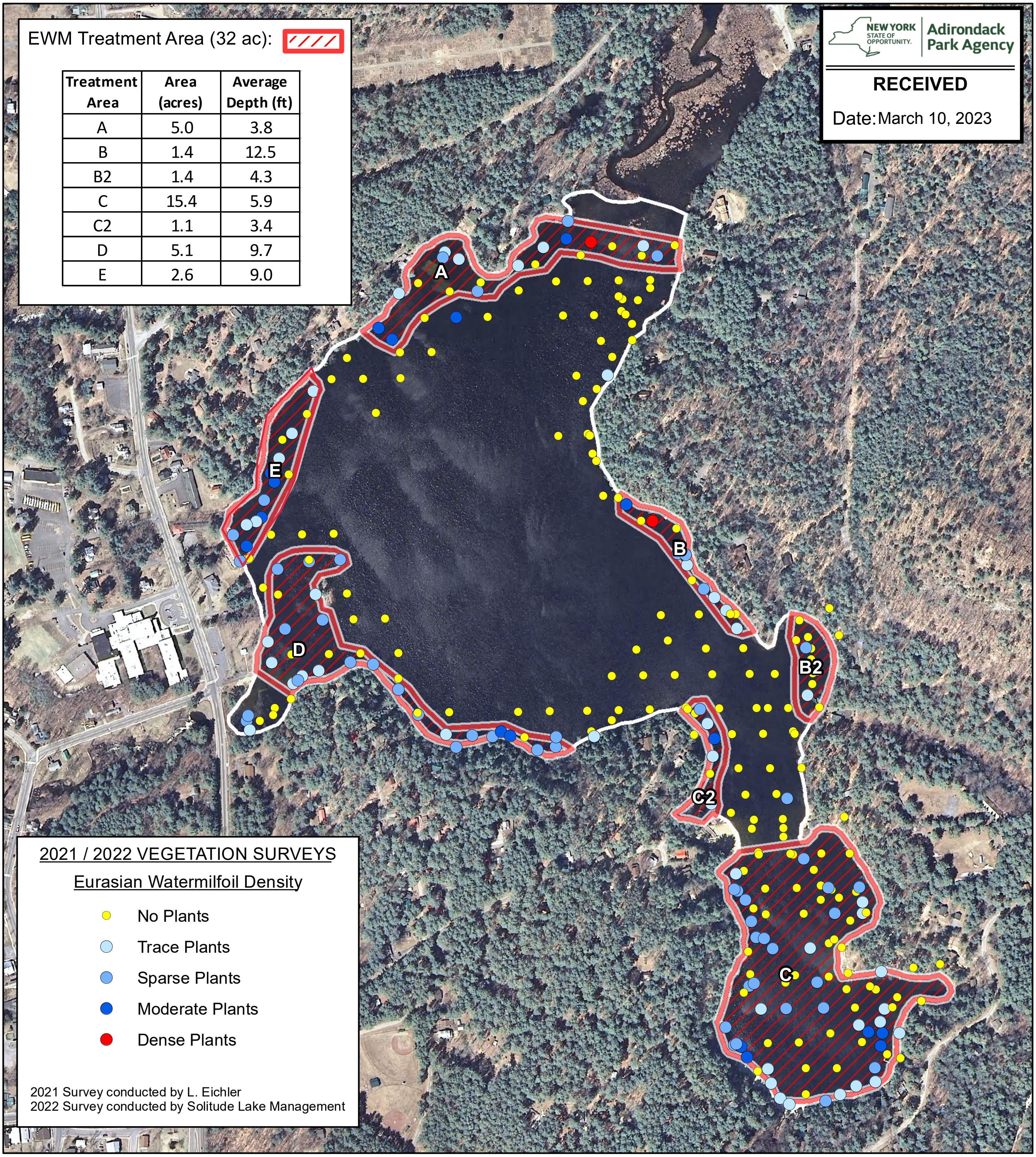
ProcellaCOR EC is recommended at Lake Luzerne as an alternative to repeating the Renovate application for two main reasons; slightly improved selectivity compared to Renovate, and a much lower application rate, providing less downstream movement and less in-lake monitoring and duration of water use restrictions.

7. Post- treatment monitoring

a. A post-treatment herbicide monitoring plan and map is included with this submission.
b. Solitude Lake Management will conduct a post-treatment qualitative assessment of Lake Luzerne, and specifically the application areas using both visual survey and rake-toss surveys, approximately 4-6 weeks following application.
c. In late summer, the Town of Lake Luzerne will contract with a reputable firm to repeat their pre-treatment plant survey, using the same survey points, to document the comparison of pre and post-treatment plant abundances.

2023 EURASIAN WATERMILFOIL TREATMENT AREAS

SOLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



EWM Treatment Area (32 ac):

Treatment Area	Area (acres)	Average Depth (ft)
A	5.0	3.8
B	1.4	12.5
B2	1.4	4.3
C	15.4	5.9
C2	1.1	3.4
D	5.1	9.7
E	2.6	9.0

2021 / 2022 VEGETATION SURVEYS

Eurasian Watermilfoil Density

- No Plants
- Trace Plants
- Sparse Plants
- Moderate Plants
- Dense Plants

2021 Survey conducted by L. Eichler
2022 Survey conducted by Solitude Lake Management

Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°

LAKE LUZERNE

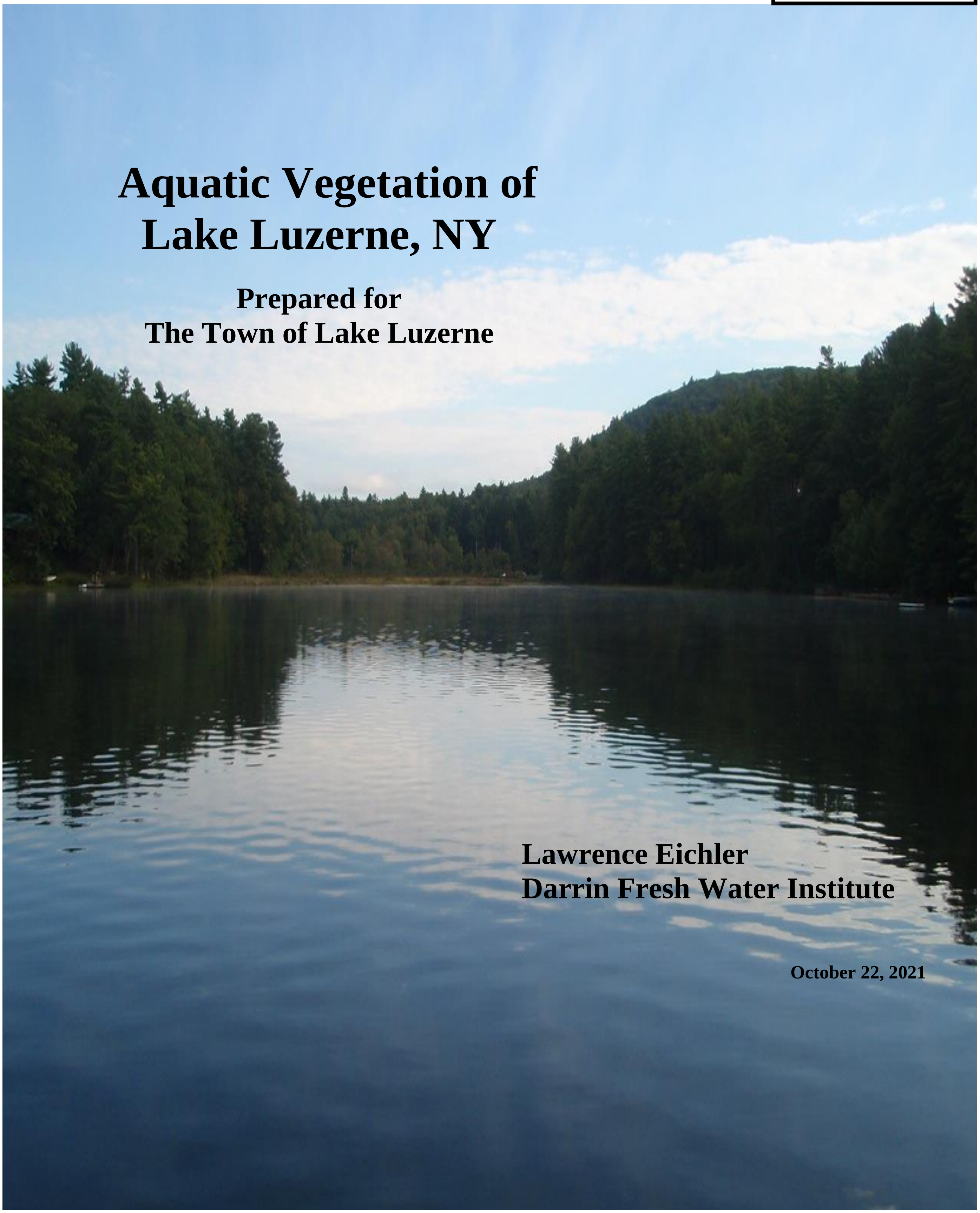
1:6,800

0 130 260 520 Feet

518.37 ft

140

Date Saved: 1/17/2023
File: Luzerne23_TA
Prepared by: KM
Office: Washington, NJ



Aquatic Vegetation of Lake Luzerne, NY

Prepared for
The Town of Lake Luzerne

Lawrence Eichler
Darrin Fresh Water Institute

October 22, 2021

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Acknowledgements

The author would like to thank Tracy Clothier and Dean Long for their assistance in coordinating lake access, assisting in the upstream surveys and development of the current survey project. Dan Waterhouse of the Town of Lake Luzerne provided the impetus for the current survey.

Background

Quantitative surveys were undertaken for Lake Luzerne, New York, to obtain distribution information on the aquatic plant population with a focus on the invasive aquatic Eurasian watermilfoil, *Myriophyllum spicatum* L. The plant survey was designed to provide data comparable to earlier surveys by the author in 1992, 1998, 2004, 2009, 2010 and 2019. The point intercept survey methods employed were designed to meet with NYS DEC Tier III Survey requirements. The survey consisted of a) frequency of occurrence of all aquatic plant species for points distributed within the whole lake, and b) comparison of historical survey results to current conditions, with particular reference to changes in the relative abundance of Eurasian watermilfoil.

Introduction

Eurasian watermilfoil, *Myriophyllum spicatum* L., an invasive exotic plant species, was first reported in Lake Luzerne, Warren County, New York in 1989. A survey at that time indicated extensive growth of this nuisance species. In 1992, a management program keyed to hand harvesting Eurasian watermilfoil was conducted under the auspices of Warren County and the Town of Luzerne. Post-treatment plant surveys reported that this management program reduced scattered growth of Eurasian watermilfoil, however no attempt was made to address areas of dense growth. Dense growth of Eurasian watermilfoil (beds) covered approximately 1.4 acres (1%) of the lake bottom in 1998 (Eichler and Howe 1998). By 2004, dense growth of Eurasian watermilfoil had expanded to 3.9 acres (4%), with scattered growth reported throughout the remainder of the lake. The presence of a second invasive plant species, Curly-leaf Pondweed (*Potamogeton crispus* L.), was confirmed in 2004. In order to address the expanded growth of Eurasian watermilfoil, benthic barrier was incorporated in 2005. Continued expansive growth of Eurasian watermilfoil in the southeast bay spawned a desire to evaluate additional treatment alternatives. Permits were acquired and a sequestered treatment with the herbicide triclopyr (Renovate™) was conducted in the Spring of 2010. Hand harvesting, diver assisted suction harvesting (DASH) and benthic barrier have been employed over the last decade to manage the expansion of Eurasian watermilfoil.

Surveys of aquatic plants in Lake Luzerne were conducted in 1989 (Eichler and Madsen, 1990), 1992 (Enviromed Assoc., 1992), 1998 (Eichler and Howe, 1998), 2004 (Eichler and Boylen, 2004), 2007 (King 2007), 2009 (Eichler, 2009), 2010 (Eichler, 2010), 2011 (Allied Biological, 2011), and 2015, 2018 (Schwartzberg, E.G., Hoh, J. and Varin, Z., 2018) and 2019 (Eichler, 2019). The species lists for most surveys are similar. Twenty-seven aquatic plant species were reported in 1989 and 1992, 39 species in 2004, 33 species in both 1998 and 2008, 36 species in 2010 and 40 species in 2019. Between the surveys, a total of 41 species of aquatic plants are reported for Lake Luzerne (Table 1). Differences among the surveys are generally in the less common and emergent species. Emergent species may have been intentionally excluded from past surveys due to their presence at the water's edge rather than submersed. For instance, *Typha latifolia* or cattail is a common emergent species, generally associated with marshlands peripheral to the lake. Cattails were not reported prior to 1998. Additional invasive species, including Curly-leaf Pondweed (*Potamogeton crispus* L.) first reported in 2004 and Brittle Naiad

(*Najas minor*) first reported in 2019, complete the list.

Common members of the aquatic plant community of Lake Luzerne include macroscopic alga, or charophytes (*Chara/Nitella*), floating-leafed species (*Brasenia, Nuphar* and *Nymphaea*), emergent species (*Sparganium, Sagittaria* and *Pontederia*) and 31 submersed species. Of these species, the dominant plants were *Myriophyllum spicatum, Myriophyllum sibiricum, Sagittaria graminea, Eleocharis acicularis, Potamogeton robbinsii, Najas flexilis, Najas guadalupensis, Isoetes echinospora*, and *Vallisneria americana*. The large number of species observed indicates excellent diversity, typical of low-elevation Northeastern lakes (Madsen et al. 1989). For instance, Lake George has 47 submersed species (RFWI et al., 1988) and 32 were observed in Chazy Lake in 2008 (Eichler and Boylen, 2008). In both of these lakes, high diversity is threatened by further growth and expansion of an exotic plant species, Eurasian watermilfoil, which will have negative implications for the health of the lakes as a whole (Madsen et al., 1989, 1990; Eichler and Boylen, 2008).

The composition of the species list for Lake Luzerne is similar to that of other nearby lakes. For instance, all of the species observed in Lake Luzerne have been noted for other regional lakes (Ogden et al, 1973; Madsen et al., 1989, Eichler and Boylen, 2008). Fifteen species are typical for a lake of this type (low elevation, mesotrophic) in New York State (Madsen et al., 1993; Taggett et al. 1990).

One of the plant species known for Lake Luzerne (*Myriophyllum alterniflorum*) is on the New York State Rare Plant list (Young, 2020). This species is generally found on sandy, wave washed shorelines common to Adirondack lakes. Another species reported for Lake Luzerne is on the NYS Watch List (*Isoetes lacustris*). Its' presence on the watch list may be a result of lack of survey data rather than actual scarcity.

Methods

Survey Site. Lake Luzerne is located at the southern edge of Warren County in the Town of Luzerne. The lake's watershed is located in the foothills of the Adirondack Mountains. Elevations within the watershed range from 623 feet above sea level at the surface of the lake to 1000 feet at the highest elevations.

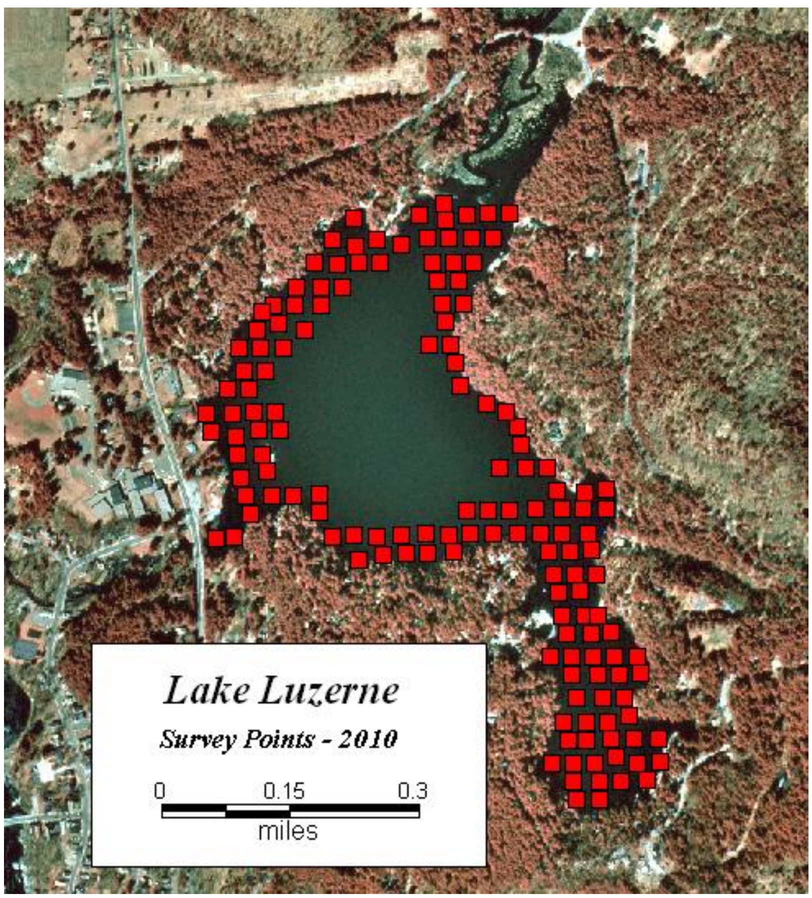
The lake has a surface area of 111 acres and a steeply sloping watershed of 14,109 acres. It is the final link in a chain of lakes including Fourth, Third, and Second Lakes. The lake has a maximum depth of 15.8 meters (52 feet) and a mean depth of 7.3 meters (24 feet). Typical of lakes in the temperate region, it is dimictic, exhibiting both summer and winter thermal stratification. Located on the western margin is the only outlet, which is dammed and used to maintain the level of the lake. The lake is best classified as mesotrophic, which indicates that nutrients necessary for the growth of algae and subsequently the myriad of organisms that feed on these plants, are moderate.

The surficial geology is primarily glacial till, a sand and gravel soil without exposed bedrock. The soil associations are Oakville, Hinckley and Hinckley-Plainfield deposits consisting of loam, fine sands and cobblestones. Drainage in these deposits is rapid and their ability to furnish lime, nitrogen and phosphorus to terrestrial plants is poor. Lake Luzerne is a residential/recreational lake with boating, fishing and swimming as the primary uses. Public access is available via a launch ramp and public beach (Nicks Beach) maintained by the Town of Luzerne.

Species List and Herbarium Specimens. As the lake was surveyed, the occurrence of each aquatic plant species observed in the lake was recorded and adequate herbarium specimens were collected. The authoritative taxonomic reference used was Crow and Hellquist, 2000.

Point Intercept. The frequency and diversity of aquatic plant species were evaluated using a point intercept method (Madsen 1999). At each grid point intersection, water depth and all species present were recorded. Species were located by a visual inspection of the point and by deploying a rake to the bottom, and examining the plants retrieved. A total of 159 points (Figure 1) were selected for Lake Luzerne, on a 50 m grid. A differential global positioning system (DGPS) was used to navigate to each point for the survey observation. Point intercept plant frequencies were surveyed on August 31, 2021. Data presented in the summary are on a whole-lake basis and have not been adjusted for the littoral zone only.

Figure 2. Point intercept survey points for Lake Luzerne.



Results and Discussion

Lake Luzerne Open-Lake Survey Results

In August of 2021, the aquatic plant community of Lake Luzerne included thirty-three submersed species, three floating-leaved species, and five emergent species (Table 1). A total of 41 species of aquatic plants were observed with 36 collected by the point intercept survey. Three invasive species (Eurasian watermilfoil) *Myriophyllum spicatum*, (Curly-leaf Pondweed) *Potamogeton crispus* and (BrittleNaiad) *Najas minor* were present. Species richness was quite high, with a large number of species occurring in more than 5% of survey points (Table 2). Native species were clearly dominant, however Eurasian watermilfoil (*Myriophyllum spicatum*) was widely distributed. Common native species for Lake Luzerne included *Potamogeton robbinsii, Chara* sp., *Utricularia minor, Utricularia purpurea, Vallisneria americana, Elodea canadensis, Potamogeton vaseyii, Myriophyllum sibiricum, Potamogeton praelongus,* and *Brasenia schreberi*.

Table 1. Species list for Lake Luzerne.

Species	**Common Name**	**2021**	**2019**	**2010**	**2009**	**2004**
Brasenia schreberi J.F. Gmel	Water Shield	fl	fl	x	x	x
Chara species	Musk Grass	s	s	x	x	x
Elatine minima (Nutt.) Fisch. & C.A. Mey.	Little Elatine	s	s	x	x	x
Eleocharis acicularis (L.) Roemer & Schultes	Spike Rush	e	e	x	x	x
Elodea canadensis Michx.	Waterweed	s	s	x	x	x
Eriocaulon septangulare With.	Pipewort	e	e	x	x	x
Fontinalis sp.	Moss	s	s	x	x	x
Isoetes echinospora Dur.	Quillwort	s	s	x	x	x
Isoetes lacustris L.	Large spored Quillwort			x		x
Lindernia sp.	False Pimpernel	s	s			x
Megalodonta beckii	Water Marigold	s	s	x	x	x
Myriophyllum alterniflorum	Little Milfoil	s	s			x
Myriophyllum sibiricum L.	Northern Milfoil	s	s	x	x	x
Myriophyllum spicatum L.	Eurasian watermilfoil	s	s	x	x	x
Myriophyllum tenellum Kom.	Leafless Milfoil	s	s	x	x	x
Najas flexilis (Willd.) Rostk. & Schmidt.	Naiad	s	s	x	x	x
Najas guadalupensis	Southern Naiad	s	s			
Najas minor	Brittle Naiad	s	s			
Nuphar variegata Engem. Ex Durand	Yellow Water Lily	fl	fl	x	x	x
Nymphaea odorata Ait.	White Water Lily	fl	fl	x	x	x
Pontedaria cordata L.	Pickerelweed	e	e	x	x	x
Potamogeton amplifolius Tuckerm.	Broad leaf Pondweed	s	s	x	x	x
Potamogeton crispus L.	Curly leaf Pondweed	s	s			x
Potamogeton epihydrus Raf.	Ribbon leaf Pondweed	s	s	x	x	x
Potamogeton gramineus L.	Variable Pondweed	s	s			x

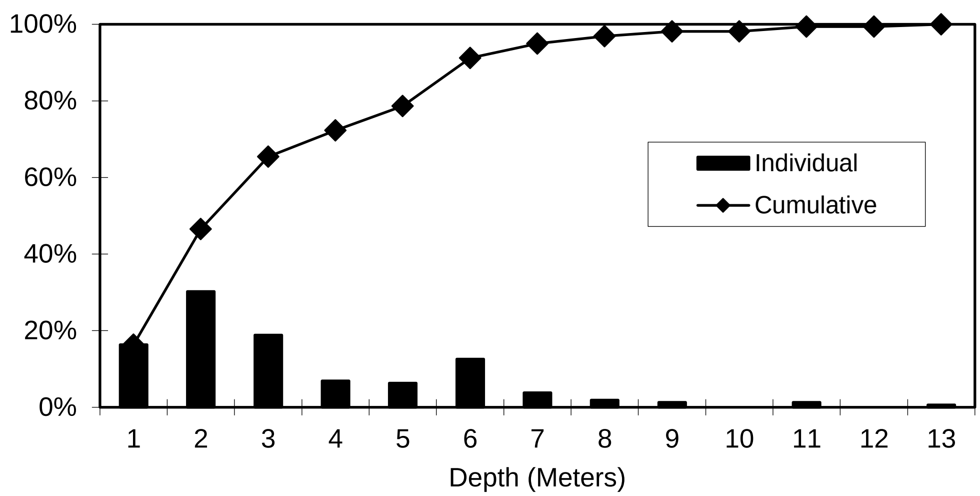
Species	Common Name	2021	2019	2010	2009	2004
Potamogeton illinoensis Morong	Illinois Pondweed	s	s	x	x	x
Potamogeton perfoliatus L.	Heart leaf Pondweed	s	s			x
Potamogeton praelongus Wulfen	White stem Pondweed	s	s	x	x	x
Potamogeton pusillus L.	Narrow leaf Pondweed	s	s	x	x	x
Potamogeton richardsonii (Ar. Benn) Rydb.	Richardsons Pondweed	s	s			x
Potamogeton robbinsii Oakes	Robbins Pondweed	s	s	x	x	x
Potamogeton spirillus Tuckerm.	Small Pondweed			x	x	x
Potamogeton vaseyii Robbins	Vasey's Pondweed	s	s	x	x	x
Potamogeton zosteriformis Fern.	Flat Stem Pondweed	s	s			x
Sagittaria graminea Michx.	Arrowhead	s	s	x	x	x
Scirpus spp.	Rush	s	s	x		
Sparganium sp.	Bur Reed	e	e	x	x	x
Typha latifolia L.	Cattail	e	e	x	x	x
Utricularia intermedia Hayne	Bladderwort	s				x
Utricularia gibba L.	Humped Bladderwort	s	s	x	x	x
Utricularia purpurea Hayne	Purple Bladderwort	s	s	x	x	
Utricularia vulgaris L.	Great Bladderwort	s	s			x
Vallisneria americana L.	Duck Celery	s	s	x	x	x

Species present and their relative abundance remain comparable to prior survey results. With this diversity and distribution of native species, the test for non-target impacts of management should be sensitive to numerous species, and the probability of native plant restoration in areas formerly inhabited by Eurasian watermilfoil should be high following management efforts.

Maximum Depth of Colonization

The littoral zone is the area of the lake bottom supporting rooted aquatic plant growth and is generally defined by the maximum depth to which sufficient light penetrates to allow for plant growth. In Lake Luzerne, depth distribution of native species remained similar to past surveys with aquatic plant growth observed to a maximum depth of 5.5 meters (16 feet). Macroalgae or charophytes form a carpet at the outer margin of plant growth, in depths from 5 to 7 meters (16 to 22 feet). While Eurasian watermilfoil occurred throughout Lake Luzerne, dense growth typically was found in depths from 3 to 10 feet. Depth distribution of sampling points (Figure 3) was primarily within the littoral zone (less than 6 meters), however most depths in Lake Luzerne were sampled.

Figure 3. Distribution of Lake Luzerne sampling points in 1 meter depth classes.



Species Lists

Maps of the distribution of all aquatic plant species for Lake Luzerne are included in Appendix B, Figures B1–B19. These maps are based on the presence of individual species in point intercept samples and the relative abundance of each species within each sample. Species richness in Lake Luzerne was high, with a large number of species occurring in more than 5% of survey points (Table 2). A total of 41 species of aquatic plants were observed with 36 collected by the point intercept survey. Southern naiad, *Najas guadalupensis,* was the most common species (44% of survey points). Eurasian watermilfoil was a common species lakewide, ranked third by frequency of occurrence (26% of survey points). A number of native species were also commonly observed, including *Potamogeton robbinsii* (33% of survey points), *Chara/Nitella* spp. (21%), *Utricularia purpurea* (21%), *Vallisneria americana* (18%), *Potamogeton praelongus* (16%), *Potamogeton illinoensis* (12%), *Nymphaea odorata* (11%), *Utricularia gibba* (8%), *Brasenia schreberi* (8%), *Najas flexilis* (7%), and *Potamogeton amplifolius* (6%).

Table 2. Aquatic plant percent frequency by species for Lake Luzerne.

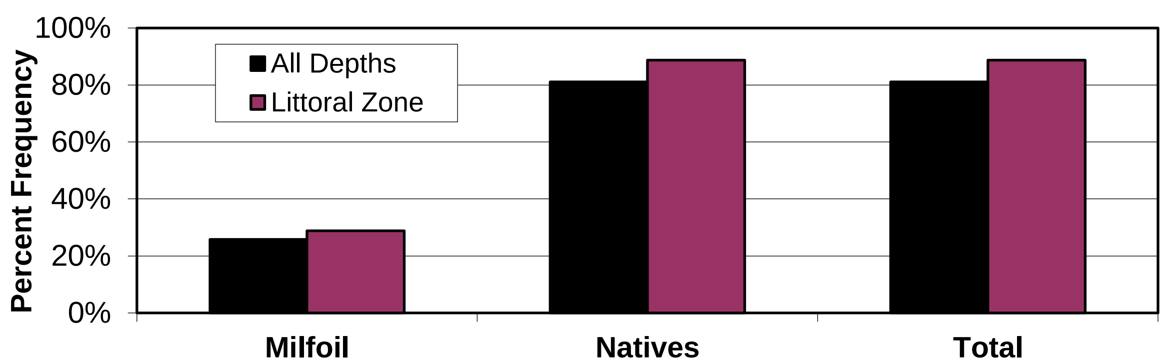
Species	2021	2019	2010	2009	2004
Brasenia schreberi	8.2%	7.1%	7.6%	9.7%	
Chara species	21.4%	37.4%	42.9%	37.1%	77.1%
Eleocharis acicularis (L.) Roemer & Schultes	1.9%	1.9%	2.5%	3.2%	
Elodea canadensis Michx.	2.5%	14.8%	14.3%	30.6%	45.8%
Eriocaulon septangulare	0.6%	0.6%	0.8%	1.6%	
Fontinalis	4.4%	5.2%	6.7%	4.8%	
Isoetes echinospora	0.6%	2.6%	1.7%		
Isoetes lacustris			1.7%		
Myriophyllum alterniflorum	0.6%	0.6%	0.8%		
Megalodonta beckii	2.5%	2.6%	0.8%	4.8%	
Myriophyllum sibiricum	4.4%	7.7%	11.8%	12.9%	47.9%
Myriophyllum spicatum L.	25.8%	32.3%	21.8%	45.2%	60.4%
Myriophyllum tenellum	3.8%	2.6%	3.4%	4.8%	31.3%
Najas flexilis	6.9%	13.5%	10.1%		47.9
Najas guadalupensis	44.0%	25.2%			
Najas minor	0.6%	1.9%			
Nuphar variegata	1.3%	1.9%	0.8%	1.6%	
Nymphaea odorata Ait.	11.3%	9.7%	6.7%	6.5%	
Pontedaria cordata		0.6%		1.6%	
Potamogeton amplifolius	5.7%	7.1%	0.8%	6.5%	
Potamogeton crispus	1.9%	0.6%	0.8%		
Potamogeton epihydrus	1.9%	1.9%	2.5%	1.6%	50.0%
Potamogeton illinoensis	11.9%	21.9%	22.7%	8.1%	
Potamogeton gramineus	5.0%	3.9%			
Potamogeton perfoliatus	0.6%	1.9%			
Potamogeton praelongus	16.4%	9.0%	9.2%	9.7%	
Potamogeton pusillus L.	3.8%	5.8%	14.3%	1.6%	
Potamogeton robbinsii	33.3%	45.2%	57.1%	58.1%	58.3%
Potamogeton vaseyi	2.5%	9.0%	11.8%	16.1%	39.6%
Sagittaria graminea	2.5%	5.2%	0.8%	1.6%	
Scirpus sp.	1.3%	3.2%	0.8%		
Sparganium spp.	4.4%	0.6%	1.7%	3.2%	
Utricularia gibba	8.2%	14.2%	12.6%	46.8%	
Utricularia intermedia	1.3%				
Utricularia purpurea	21.4%	21.9%	37.0%	37.1%	
Utricularia vulgaris	1.9%	9.0%	23.5%		39.6%
Vallisneria americana L.	17.6%	20.0%	26.9%	35.5%	62.5%

In 2019, Robbins pondweed, *Potamogeton robbinsii* was the most common species (45% of survey points). Eurasian watermilfoil was ranked third by frequency of occurrence lakewide (32% of survey points). A number of native species were also commonly observed, and included

Chara spp. (37%), *Najas guadalupensis* (25%), *Utricularia purpurea* (22%), *Potamogeton illinoensis* (22%), *Vallisneria americana* (20%), *Elodea canadensis* (15%), *Utricularia gibba* (14%), *Utricularia vulgaris* (9%), *Potamogeton vaseyii* (9%), *Potamogeton praelongus* (9%), *Myriophyllum sibiricum* (8%), and *Brasenia schreberi* (7%). In 2009, a pre-treatment survey produced comparable results including: *Potamogeton robbinsii* (58% of survey points), *Chara* spp. (37%), *Utricularia minor* (47%), *Utricularia purpurea* (37%), *Vallisneria americana* (36%), *Elodea canadensis* (31%), *Potamogeton vaseyii* (16%), *Myriophyllum sibiricum* (13%), *Potamogeton praelongus* (10%), and *Brasenia schreberi* (10%). Eurasian watermilfoil was ranked third by frequency of occurrence in 2009 (45% of survey points). *Najas guadalupensis*, reported in trace amounts in 1998 and 2011, became a dominant member of the plant community in 2019 and 2021.

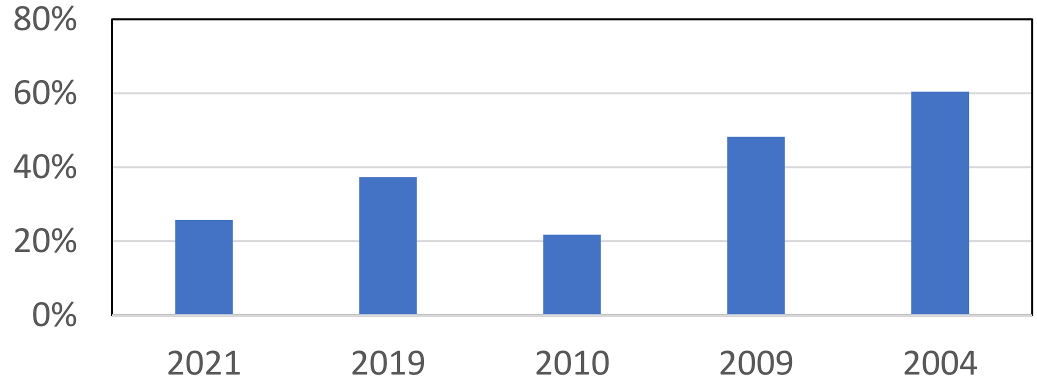
Comparing frequency of occurrence between 2019 and 2021 (Table 2), twenty three species showed a decline in frequency of occurrence and 9 species increased. Of the 23 species showing declines, three were native species showing declines of 1% or less. Three native species showed substantial declines over time, *Elodea canadensis*, *Utricularia vulgaris* and *Utricularia gibba*. Getsinger et al. (2002) reported native species experiencing declines following herbicide treatment with fluridone, including *Najas flexilis, Elodea canadensis, Myriophyllum sibiricum, Potamogeton illinoensis*, and *P. zosteriformis*, however he found greater than 50% of survey points remained vegetated with native species during the year of treatment. The majority of these species were observed to increase in frequency of occurrence the following year, after a decline in the year of treatment. One species, *Najas guadalupensis,* was absent prior to 2019 but abundant in the 2019 and 2021 surveys. Getsinger et al. (2002) reported a proliferation of *Potamogeton illinoensis* following herbicide treatments, leading several residents to complain of nuisance levels of growth of this native species. Lake Luzerne has experienced a similar expansion of this species. Eichler and Boylen (2008) reported increases in frequency of occurrence of *Najas flexilis* and *Elodea canadensis* in two Vermont lakes following triclopyr treatments, however these also returned to pre-treatment levels within one year of treatment. All other differences were in the less common species.

Figure 4. Lake Luzerne frequency of occurrence summaries lakewide in 2021.



Eighty-one percent of whole lake sampling points were vegetated by at least one plant species in 2021 (Figure 4) comparable to the 85%, 84% and 89% reported for 2019, 2010 and 2009, respectively. In depths of 6 m or less, representing the littoral zone, 89% of survey points contained native species in 2021, while 98% were reported in 2019 and 95% of survey points were reported in both 2009 and 2010 surveys. Eurasian watermilfoil was present in 26% of survey points in 2021, 32% in 2019 and 24% of survey points in 2010, a slight change over 9 years. A general decline in Eurasian watermilfoil abundance was observed between 2004 and 2010 (Figure 5), most likely a result of aquatic plant management efforts.

Figure 5. Lake Luzerne Eurasian watermilfoil frequency of occurrence.



The number of plant species present per sample point, or species richness, is presented in Table 4 and Figure 6. Whole lake native species richness is comparable to total species richness, reported at 2.54 and 2.82 species per sample point, respectively. When comparing only survey points within the littoral zone, native and total species richness remain similar, at 2.82 and 3.14 species per sample point, and within the relative error of the measurement. The use of sampling points predominantly within the littoral zone accounts for the similarity of results.

Figure 6. Lake Luzerne species richness lakewide. Error bars are standard error.

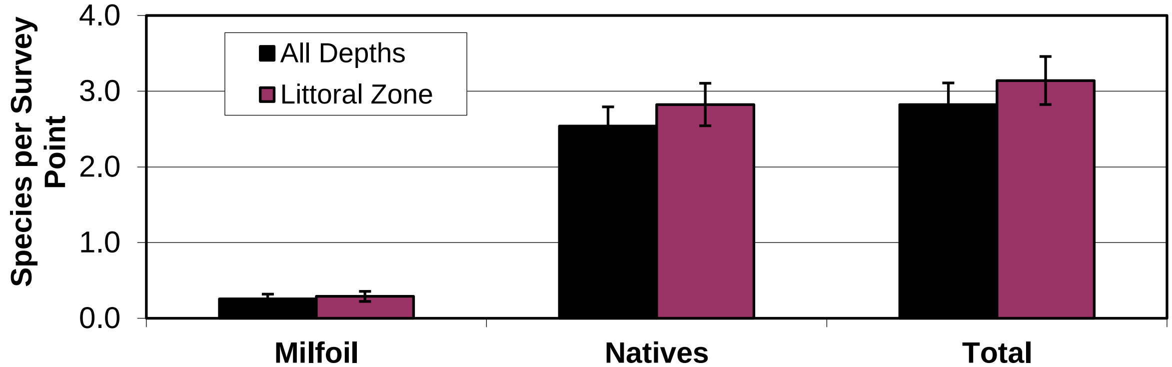


Table 4. Species richness comparison between the 2010 (post-treatment), 2019 and 2021 surveys

Plant Grouping	Water Depth Class	Summary Statistic	Lakewide Surveys 2010	2019	2021
Native plant species	Whole Lake (all depths)	Mean	2.94	3.14	2.54
		N	152	155	159
		Std. Error	0.17	0.18	0.15
	Points with depths <6m	Mean	3.35	3.59	2.82
		N	134	134	142
		Std. Error	0.17	0.17	0.16
	Points with depths <2m	Mean	4.5	4.53	3.78
		N	53	58	60
		Std. Error	0.24	0.23	0.24
All plant species	Whole Lake (all depths)	Mean	3.13	3.48	2.82
		N	152	155	159
		Std. Error	0.18	0.20	0.17
	Points with depths <6m	Mean	3.56	3.99	3.14
		N	134	134	142
		Std. Error	0.18	0.19	0.17
	Points with depths <2m	Mean	4.72	4.95	4.25
		N	53	58	60
		Std. Error	0.26	0.25	0.26

Declines in native species richness following expansive growth of *Myriophyllum spicatum* have been well documented (Madsen et al. 1989, 1991). Conversely, species richness increases in areas where Eurasian watermilfoil growth is reduced (Boylen et al., 1996). Native and total species richness declined slightly between 2019 and 2021, while the abundance of Eurasian watermilfoil also declined. Natural interannual variability in species richness may account for these differences.

Summary

Quantitative aquatic plant surveys were undertaken for Lake Luzerne, New York, to obtain post-treatment data for a Eurasian watermilfoil (*Myriophyllum spicatum* L.) management program based on diver assisted suction harvesting. The point intercept survey methods employed were designed to meet with NYS DEC Tier III Survey requirements. The current plant survey was designed to provide data comparable to earlier surveys by the author (Eichler et al. 1989, 1992, 1998, 2004, 2009, 2010 and 2019). The survey consisted of a) frequency of occurrence of all aquatic plant species for points distributed throughout the lake, and b) comparison of historical survey results to current conditions, with particular reference to changes in the relative abundance of Eurasian watermilfoil.

Lake Luzerne supports a diverse native plant community with thirty-three submersed species, three floating-leaved species, and five emergent species. An exotic, invasive aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*) was first confirmed in Lake Luzerne in 1989. Periodic hand harvesting efforts were conducted, however by 2004 Eurasian watermilfoil had expanded its coverage. The presence of a second invasive plant species, Curly-leaf Pondweed (*Potamogeton crispus* L.), was confirmed in 2004. In order to address the expanded growth of Eurasian watermilfoil, benthic barrier was incorporated in 2005. Continued expansive growth of Eurasian watermilfoil in the southeast bay spawned a desire to evaluate additional treatment alternatives. Permits were acquired and a sequestered treatment with the herbicide triclopyr (Renovate™) was conducted in the Spring of 2010, greatly reducing Eurasian watermilfoil abundance in this area of the lake. Hand and diver assisted suction harvesting (DASH) have been conducted since that time. A third invasive species, Brittle Naiad (*Najas minor*) was first reported in 2019.

Species richness in Lake Luzerne remains quite high, with a large number of species occurring in more than 5% of survey points. A total of 41 species were recorded in open-lake surveys of Lake Luzerne in 2021, comparable to previous surveys in 2019 (40 species), 2004 (39 species), 2010 (36 species) 1998 and 2009 (33 species), and 1989 - 1992 (27 species). Between all surveys, a total of 41 species of aquatic plants are reported for Lake Luzerne. The large number of aquatic plant species is a testament to the diversity of habitats present in Lake Luzerne and the exceptional water quality of the lake.

Southern naiad, *Najas guadalupensis,* was the most common species (44% of survey points) in 2021. This species has been reported to reach nuisance levels in area lakes. Eurasian watermilfoil was a common species lakewide, ranked third by frequency of occurrence (26% of survey points). A number of native species were also commonly observed, including *Potamogeton robbinsii* (33% of survey points), *Chara/Nitella* spp. (21%), *Utricularia purpurea* (21%), *Vallisneria americana* (18%), *Potamogeton praelongus* (16%), *Potamogeton illinoensis* (12%), *Nymphaea odorata* (11%), *Utricularia gibba* (8%), *Brasenia schreberi* (8%), *Najas flexilis* (7%), and *Potamogeton amplifolius* (6%).

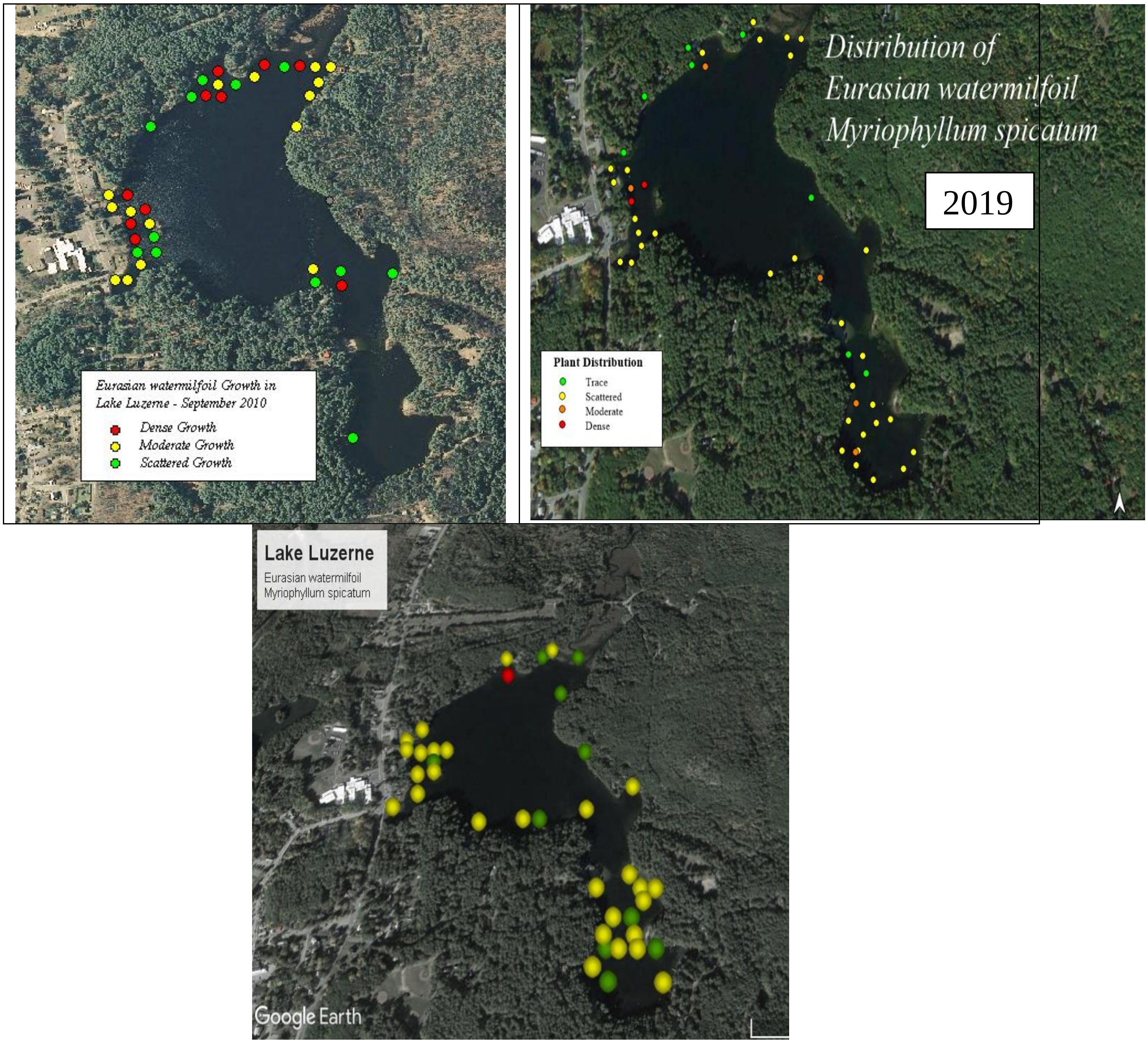
These results are similar to 2019, when Robbins pondweed, *Potamogeton robbinsii* was the most common species (45% of survey points). Eurasian watermilfoil was also dominant in 2019

ranked third by frequency of occurrence (32% of survey points). A number of native species were also commonly observed, including *Chara* spp. (37% of survey points), *Najas guadalupensis* (25%), *Utricularia purpurea* (22%), *Potamogeton illinoensis* (22%), *Vallisneria americana* (20%), *Elodea canadensis* (15%), *Utricularia gibba* (14%), *Utricularia vulgaris* (9%), *Potamogeton vaseyii* (9%), *Potamogeton praelongus* (9%), *Myriophyllum sibiricum* (8%), and *Brasenia schreberi* (7%). These results are quite similar to frequency of occurrence results for the 2010 survey: *Potamogeton robbinsii* (57% of survey points), *Chara* (40% of survey points), *Utricularia purpurea* (30%), *Vallisneria americana* (26%), *Utricularia vulgaris* (16%), *Potamogeton illinoensis* (16%), *Elodea canadensis* (16%), *Utricularia minor* (15%), *Potamogeton vaseyii* (11%), *Myriophyllum sibiricum* (9%), *Potamogeton praelongus* (7%), and *Brasenia schreberi* (7%). The preponderance of native species points to the success of the management effort to generally control the growth of Eurasian watermilfoil. The dominance of Southern Naiad (*Najas guadalupensis*), in the 2019 and 2021 surveys suggests a potential for future nuisance levels of growth.

Eighty-one percent of whole lake sampling points were vegetated by at least one plant species in 2021 comparable to the 85% reported in 2019, 84% reported in 2010 and 89% reported for 2009. In depths of 6 m or less, representing the littoral zone, 89% of survey points contained native species in 2021, while 98% were reported in 2019 and 95% of survey points were reported in both 2009 and 2010 surveys. Eurasian watermilfoil was present in 26% of survey points in 2021, 32% in 2019 and 24% of survey points in 2010, a slight change over 9 years. Regrowth of Eurasian watermilfoil in the southeastern embayment, which was treated with herbicide in 2010, largely accounted for the difference.

In 2021, whole lake native species richness was comparable to total species richness, reported at 2.54 and 2.82 species per sample point, respectively. When comparing only survey points within the littoral zone, native and total species richness remain similar, at 2.82 and 3.14 species per sample point, and within the relative error of the measurement. Similar results were reported in 2019, at 3.14 and 3.48 species per sample point, respectively. For 2010, whole lake native species richness was reported at 2.94 and 3.13 species per sample point respectively. When comparing only survey points within the littoral zone for 2019, native and total species richness remained similar, at 3.59 and 3.99 species per sample point. The use of sampling points predominantly within the littoral zone accounts for the similarity of results. The fact that lake-wide species richness is comparable between the 3 surveys is likely due to ongoing aquatic plant management efforts, given that declines in native species richness following unchecked growth of *Myriophyllum spicatum* have been well documented (Madsen et al. 1989, 1991).

Figure 7. Distribution of Eurasian watermilfoil (*Myriophyllum spicatum*) in the 2010, 2019 and 2021 surveys of Lake Luzerne.



One of the plant species in Lake Luzerne (*Myriophyllum alterniflorum*) is on the New York State Rare Plant list (Young, 2020). This species is generally found on sandy, wave washed shorelines common to Adirondack lakes. This species was reported for Lake Luzerne in 2010, 2019 and 2021. One other species reported in Lake Luzerne is on the NYS Watch List (*Isoetes lacustris*). *Isoetes lacustris* was absent in the 2019 and 2021 surveys. This species is small in size and difficult to sample effectively with the current survey techniques.

Eurasian watermilfoil growth has dominated several areas of Lake Luzerne for many years, including the outlet area, inlet area and the southeastern cove. The southeast cove of Lake Luzerne was treated with herbicide in 2010, and only a single stem of Eurasian watermilfoil was recorded in the post-treatment survey (Figure 7). Frequency of occurrence for Eurasian watermilfoil plants within the treatment zone declined from 58% of survey points pre-treatment to 3% post-treatment. The remainder of Lake Luzerne supported extensive growth of Eurasian watermilfoil in 2010. Since 2010, a general decline in relative abundance of Eurasian watermilfoil has occurred, most likely due to management efforts, while frequency of occurrence has increased slightly. The increase is almost exclusively found in the southeastern embayment due to Eurasian watermilfoil recovery since the 2010 herbicide treatment. The current survey results should continue to provide a baseline from which to assess future impacts of both Eurasian watermilfoil growth and management activities.

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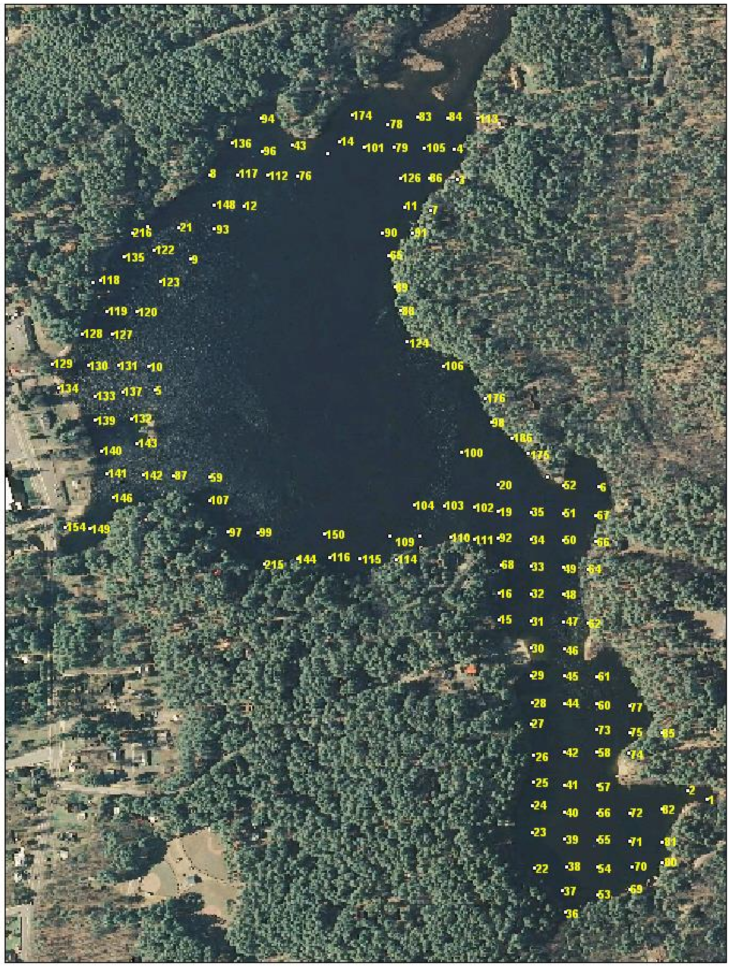
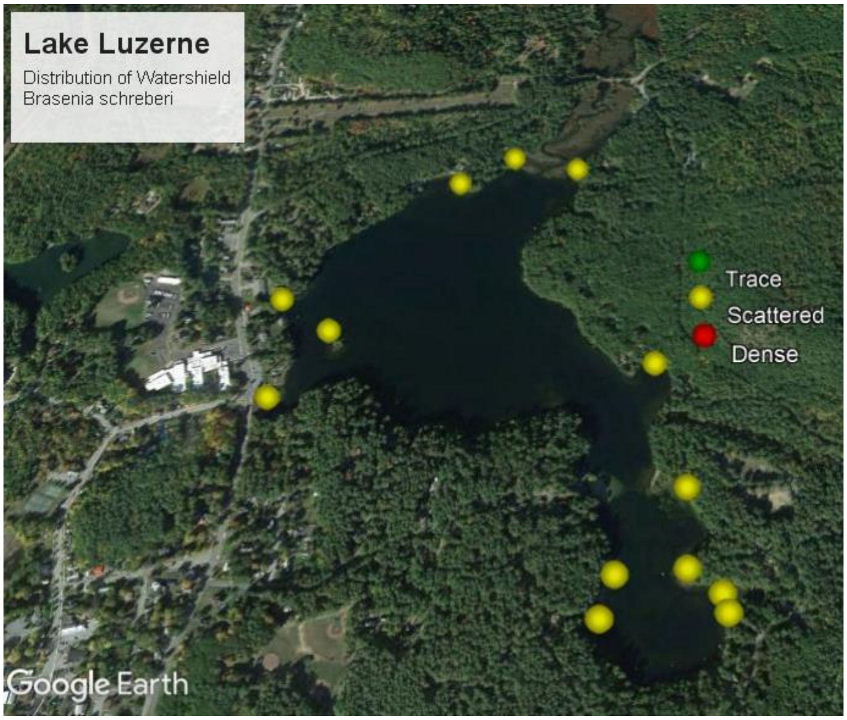
Appendix A.

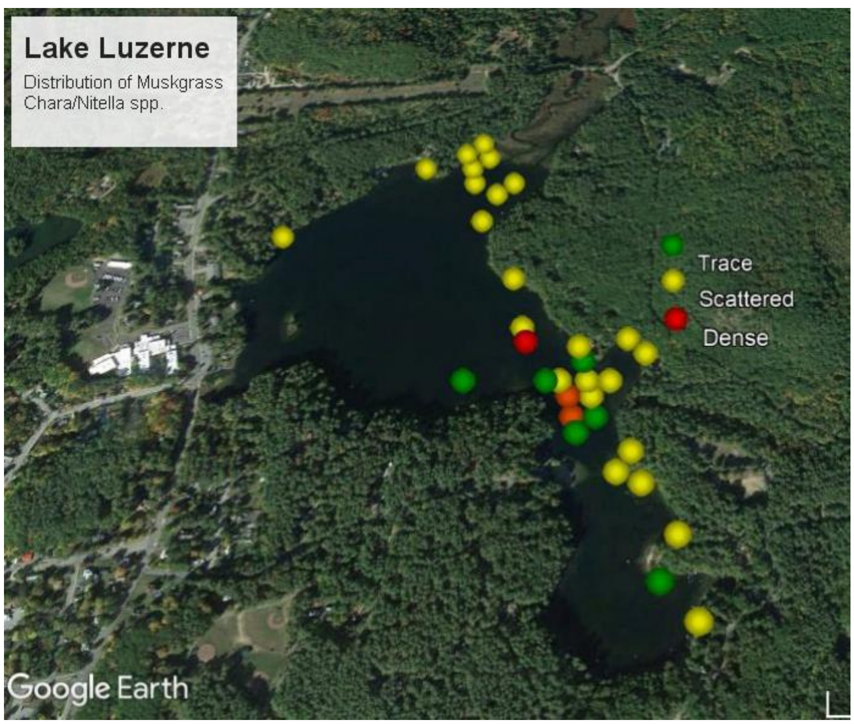
Topographic map showing the approximate locations of the 2021 survey points with GPS number for Lake Luzerne, NY.

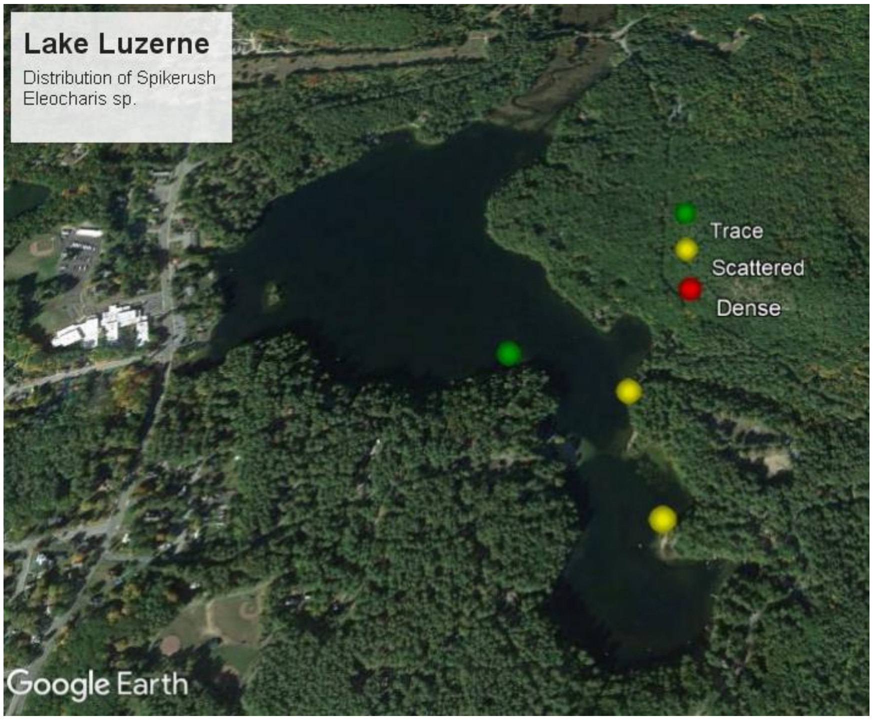


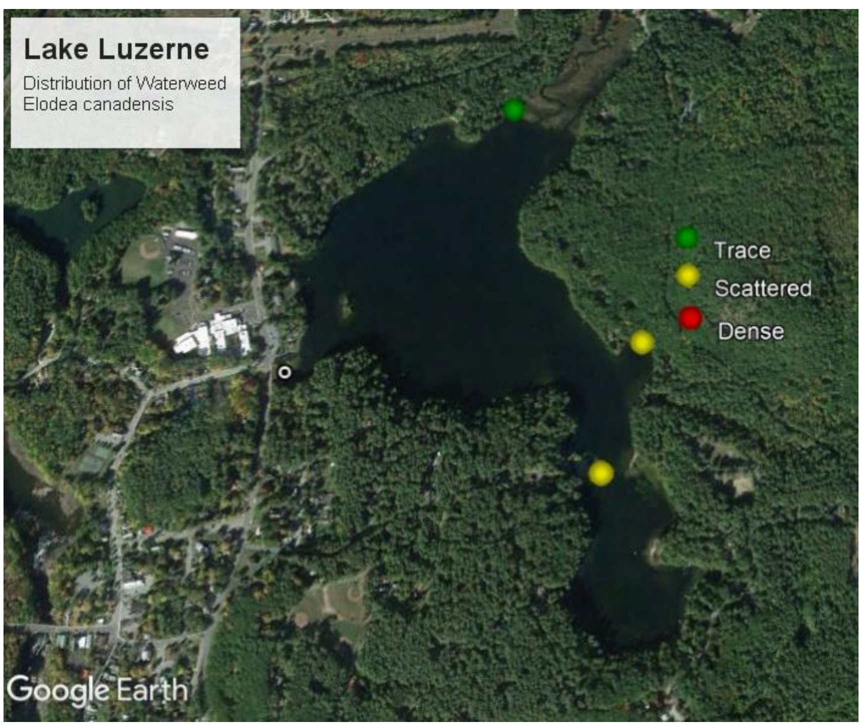
Appendix B.

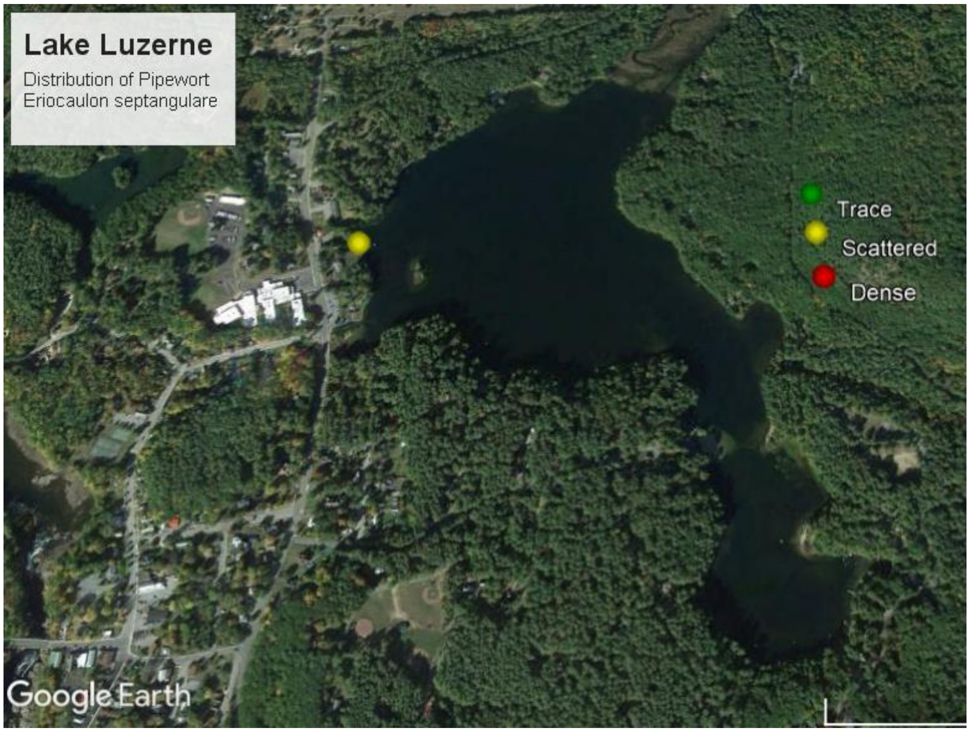
Aquatic Plant Distribution Maps for Lake Luzerne Based on Point Intercept Survey Data

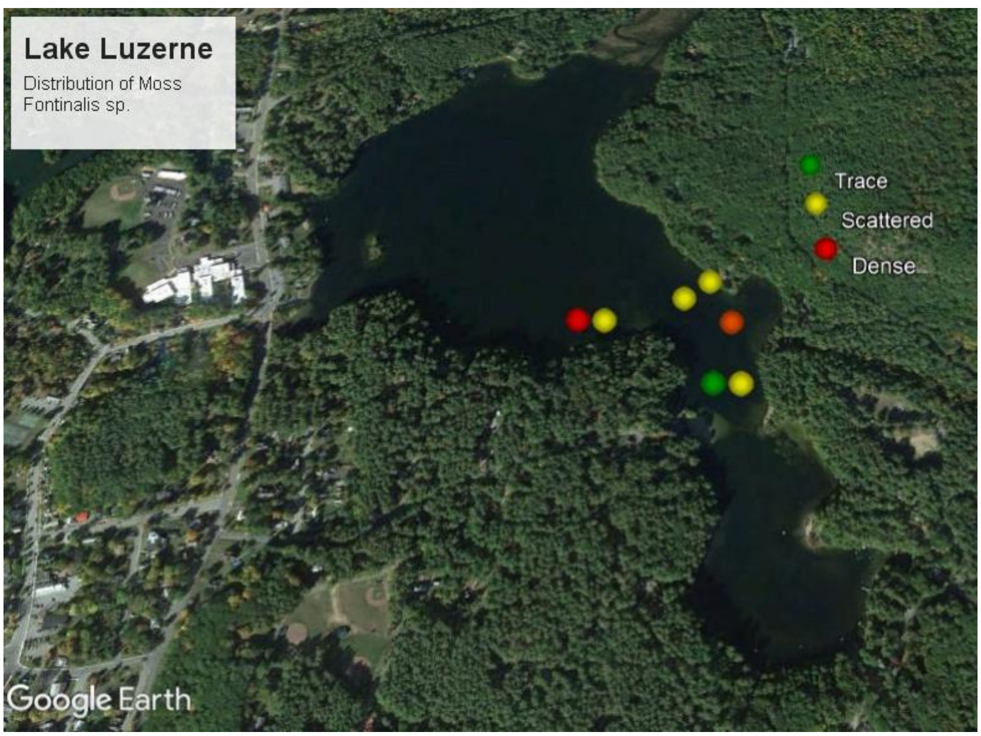

Lake Luzerne
Distribution of Watershield
Brasenia schreberi
Trace
Scattered
Dense
Google Earth

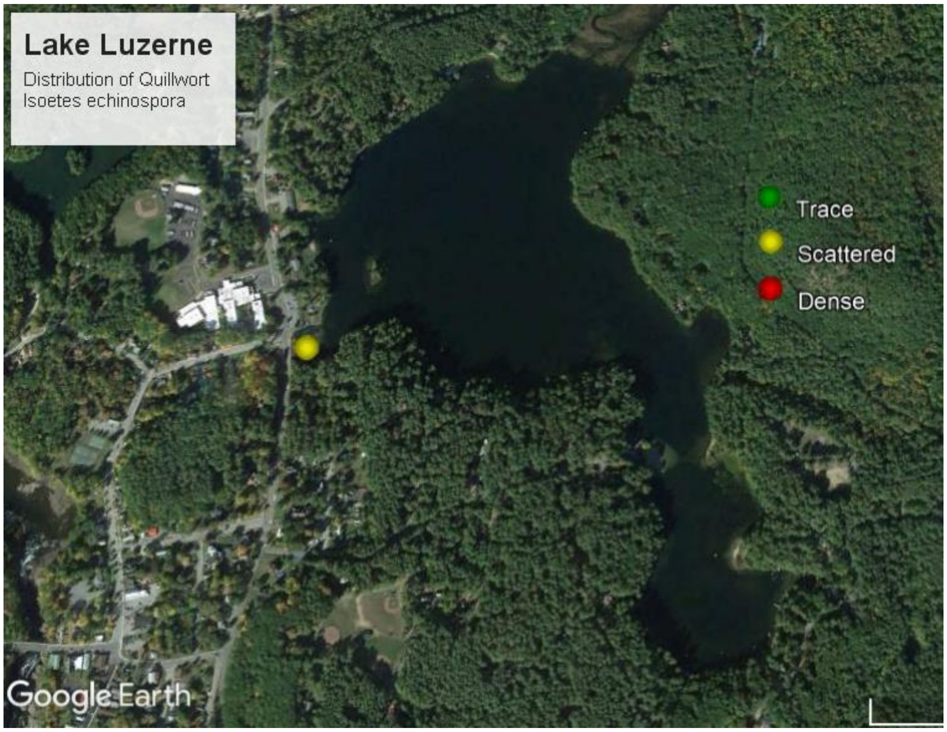

Lake Luzerne
Distribution of Muskgrass
Chara/Nitella spp.
Trace
Scattered
Dense
Google Earth

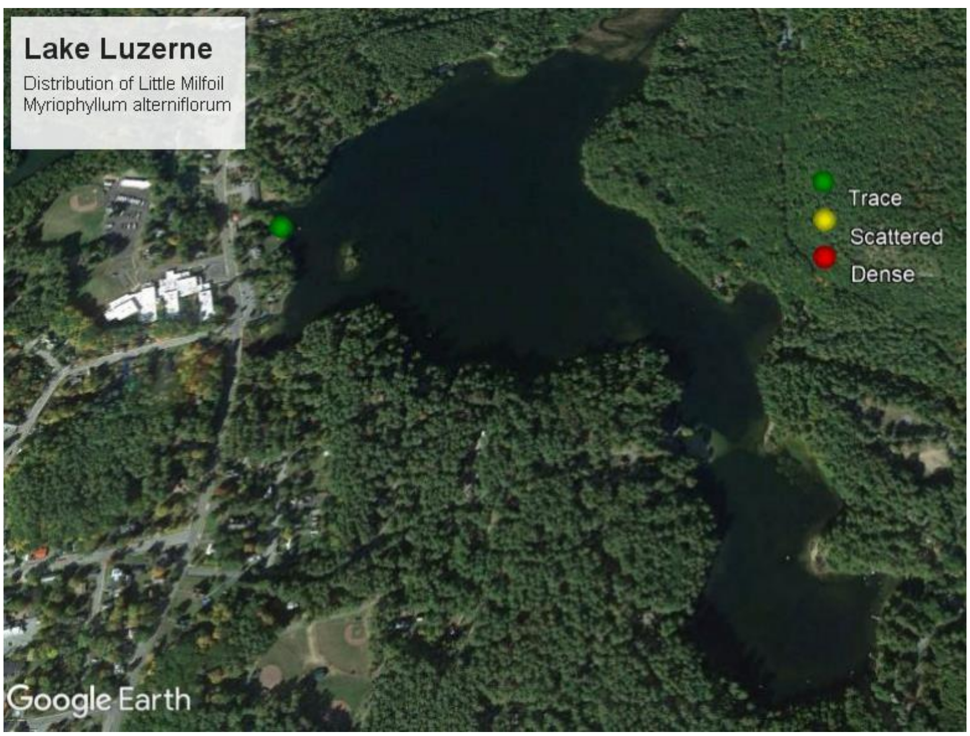

Lake Luzerne
Distribution of Spikerush
Eleocharis sp.
Trace
Scattered
Dense
Google Earth

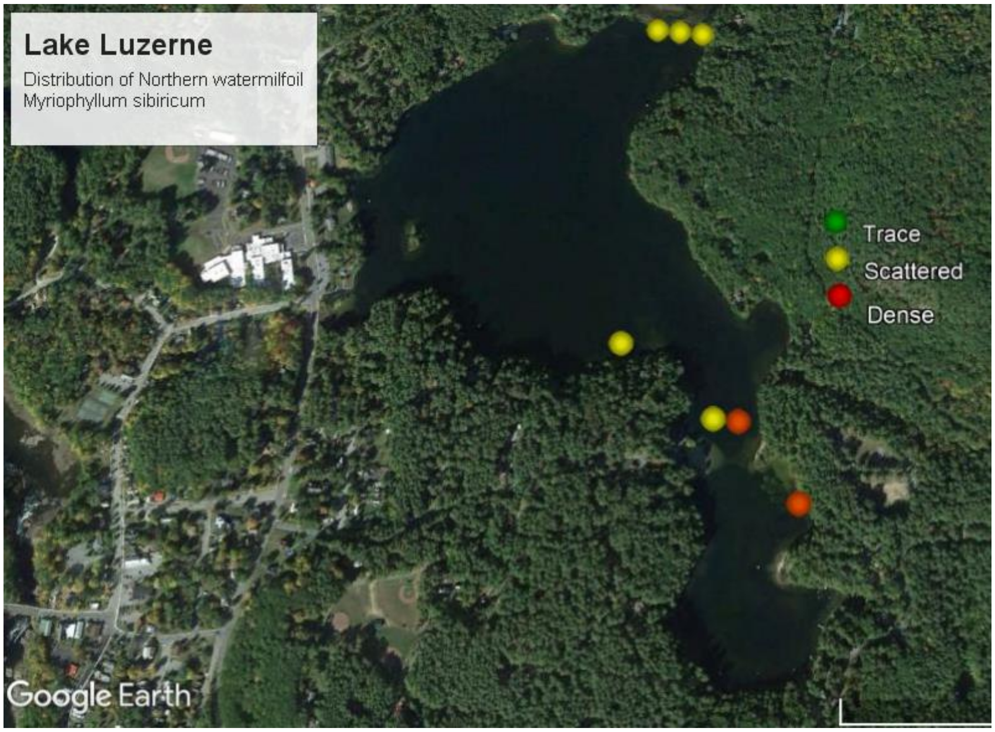

Lake Luzerne
Distribution of Waterweed
Elodea canadensis
Trace
Scattered
Dense
Google Earth

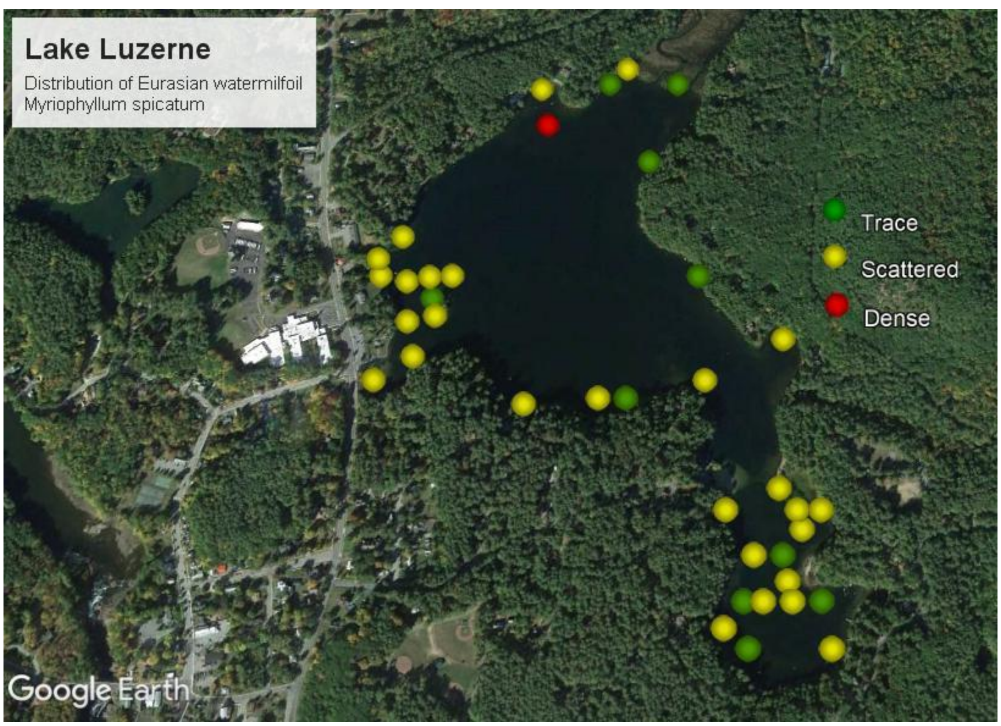

Lake Luzerne
Distribution of Pipewort
Eriocaulon septangulare
Trace
Scattered
Dense
Google Earth

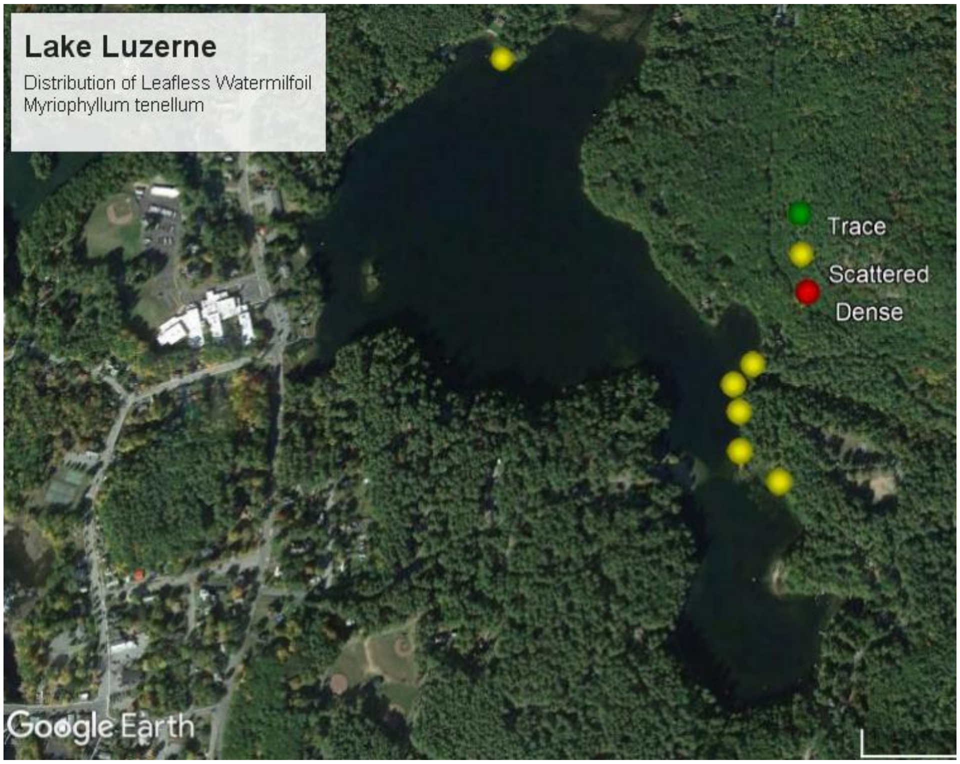

Lake Luzerne
Distribution of Moss
Fontinalis sp.
Trace
Scattered
Dense
Google Earth

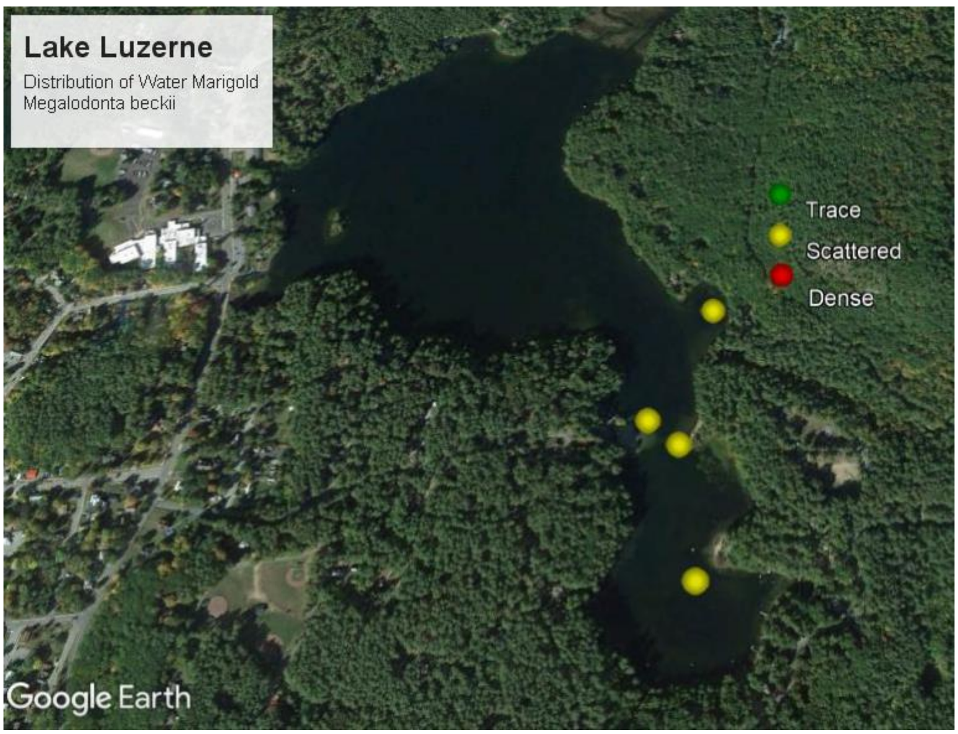

Lake Luzerne
Distribution of Quillwort
Isoetes echinospora
Trace
Scattered
Dense
Google Earth

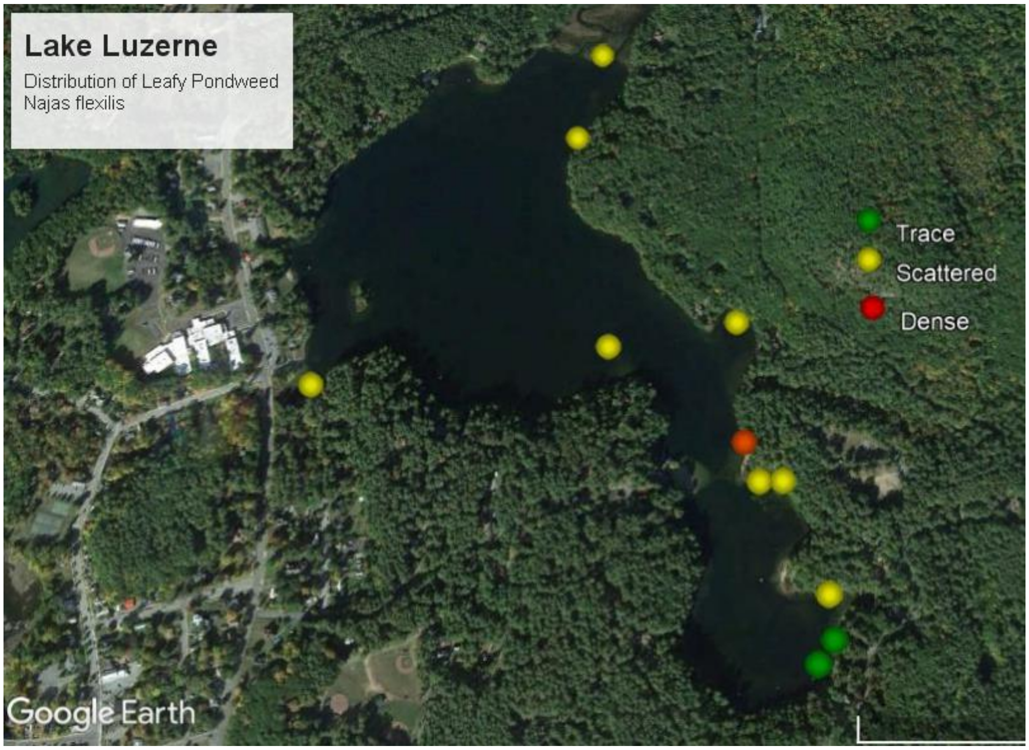

Lake Luzerne
Distribution of Little Milfoil
Myriophyllum alterniflorum
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Northern watermilfoil
Myriophyllum sibiricum
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Eurasian watermilfoil
Myriophyllum spicatum
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Leafless Watermilfoil
Myriophyllum tenellum
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Water Marigold
Megalodonta beckii
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Leafy Pondweed
Najas flexilis
Trace
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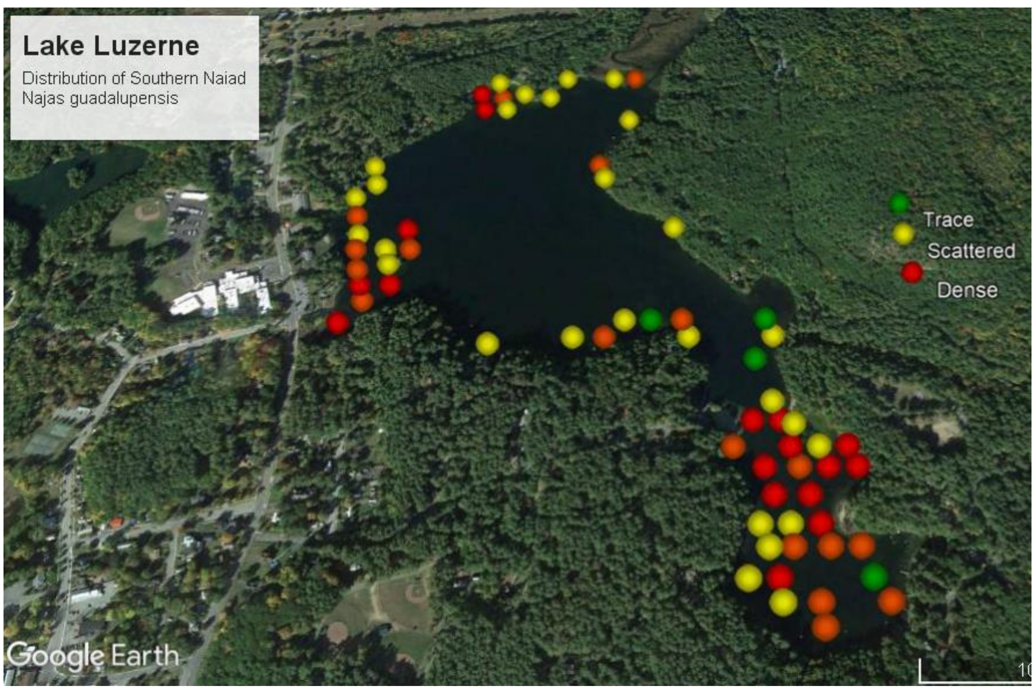
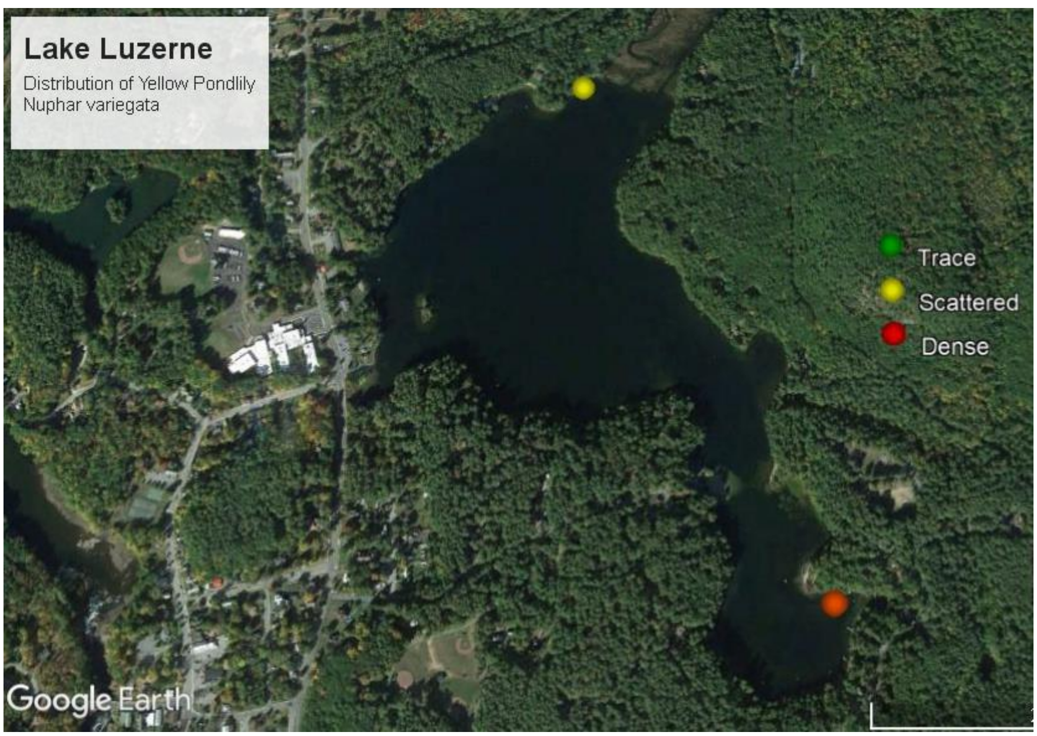
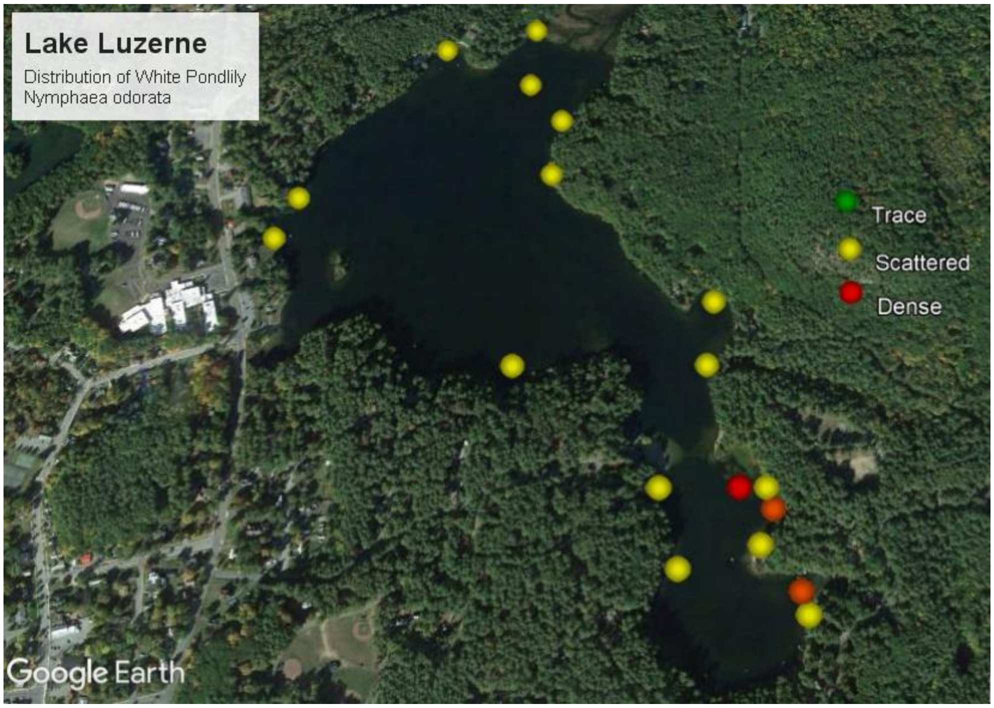
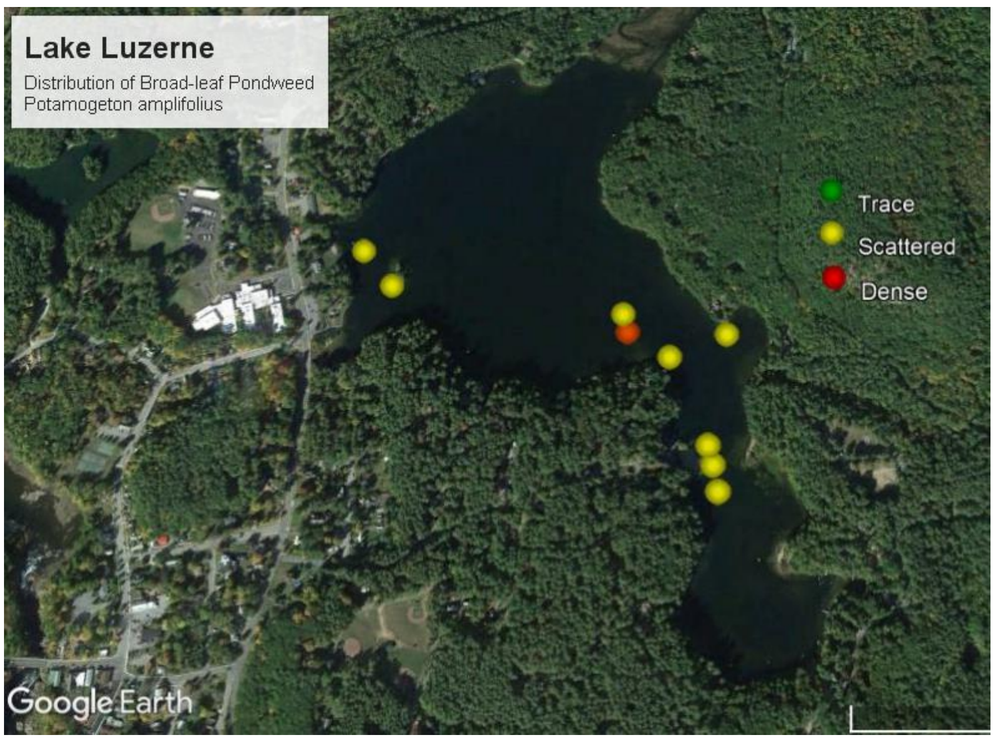
Dense
Google Earth

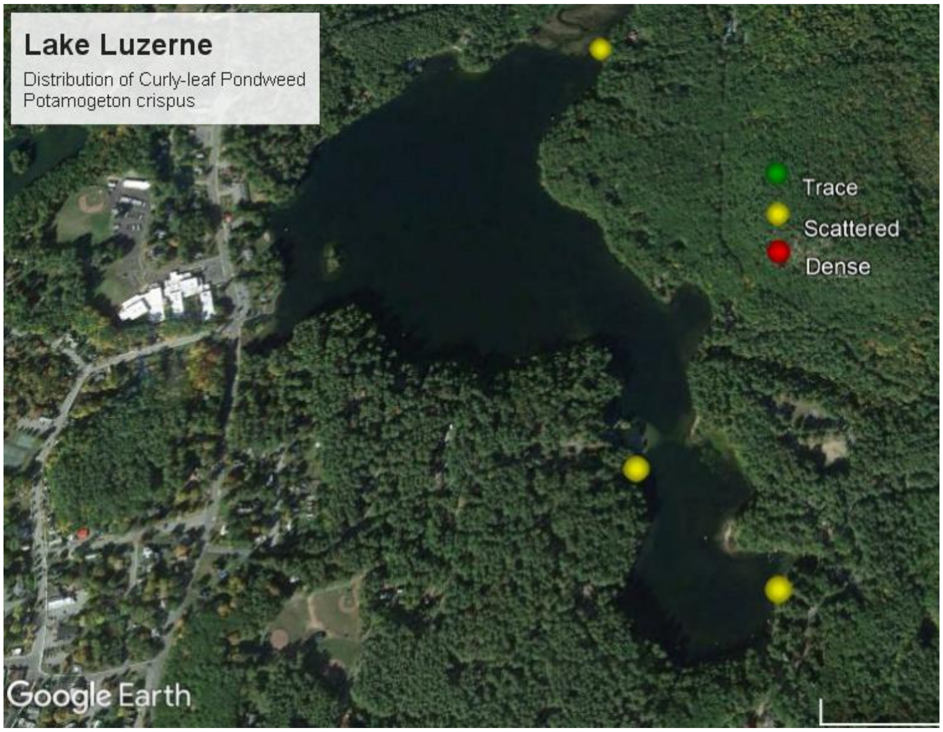

Lake Luzerne
Distribution of Southern Naiad
Najas guadalupensis
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Brittle Naiad
Najas minor
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Yellow Pondlily
Nuphar variegata
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of White Pondlily
Nymphaea odorata
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Broad-leaf Pondweed
Potamogeton amplifolius
Trace
Scattered
Dense
Google Earth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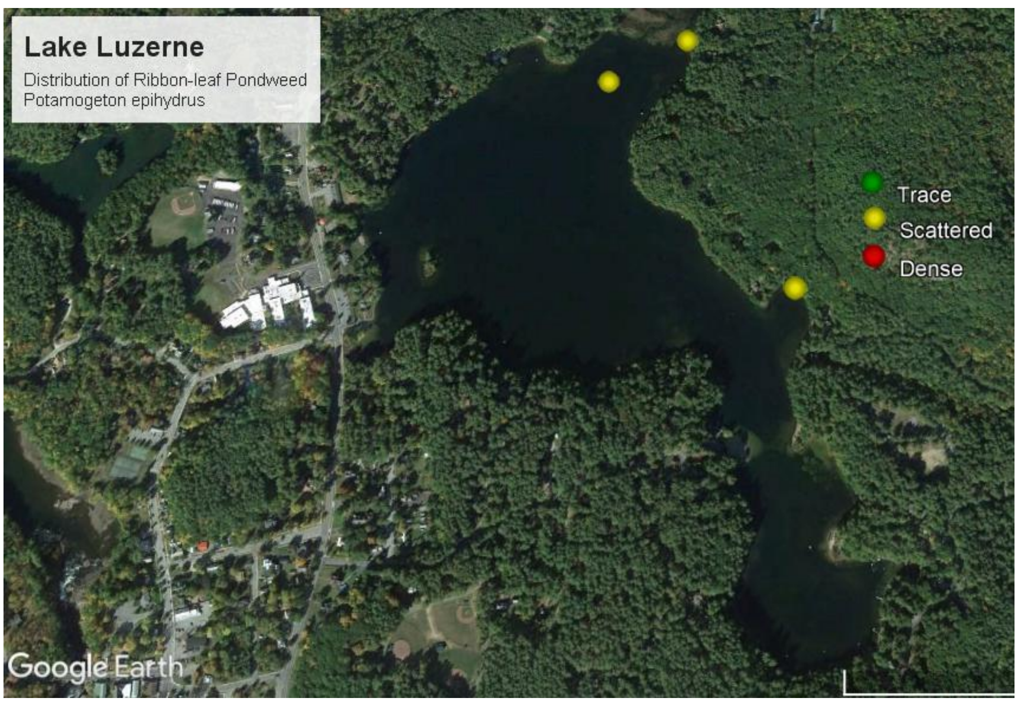
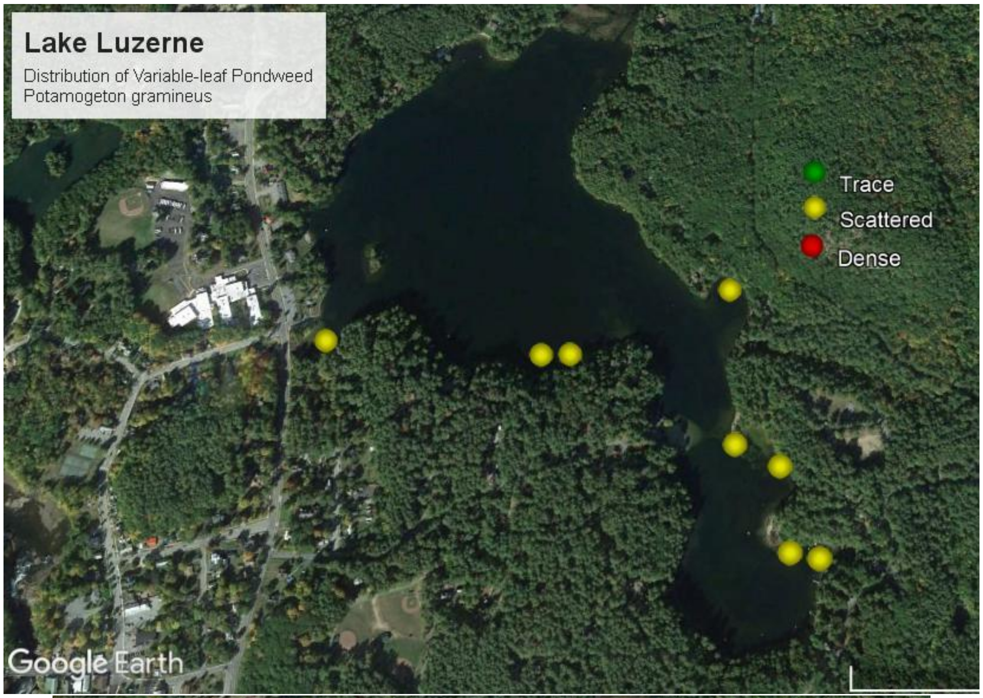
Distribution of Curly-leaf Pondweed
Potamogeton crispus
Trace
Scattered
Dense
Google Earth


Lake Luzerne
Distribution of Ribbon-leaf Pondweed
Potamogeton epihydrus
Trace
Scattered
Dense
Google Earth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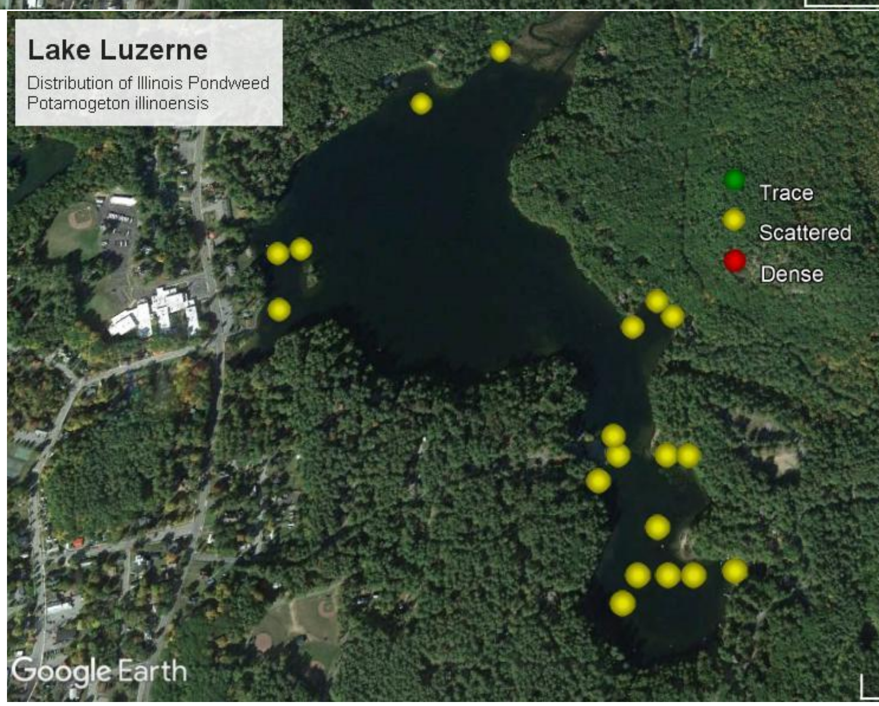
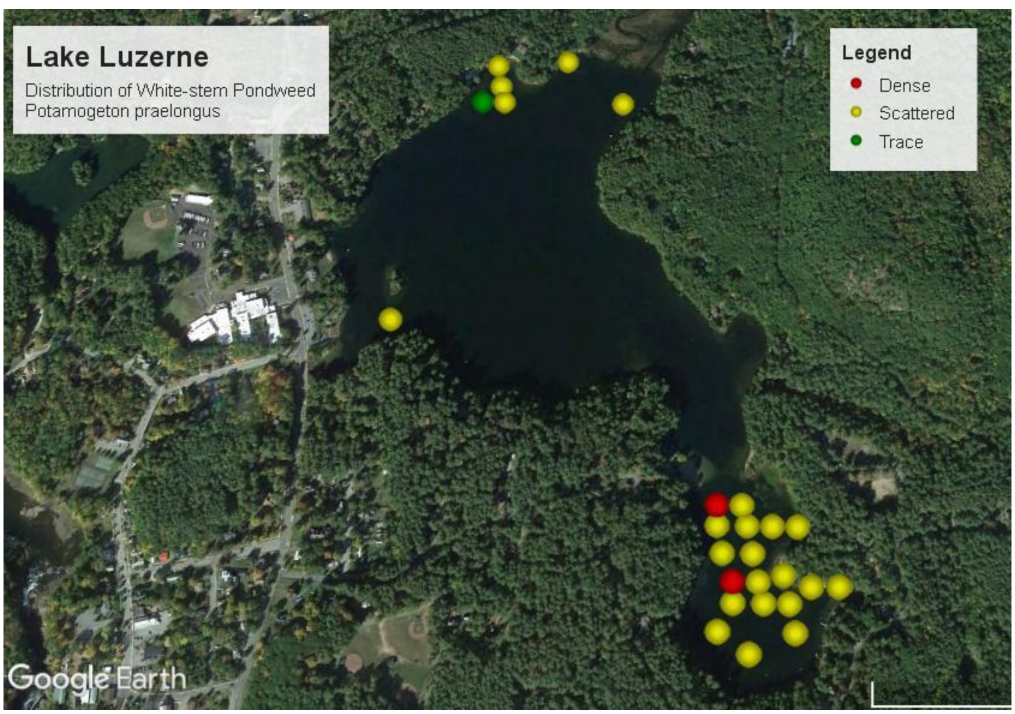
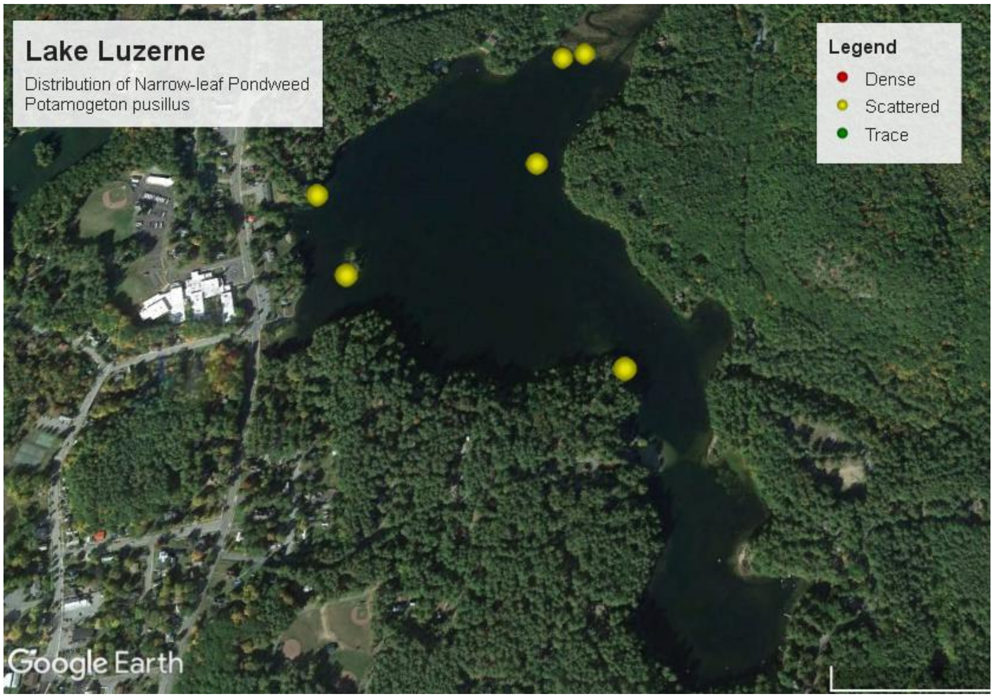
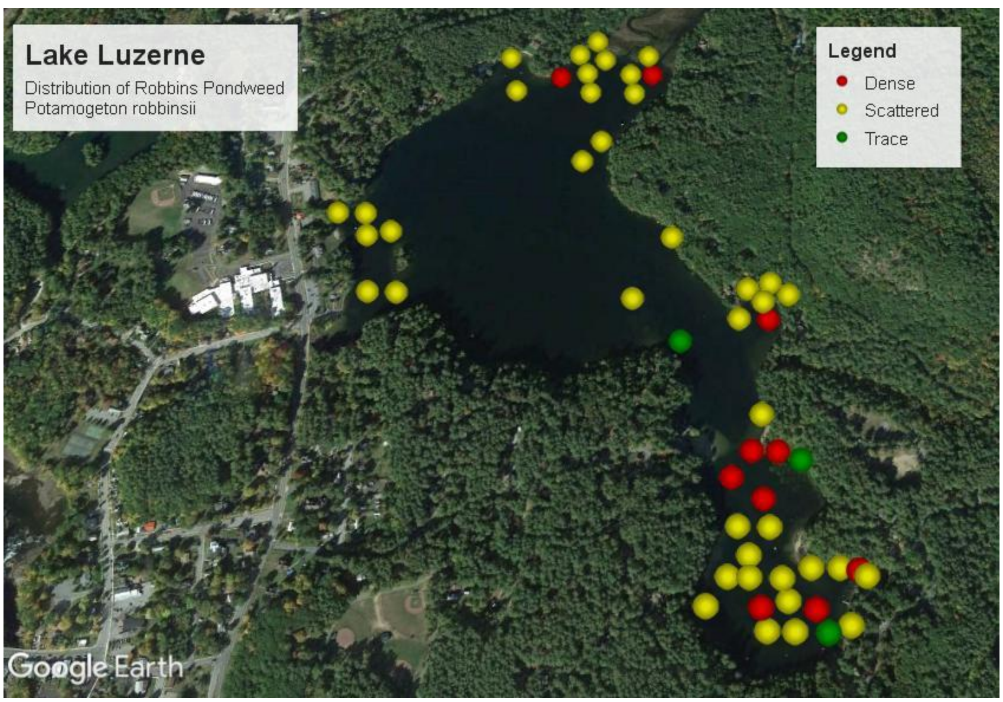
Distribution of Variable-leaf Pondweed
Potamogeton gramineus
Trace
Scattered
Dense
Google Earth

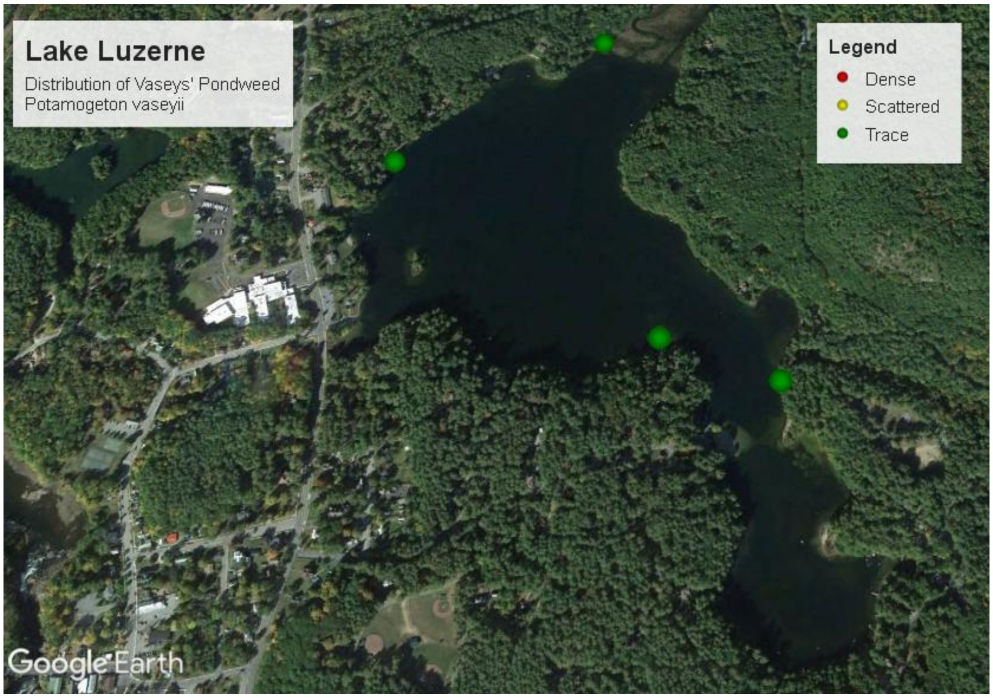

Lake Luzerne
Distribution of Illinois Pondweed
Potamogeton illinoensis
Trace
Scattered
Dense
Google Earth

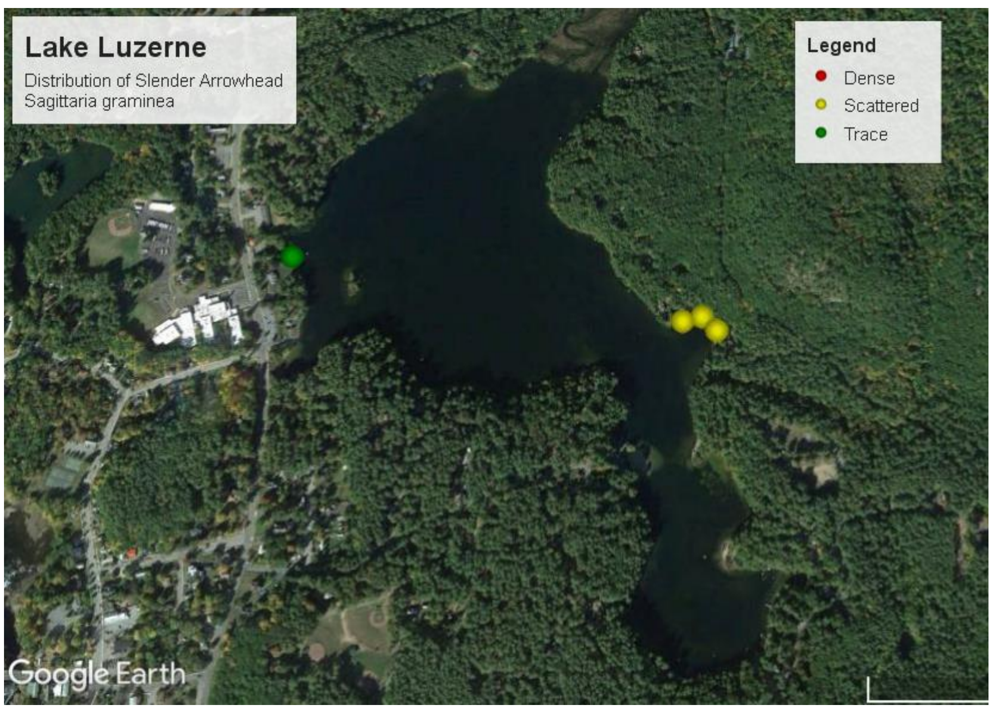

Lake Luzerne
Distribution of Heart-leaf Pondweed
Potamogeton perfoliatus
Legend
Dense
Scattered
Trace
Google Earth

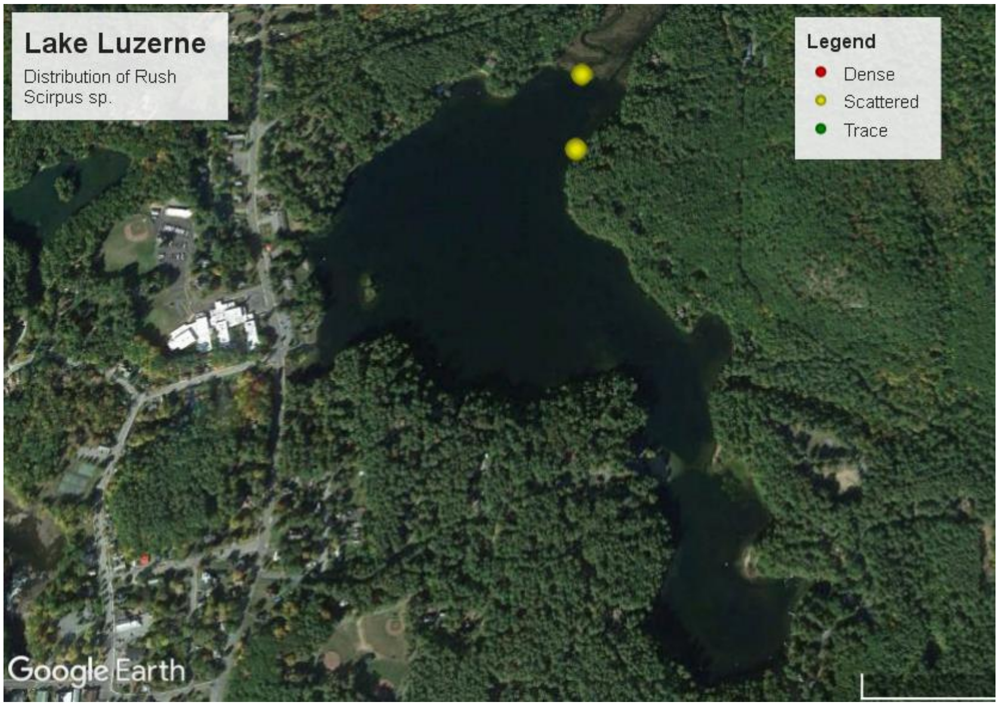

Lake Luzerne
Distribution of White-stem Pondweed
Potamogeton praelongus
Legend
Dense
Scattered
Trace
Google Earth

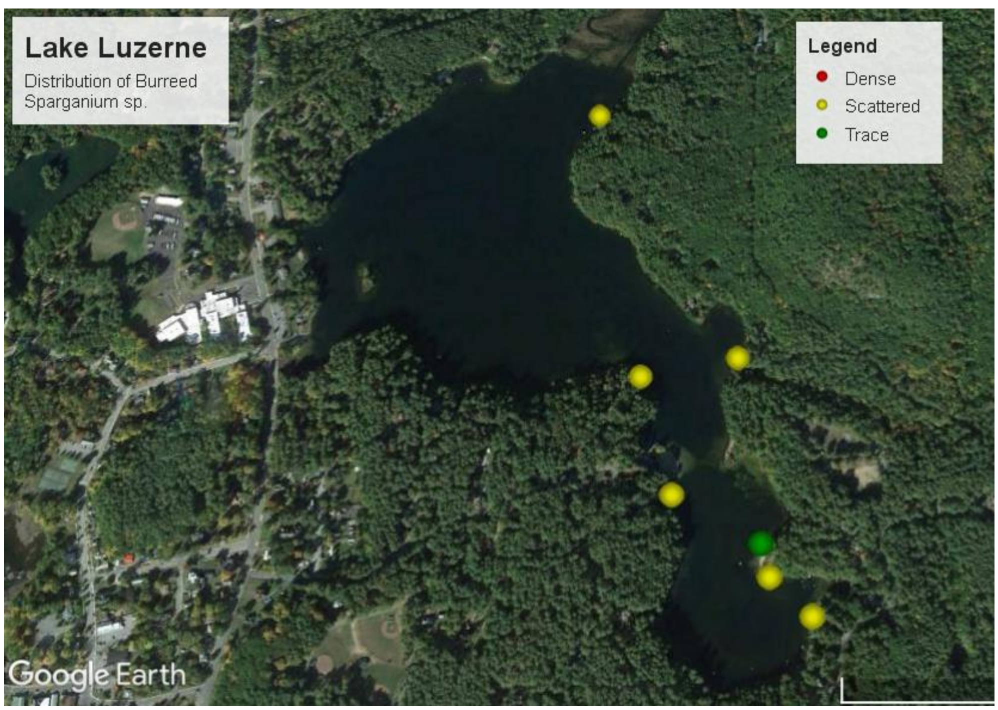

Lake Luzerne
Distribution of Narrow-leaf Pondweed
Potamogeton pusillus
Legend
Dense
Scattered
Trace
Google Earth

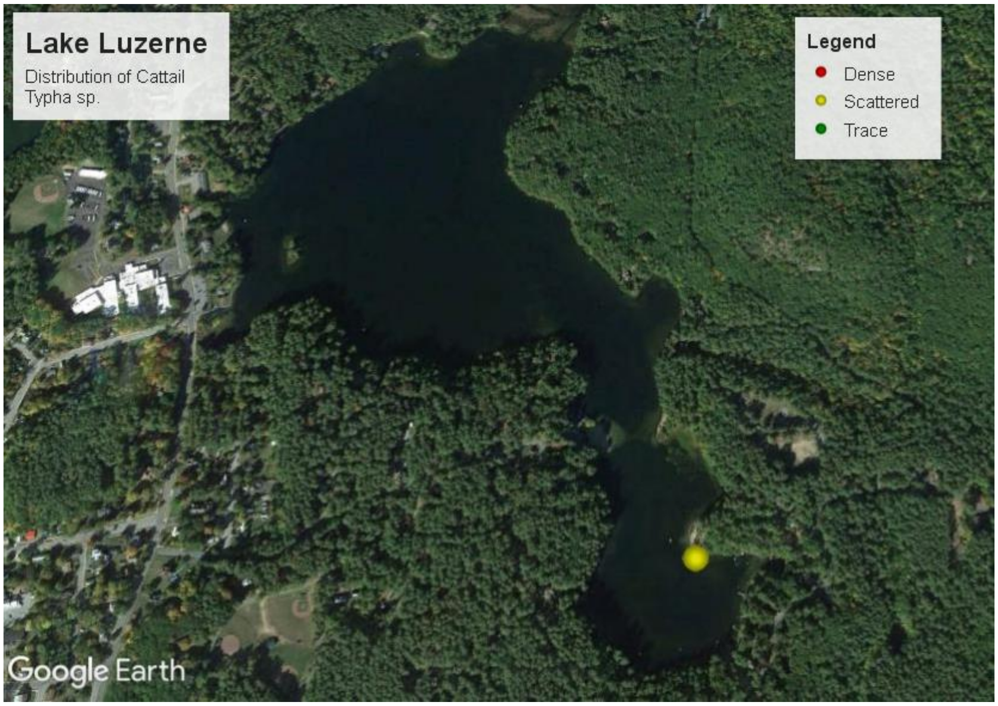

Lake Luzerne
Distribution of Robbins Pondweed
Potamogeton robbinsii
Legend
Dense
Scattered
Trace
Google Earth

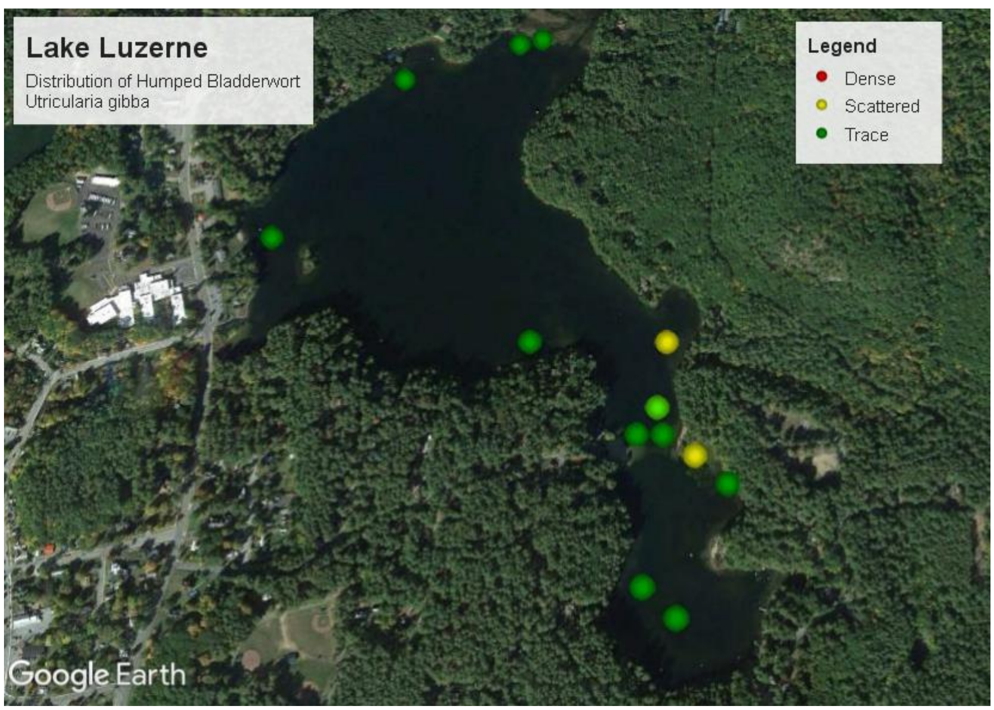

Lake Luzerne
Distribution of Vaseys' Pondweed
Potamogeton vaseyii
Legend
Dense
Scattered
Trace
Google Earth

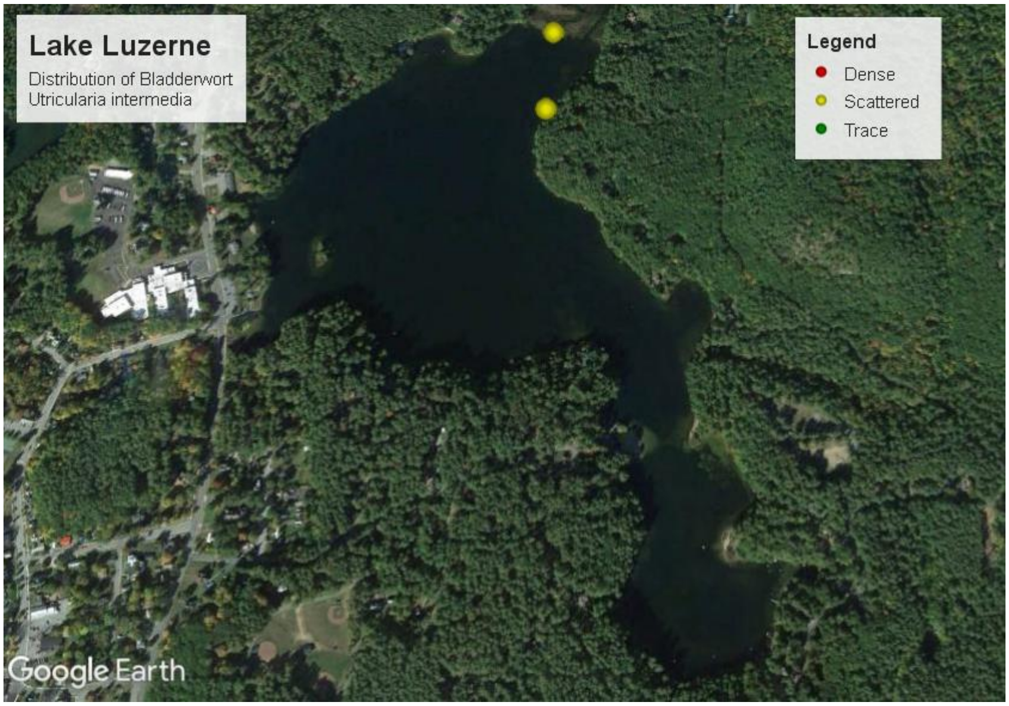

Lake Luzerne
Distribution of Slender Arrowhead
Sagittaria graminea
Legend
Dense
Scattered
Trace
Google Earth

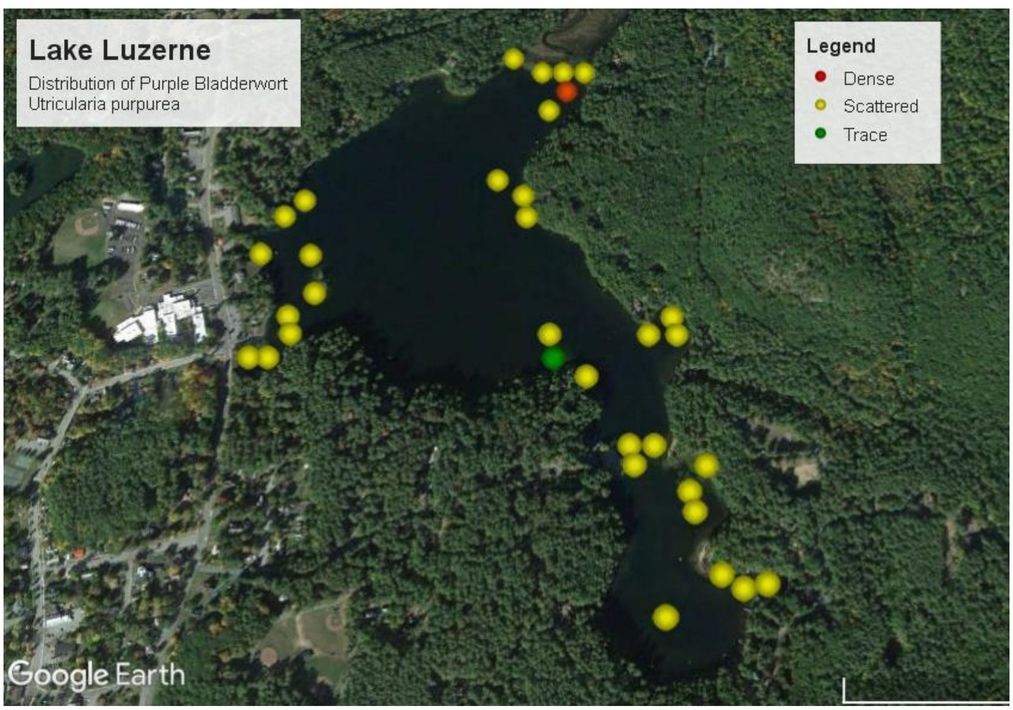

Lake Luzerne
Distribution of Rush
Scirpus sp.
Legend
Dense
Scattered
Trace
Google Earth

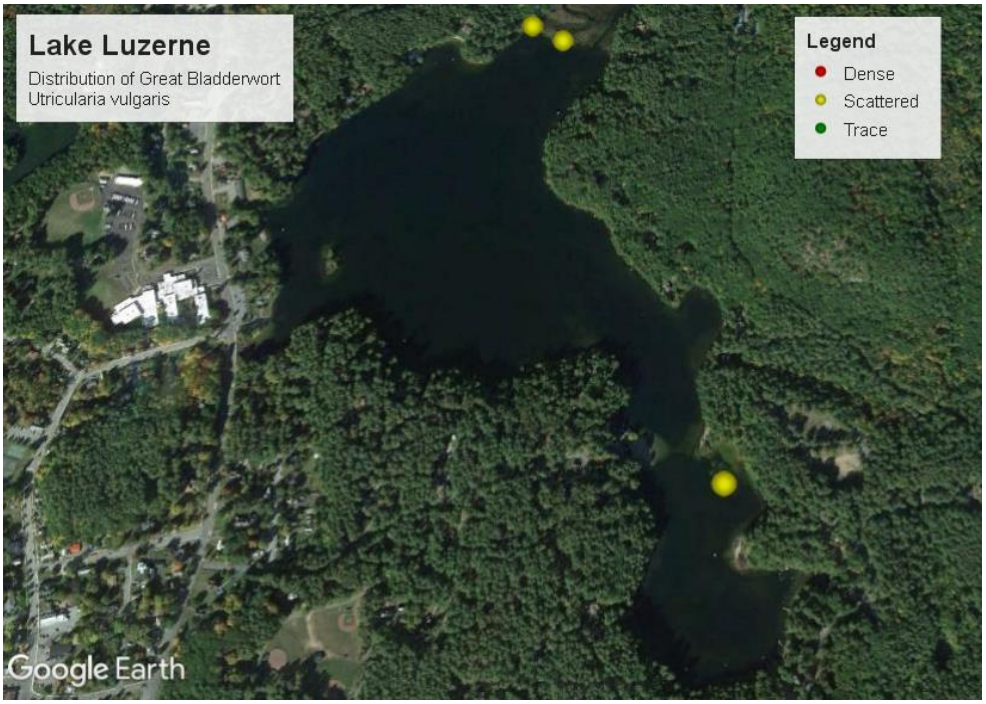

Lake Luzerne
Distribution of Burreed
Sparganium sp.
Legend
Dense
Scattered
Trace
Google Earth

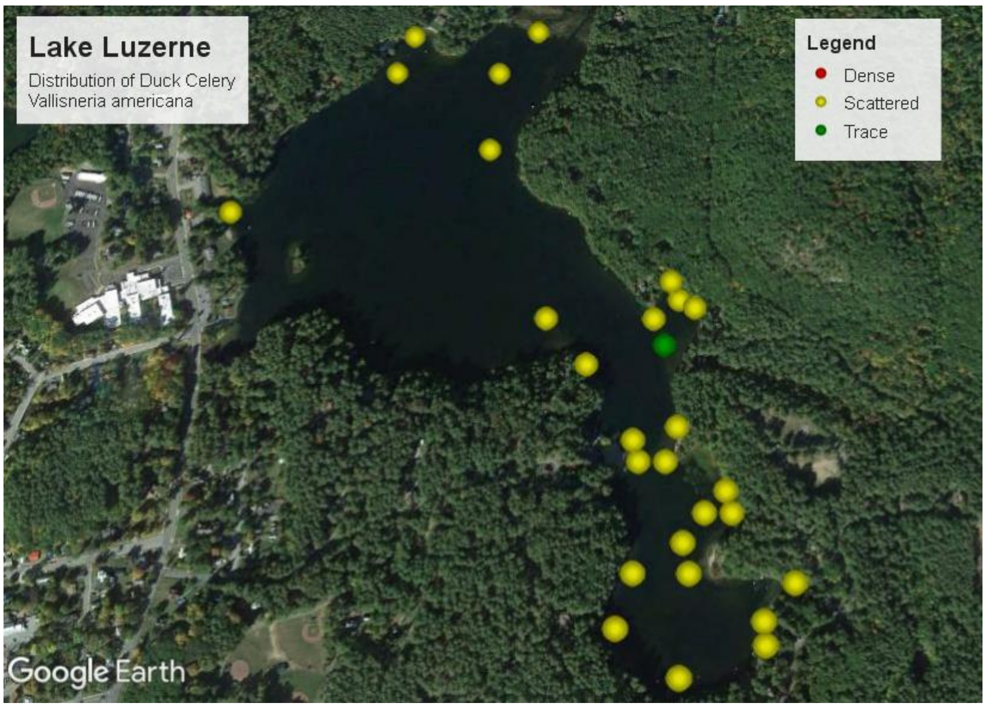

Lake Luzerne
Distribution of Cattail
Typha sp.
Legend
Dense
Scattered
Trace
Google Earth


Lake Luzerne
Distribution of Humped Bladderwort
Utricularia gibba
Legend
Dense
Scattered
Trace
Google Earth


Lake Luzerne
Distribution of Bladderwort
Utricularia intermedia
Legend
Dense
Scattered
Trace
Google Earth


Lake Luzerne
Distribution of Purple Bladderwort
Utricularia purpurea
Legend
Dense
Scattered
Trace
Google Earth


Lake Luzerne
Distribution of Great Bladderwort
Utricularia vulgaris
Legend
Dense
Scattered
Trace
Google Earth


Lake Luzerne
Distribution of Duck Celery
Vallisneria americana
Legend
Dense
Scattered
Trace
Google Earth

September 16, 2022

TO: Town of Lake Luzerne, Eugene Merlino, Supervisor
FROM: Amanda Mahaney, Senior Biologist
RE: 2022 Annual Aquatic Vegetation Survey Report of Lake Luzerne

INTRODUCTION

The Town of Lake Luzerne hired SOLitude Lake Management to perform a plant-specific survey of Alternate-flowered Watermilfoil (*Myriophyllum alterniflorum)* and Eurasian Watermilfoil (*Myriophyllum spicatum)* at Lake Luzerne.

Alternate-flowered watermilfoil is considered threatened in the state of NY. It was identified by Allied Biological, Inc. in 2011. The survey is a requirement of the NYSDEC permit application for the management of the invasive, non-native Eurasian Watermilfoil (*M. spicatum*).

METHODOLOGY

The survey was performed by a 14-foot sundance skiff on August 18th by two SOLitude biologists. The littoral zone was maneuvered in a z-pattern to cover all depths in order to capture the full extent of plant growth. A throw-rake and on-board sonar was utilized to identify plant growth where present. Rake tosses were performed at random throughout the littoral zone. At each rake toss, a GPS point was collected and the species that were collected on the rake and/or observed visually around the perimeter of the boat (whether native and/or non-native species) were cataloged in a Rite-in-the-Rain notebook.

Any samples that were unable to be identified on-site were sent to the University of Wisconsin for DNA analysis to confirm the species.

AQUATIC VEGETATION SURVEY RESULTS

During the survey, nineteen (19) aquatic species and macro-alga were identified (table 1). Eurasian watermilfoil (*M. spicatum*) was identified at trace to dense abundance throughout the littoral zone of the lake, but was more abundant on the western shoreline (Density & Distribution of Eurasian Watermilfoil). Several samples were brought back from the field and sent directly to the University of Wisconsin for DNA analysis. The watermilfoil (*Myriophyllum*) samples were determined to be variable-leaved watermilfoil, which is considered an invasive species in the state of New York. The DNA analysis report can be found following the survey report.

Native species that were identified during the survey included several pondweed species (*P. amplifolius, P. robbinsii, P. praelongus, P. illinoensis, P. gramineus. P. perfoliatus, & P. zosteriformis*), water marigold (*Bidens beckii*), water stargrass (*Z. dubia*), several floating-leaf species (*N.odorata, N. variegata, B. schreberi*), tapegrass (*V. americana*), waterweed (*Elodea spp.*), purple bladderwort (*U. purpurea*), and slender naiad (*N. flexilis*). Macro-alga was already observed during the survey. Maps depicting the distribution of the invasive watermilfoils and the native plant distribution can be found following the report.

COMMON NAME	SCIENTIFIC NAME
Eurasian Watermilfoil	*Myriophyllum spicatum*
Variable-leaved Watermilfoil	*Myriophyllum heterophyllum*
Water Marigold	*Bidens beckii*
Robbin's Pondweed	*Potamogeton robbinsii*
White-stemmed Pondweed	*Potamogeton praelongus*
Bassweed	*Potamogeton amplifolius*
Illinois Pondweed	*Potamogeton illinoensis*
Clasping-leaf Pondweed	*Potamogeton perfoliatus*
Grassy Pondweed	*Potamogeton gramineus*
Flat-stemmed Pondweed	*Potamogeton zosteriformis*
Water Stargrass	*Zosterella dubia*
Water Celery	*Vallisneria americana*
Common Waterweed	*Elodea spp.*
Purple Bladderwort	*Utricularia purpurea*
Watershield	*Brasenia schreberi*
White Waterlily	*Nymphaea odorata*
Yellow Waterlily	Nuphar variegata
Slender Naiad	*Najas flexilis*
Stonewort	*Nitella spp. (macro alga)*

CONCLUSION

The 2022 vegetation survey was performed to determine Eurasian watermilfoil management areas, as well as confirm presence of the rare alternate-flowered watermilfoil. Eurasian watermilfoil was identified, whereas alternate-flowered watermilfoil was not. Instead, a second invasive watermilfoil, variable watermilfoil (*M. heterophyllum*) was collected and identified via DNA analysis.

Lake Luzerne has a healthy assemblage of native aquatic plant species that provide great habitat for aquatic wildlife. However, the occurrence of Eurasian watermilfoil has already interrupted the native plant habitats with thick stands of this singular plant. With the identification of the second invasive watermilfoil, even more native habitat has the potential to be replaced.

It was a pleasure to perform the vegetation survey at Lake Luzerne for the Town of Lake Luzerne. Please feel free to contact your SOLitude project manager if you have any questions or concerns regarding this report.

University of Wisconsin Whitewater

PHYTOID

Certificate of Analysis

Client:
Amanda Mahaney
Solitude Lake Management
amahaney@solitudelake.com
888-480-5253

Service provider:
Nicholas Tippery, Ph.D.
Department of Biological Sciences
University of Wisconsin - Whitewater
800 W Main St
Whitewater, WI 53190
tipperyn@uww.edu
262-472-1061

11 September 2022

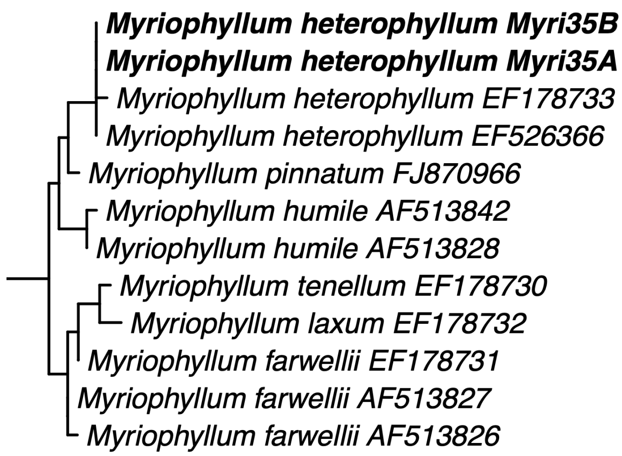
Summary—Two plant samples were tested from Lake Luzerne and identified using DNA sequence data. DNA was extracted from the plants and amplified using polymerase chain reaction (PCR). Sequences were obtained using the Sanger sequencing method, then aligned against available sequences for other species. Finally, the aligned sequences were subjected to a phylogenetic analysis that allows the new sequences to be viewed in the context of related sequences.

For this analysis, we sequenced the internal transcribed spacer (ITS) region. This region is part of the DNA that is located in the nucleus, and it has the potential to show if plants are hybrids.

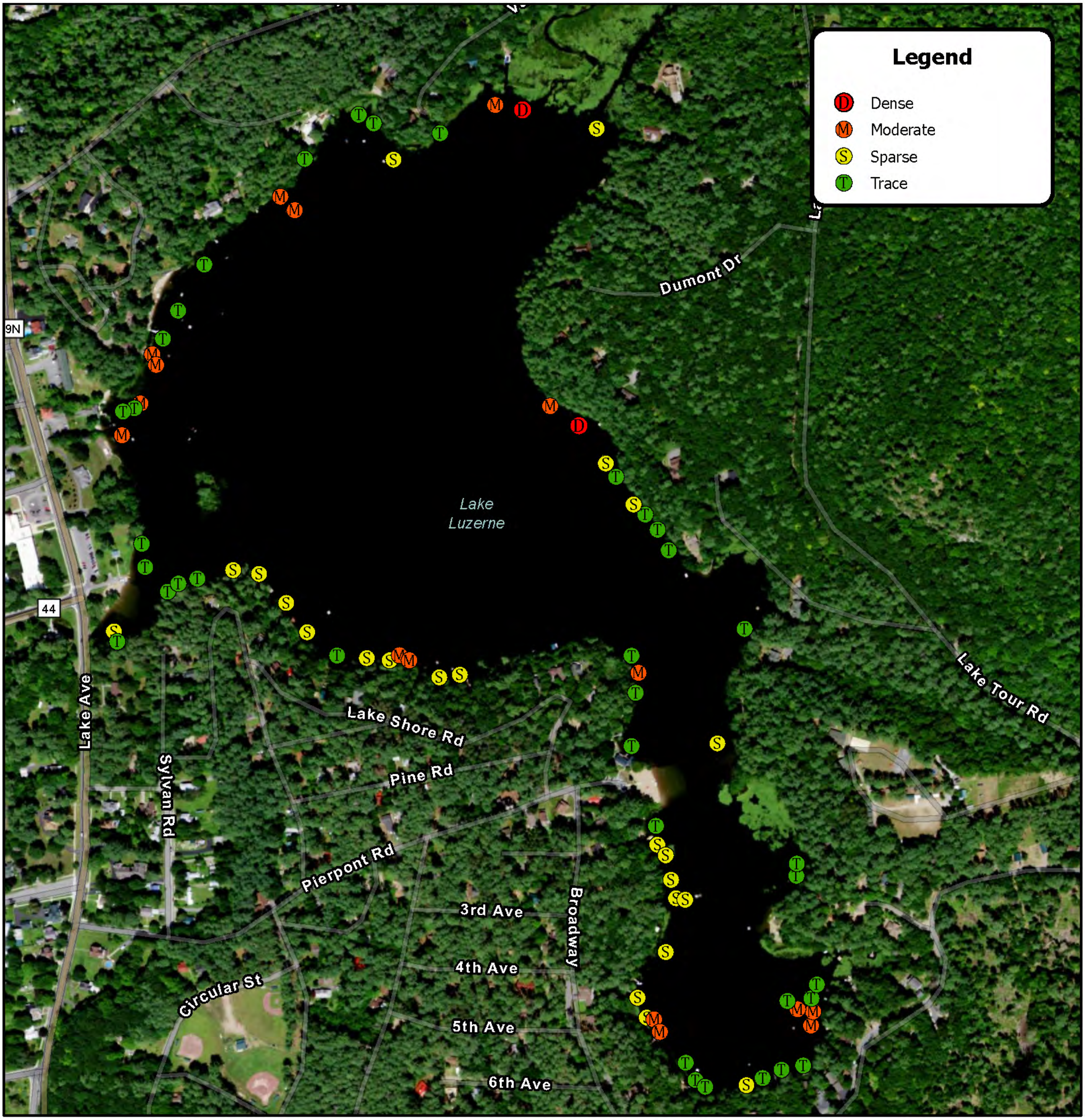
Samples—The following plant samples were analyzed:

Lab ID	Locality	Collector	Collector ID	Date
Myri35A	NY: Warren Co: Lake Luzerne	Amanda Mahaney	Collection 1	27-Aug-2022
Myri35B	NY: Warren Co: Lake Luzerne	Amanda Mahaney	Collection 2	27-Aug-2022

Results—The plants were determined to be *Myriophyllum heterophyllum*. The submitted plants (shown in boldface) had DNA that exactly matched other sequences for this species. There was no indication of hybridization. The phylogeny below shows the tested samples and their position relative to previously sequenced individuals of related species.



Density & Distribution of Eurasian Watermilfoil



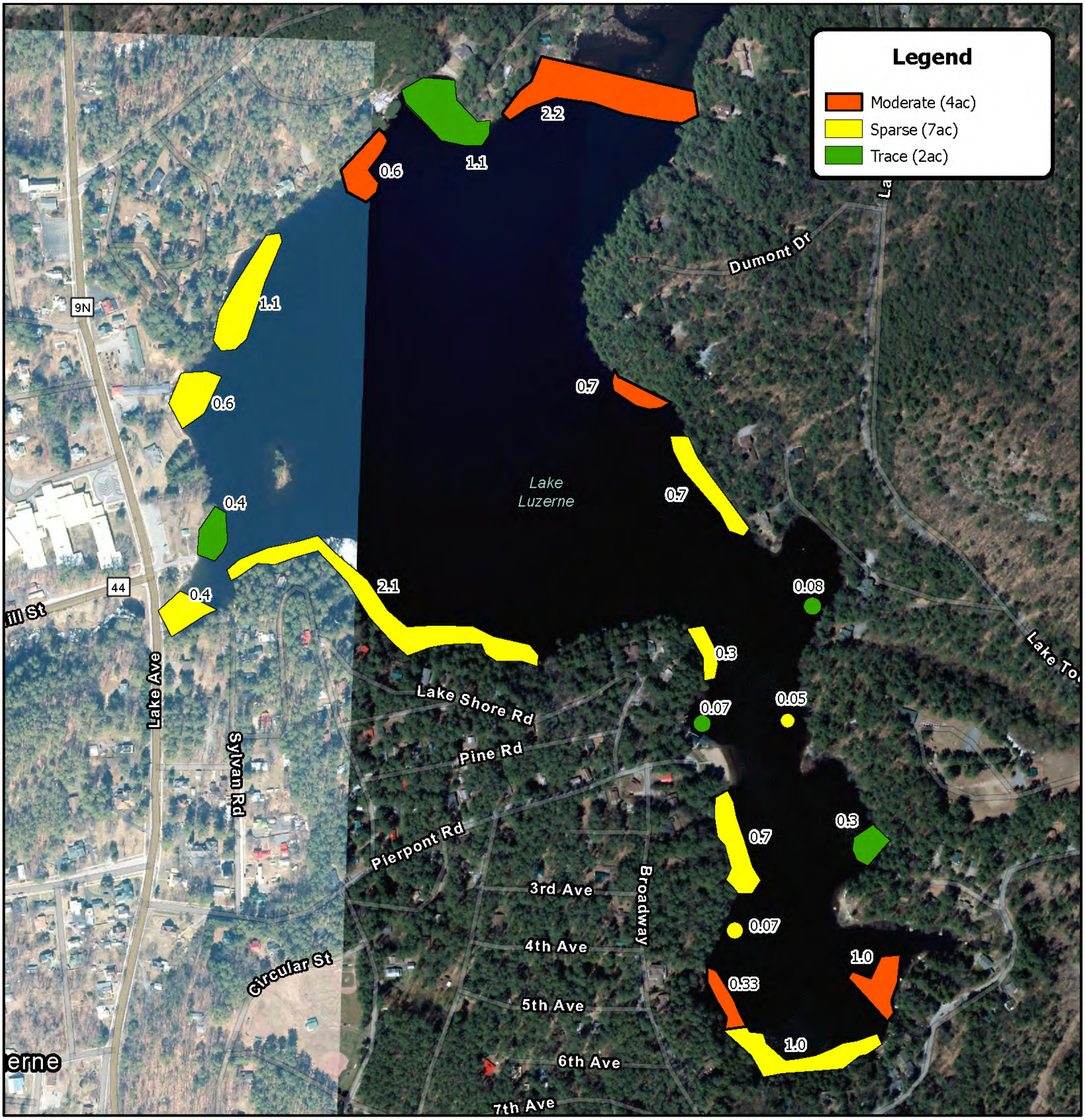
Lake Luzerne
Town of Lake Luzerne, NY

0 280 560 840 1,120 Feet

N

Map Date: 09/01/2022
Survey Date: 08/18/2022
Client: Town of Lake Luzerne

Density & Distribution of Eurasian Watermilfoil



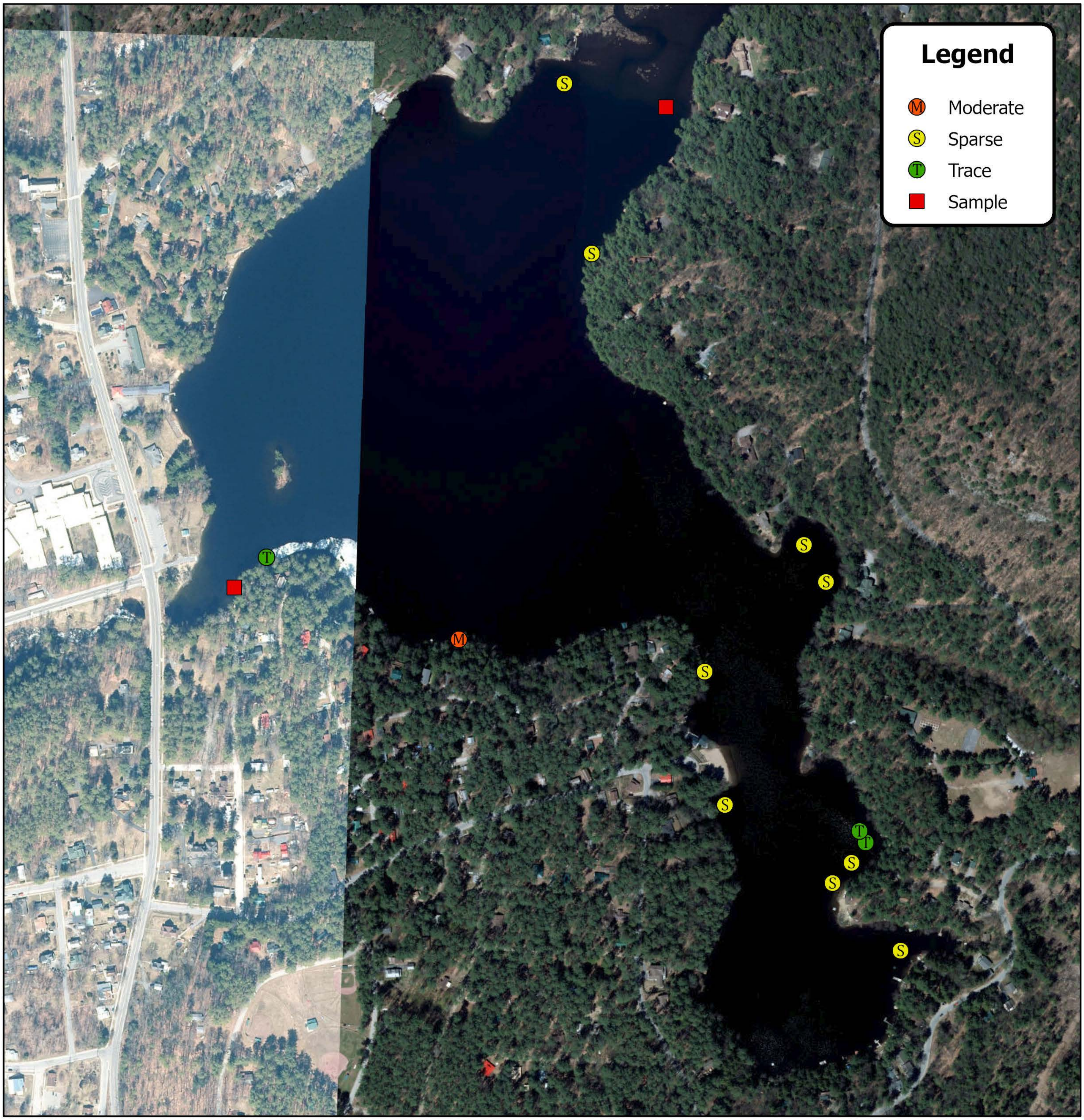
Lake Luzerne
Town of Lake Luzerne, NY

0 280 560 840 1,120 Feet

N

Map Date: 09/01/2022
Survey Date: 08/18/2022
Client: Town of Lake Luzerne

Density & Distribution of Variable Watermilfoil Species



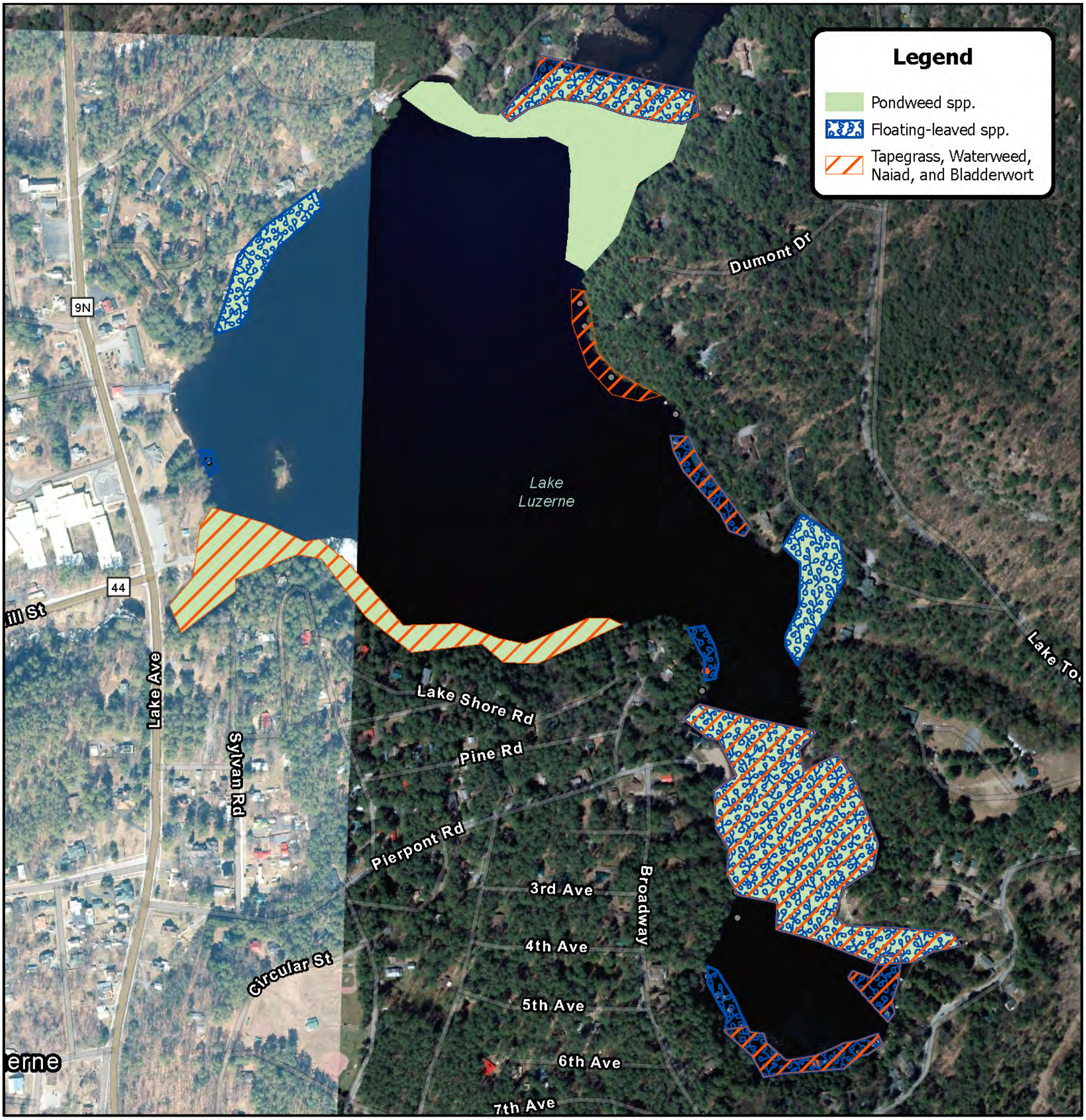
Lake Luzerne
Town of Lake Luzerne, NY

0 280 560 840 1,120 Feet

N

Map Date: 09/01/2022
Survey Date: 08/18/2022
Client: Town of Lake Luzerne

Distribution of Native Aquatic Submersed & Floating Species



Lake Luzerne
Town of Lake Luzerne, NY

0 280 560 840 1,120 Feet

N

Map Date: 09/12/2022
Survey Date: 08/18/2022
Client: Town of Lake Luzerne

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

AQV (1/2022)

FOR DEC USE:
Application Number ____________
Water Body Name ____________
Date Received ____________
Fee Receipt Number ____________
Type of Application ____________
New ___ Previous # ____________
NYCDEP/APA/Other ____________

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC)
DIVISION OF MATERIALS MANAGEMENT - BUREAU OF PESTICIDES MANAGEMENT
APPLICATION FOR A PERMIT TO USE A PESTICIDE
FOR THE CONTROL OF AN AQUATIC PEST - TITLE 6 NYCRR PART 327/328/329
http://www.dec.ny.gov/chemical/8530.html

SUBMIT THE APPLICATION 3 MONTHS BEFORE THE PROPOSED TREATMENT
A CHECK OF $100 MUST ACCOMPANY THE PERMIT APPLICATION
REFER TO THE ATTACHED APPLICATION INSTRUCTIONS

1. PERMIT APPLICANT INFORMATION

Name of Permit Applicant/Association/Agency: Town of Lake Luzerne		
Name of Authorized Person signing the Application: (if on behalf of an Association/Organization) Gene Merlino, Supervisor		
Mailing Address 539 Lake Avenue		
City: Lake Luzerne	State: NY	Zip Code: 12846
Telephone Number: 518-696-2711	Email: supervisorlakeluzerne	Website: townoflakeluzerne.com
The Permit Applicant is a (check appropriate):		
Riparian Owner: X X	Lessee:	Association of Riparian Owners:
If the Permit Applicant is an Association of Riparian Owners/Lessees, a copy of the Board of Directors resolution in support of the proposed pesticide application must be attached		
Other: (please explain) Riparian owners are residents of the Town, which is also a riparian owner		

2. PESTICIDE APPLICATOR INFORMATION

Name of Pesticide Business/Agency performing application (if applicable): Solitude Lake Management			
Business/ Agency Registration Number: 17886	Telephone Number: 908-310-8775	Contact: Glenn Sullivan	
Business Mailing Address: 7256 Rt. 9W			
City: Catskill	State: NY	Zip Code: 12414	Email: gsullivan@solitudelake.com
Name of Certified Applicator(s) performing application: TBD - see attached list			
Certified Applicator(s) Identification Number: TBD	If certified in Category 11 (Aerial) did the applicator make pesticide recommendations? Circle one: Yes No		
Business Address: (if different than Mailing Address)			
City:	State:	Zip Code:	Telephone Number:

3. PERMIT HISTORY		
Have you previously been issued an aquatic permit for this water body?	Yes ✓	No ☐
If Yes, provide the prior permit number(s): 5-5232-00139		
Is the application identical to one covered by a previous permit?	Yes ☐	No ✓
If Yes, provide the prior permit number:		
Describe any other permitted projects, alternative pest management projects, or relevant studies concerning the water body? (attach separate documentation) Lake Luzerne is part of the CSLAP program, and 2021 sampling season results are available on the CSLAP website. A lakewide aquatic plant survey was conducted by Larry Eichler in 2021, and a plant survey specificvally of milfoiul species was conducted by Solitude Lake Management in 2022. Both survey reports are available upon request. The town has employed AquaLogic, and more recently AE Commerical Diving to manually harvest eurasian watermilfoil		

4. WATER BODY INFORMATION
(Read the AQV instructions and use the Mapping Tools as needed)

Name of water body: Lake Luzerne		DEC water classification (e.g. Class A, Class B): Class B	
Address or location of water body: Rt. 9n, Lake Ave		County where water body is located: Warren	
Town where water body is located: Lake Luzerne	Rare, Threatened or Endangered plants or animals present (RTE)?	Yes ☐	No ✓
Are fish present? Yes ✓ No ☐	Are fish stocked?	Yes ✓	No ☐

If fish are present, see the Instructions for AQV Section #4.

Are there any regulated freshwater or tidal wetlands associated with the proposed treated waters (including downstream if applicable)?	Yes ☐	No ✓
Do application sites include lands under the control of the DEC?	Yes ☐	No ✓
If Yes, please specify:		

Total water body size in acres: 99	Average depth in feet: 24	Latitude: Longitude: 43deg19'26"N, 73deg50'01"W

Water body uses (Check all that apply):

Swimming ✓	Irrigation ✓	Livestock watering ☐	Potable water uses ☐	Domestic water uses ☐	Fishing ✓
Other uses (list)					

5. A DETAILED MAP MUST BE INCLUDED WITH THIS APPLICATION

- The exact map scale size and average depths of the water body.
- The outline and average depths of the application site(s), or with all streams/treated sites/catch basins clearly identified.
- Inlets and outlets to the water body. (if the applicant can't control the outflow, also include the downstream watershed map information for Attachment D - Downstream Modeling)
- Location of known designated bathing sites, livestock watering sites, water intakes, public lands contiguous to the water body, public boat launches and any other features relevant to the application.
- Wetlands contiguous or downstream of the water body.

6. WATER BODY APPLICATION INFORMATION (Fill Out the Applicable Lettered Section)	
A. Whole or Partial Water Body Application:	
Total number of application sites:	7
Surface acres of each application site:	a-5.0, b-1.4, b2-1.4, c-15.4, c2-1.1, d-5.1, e-2.6
Total application area in surface acres:	32
Average depth of each application site:	a-3.8, b-12.5, b2-4.3, c-5.9, c2-3.4, d-9.7, e-9.0
Total number of acre feet:	209.9

B. Stream Application for Black Fly or Lamprey Control:	
Miles of streams treated:	Stream flow estimates in cubic feet per second (cfs):
C. Mosquito Larvaciding Application:	
Number of sites or catch basins:	Total acreage/sq ft:

7. PESTICIDE APPLICATION INFORMATION (A COMPLETE PESTICIDE LABEL MUST BE ATTACHED TO THE APPLICATION)	
Pesticide name:	ProcellaCOR EC
Pesticide active ingredient:	florpyrauxifen-benzyl
% Active Ingredient:	2.7%
Pesticide EPA Registration Number:	67690-80
Formulation:	liquid
Application rate: (e.g. gals/acre ft. or gals/surface acre)	0.049 gals/acft
Dosage rate: (e.g. ppm, ppb)	2 PDU's/acft or 3.86 ppb
Total number of applications: (including bump/split applications)	1
Approximate date(s) of application: (including bump/split applications)	May 15-June 30, 2023
Amount of pesticide needed per application:	10.4 gallons
Total amount of pesticide needed per calendar year:	10.4 gallons
Target pest: (scientific and common name)	Eurasian watermilfoil (Myriophyllum spicatum)
Method of application (e.g. sprayed on surface, bag dragged behind boat):	mixed with water on boat and injected below the lake surface
If the proposed application involves an aircraft, indicate FAA Number(s):	N/A

12. AFFIRMATION:

The applicant/applicator guarantees that they will employ the listed pesticides in conformance with all conditions of the permit and agrees to accept the following conditions as a prerequisite to the issuance of a permit: that the issuance of the permit is based on the accuracy of all statements presented by the applicant/applicator; that damage resulting from the inaccuracy of any computations, improper application of the pesticide, or legal responsibility for the representations made in obtaining approvals or releases, or the failure to obtain approvals or releases from the riparian owners/users likely to be affected is the sole responsibility of the applicant/applicator.

I hereby affirm under penalty of perjury that information on this form is true to the best of my knowledge and belief. False statements made herein are punishable as a Class "A" misdemeanor pursuant to Section 210.45 of the Penal Law.

Signature of Permit Applicant or Representative:	Title	Date:
Eugene J. Merlino	Town Supervisor	2/21/23
Signature of Certified Applicator:	**Title**	**Date:**
[illegible]	Proj. Mgr	2/23/23

13. NOTES

8. WATER USE RESTRICTIONS	
List all the applicable water use restrictions as stated on the label/SLN, in 6 NYCRR 327.6, or the applicable water quality standards.	
Swimming	No restriction
Irrigation	for this treatment all non-truf irrigation restricted to <1 ppb, no restriciton on turf irrigation
Livestock watering	<1ppb
Potable water uses	No restriction
Fishing	No restriction
Other	

9. OUTFLOW AND DOWNSTREAM MODELING		
Does this water body have an outlet?	Yes ✓	No ☐
If yes, can the applicant hold the water during and for the required water use restrictions after the application?	Yes ☐	No ✓

☐ **Check the box if the applicant proposes to hold the water for the required water use restrictions, fill out Attachment C, and describe how the water will be held.**

■ **Check the box if the applicant cannot hold the water for the required water use restrictions, see Attachment D, and complete the Downstream Modeling spreadsheet.**

10. RIPARIAN OWNER/USER NOTIFICATIONS

If there is more than one riparian owner, or vested riparian users, these riparian owners and users must be notified in writing of the application and the water use restrictions, and their right to object. (See Attachment A - Sample Riparian Letter) If there will be outflow of treated waters through lands owned by other than the sole water body riparian owner, they too must be notified. (See Attachment D - Downstream Modeling)

11. CERTIFICATION OF NOTIFICATION OF RIPARIAN OWNERS AND USERS

The applicant must complete and sign the Certification of Notification of Riparian Owners and Users below. A copy of the notification letter and a list of riparian owners/users to whom the notification letter was sent must accompany this application. Check all appropriate statements:

✓	All owners of real property abutting the body of water proposed to be treated pursuant to this application, a list of whom is attached to this application, have been notified by letter of the proposed pesticide permit. This list includes property owners abutting the outflow from this body of water, if the water is not to be held in the treated water body for the period of time during which use of water is restricted. Such letters were mailed or personally delivered on 2/18/23. A copy of the letter is attached.
☐	A review of the appropriate real property tax records indicates that no person other than the applicant owns any real property abutting the water body proposed to be treated.
☐	A person(s), not owning abutting real property, possesses vested legal right to use the water body proposed to be treated. All such persons, and the nature of their right to use of the water proposed to be treated is attached. Such letters were mailed or personally delivered on __/__/__. A copy of the letter is attached.
☐	To my knowledge, no person other than the applicant possesses any vested legal right to use the water body treated pursuant to this application.

Name: Eugene Merlino	If Applicant is not an individual, include the title of signatory: Town Supervisor
Signature: Eugene J Merlino	Date: 2/21/23

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Aquatic Pesticide Downstream Modeling

Version: January 2016

Procedure

STEP 1: Enter relevant information on worksheets Title and Model
STEP 2: Identify nearby USGS Gage
STEP 3: Determine watershed area and 7Q10 for selected USGS gage
STEP 4: Identify locations with significant tributary inflow
STEP 5: Determine distance and slope between locations identified
STEP 6: Determine watershed area for locations identified

For more detailed information and instructions see the HELP worksheet

Purpose:

The purpose of this spreadsheet is to estimate the distance downstream required for the notification of riparian owners/users of pesticide water use restrictions. This spreadsheet can be used to estimate concentrations of substance and travel time to a given point in flowing waters. It is assumed that the only major processing is dilution and a first order decay (if applicable). Dilution is estimated using the area of the target watershed or point on a stream and a corresponding United States Geological Survey (USGS) reference gage from which the flow of the watershed in question may be obtained by correlating it to the flow and corresponding area from the reference gage. It is suggested that reference gage information be obtained using gages operated and maintained by the USGS. Half-life is incorporated in the model when choosing an active ingrdient from the drop down.

1) Treated Waterbody Name:	Lake Luzerne
2) County:	Warren
3) Product Name:	ProcellaCOR EC
4) Active Ingredient:	florpyrauxifen benzyl
5) Applicator:	Solitude Lake Management
6) Today's Date:	2/3/2023
7) Total Waterbody Size (acres):	99
8) Total proposed Treated Surface Area (acres)	32
9) Total Proposed Volume to be Treated (acre/feet):	209.92
10) Name of Outlet Stream:	Hudson River
11) Date of Application:	May 15 - June 30, 2023

12) Provide a brief description of the location, target concentration and scope of the proposed pesticide applications within the waterbody, and justification why the specific application modeled will result in the outflow of pesticide concentrations that flow the greatest distance downstream:

This dilution model is based on the application rate of 2 PDU's/acft 3.86 ppb) for section D, nearest the lake outlet.

Key:
Input
Calculation / Carry Over
Drop Down

Lists	Active Ingredient	Half-life (days)
No	Triclopyr	7.5
	2,4 D	48
	Endothall	36
	Imazamox	50
	Glyphosate	14
	Hydrogen Peroxide	0.04
	Copper Sulfate	1
	Flumioxazin	3

DIRECTIONS:

1) Treated Waterbody Name: Name of waterbody being treated needs to be identified.
2) County: The name of the county in which the waterbody is in needs to be provided.
3) Product Name: Name of product needs to be provided, e.g., Navigate.

4) Active Ingredient: The active ingredient as listed on the product label needs to be identified. Common active ingredients are provided as a drop down selection. If the active ingredient of your product is not listed simply type over and name in the cell. For example, Navigate lists 2,4 D as the active ingredient, 2,4, D should be selected from the drop down in this case. Selecting the active ingredient will incorporate the appropriate half-life into the modeling.
5) Applicator: The name of the applicator or the company applying the pesticide needs to be listed.
6) Today's Date: The date in which this file is being filled out.
7) Total Waterbody Size: The surface area in acres needs to be provided.

8)Total proposed Treated Surface Area: The total proposed area to be treated in a single application needs to be provided in acres. Multiple applications over the season will require additional models to be filled out.

9) Total Proposed Volume to be Treated: Similar to above, the total volume of each application needs to be provided in acre/feet. Multiple applications over the season will require additional models to be filled out.

*Provide the total proposed treated surface area and volume within the waterbody that will result in the outflow of pesticide concentrations that will flow the greatest distance downstream.

10) Name of Outlet Stream: The name of the stream immediately downstream on the ponded waterbody receiving treatment needs to be identified.

11) Date of Application: The date for this specific application needs to be provided. If there are multiple applications each one will need to be evaluated.
12) Description: Any additional or relevant information as identified in this cell should be provided.

Key:
Input
Calculation/Carry Over

Parameter	Value
1) Application Rate:	2
2) Units for Application rate:	PDUs
3) Concentration of Active Ingredient at Dosage Rate (ppb):	3.86
4) Starting Concentration of Product Being Modeled (ppb):	3.860
5) Reference USGS Gage Number:	1318500
6) Reference USGS Gage 7Q10 (cfs):	789.0
7) Reference USGS Gage Watershed Area (sq. mi):	1664.0
8) Watershed Area at Point of Application / Outlet (sq. mi):	25.50
9) Target Concentration for No Notification (ppb):	1.0

----> Check ---->

Whole Lake Dilution

The starting concentration will be the concentration of the active ingredient at the dosage rate. Only use the calculations to the right for partial lake applications. This will factor in whole lake dilution in determining the pesticide concentration at the outlet, with some limitations:

- Sum of the application areas is less than 1/2 of the entire lake surface area,
- Significant portion of that 1/2 area is located in the upper half of the waterbody away from the outlet,

If a significant portion of the partial lake application occurs in the lower half of the lake near the outlet, or if the sum of the application areas exceeds 1/2 of the entire lake area, then the modeling will start with the dosage rate concentration of the active ingredient.

Depending on the location of the pesticide application, for irregularly shaped lakes, or for lakes where the outlet is near the inlet, the allowance of whole lake dilution will be determined by DEC staff.

Lake Outlet Concentration for **Mass Application** Rate			Lake Outlet Concentration for a **Volume Application** Rate		
14) Mass to be Added:		lbs	18) Volume to be Added:	10.40	gal
15) Ratio of Active Ingredient:		lbs of active ingredient/lbs of product	19) Ratio of Active Ingredient:	0.210	lbs of active product/gallon
Total lbs of active product to be added:		lbs	Total lbs of active product to be added:	2.2	lbs
16) Total Area of Lake:		acres	20) Total Area of Lake:	99.0	acres
17) Average Depth of Lake:		ft	21) Average Depth of Lake:	24.0	ft
Total Volume of Lake:	0.0	ft3	Total Volume of Lake:	103498560	ft3
Lake Concentration:	#DIV/0!	lbs/ft3	Lake Concentration:	0.000	lbs/ft3
Lake Concentration:	#DIV/0!	ppm	Lake Concentration:	0.000	mg/L
Lake Concentration:	#DIV/0!	ppb	Lake Concentration:	0.338	ppb

Segment/Dilution Number	Starting Values	1	2	3	4	5	6	7	9	10	11
10) Name	Lake outlet	Hudson River confluence									
11) Watershed Area at Point Downstream (sq. mi):	25.50	1660.0									
12) Stream Slope (ft/ft):	0.0704	0.0163									
13) Distance from Outlet (mi):	0.001	0.32									
OUTPUT											
Time of Travel (days):	0.00	0.01	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total Flow 7Q10 (cfs):	12.09	787.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stream Concentration (ppb):	3.86000	0.05930	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Notification Distance:	0.24	miles

DIRECTIONS:
You may be requested to provide supporting documentation including maps, on how you arrived at the values

1) Application Rate: The application rate should be rate that the applicant has indicated that they will be using out of the container based on the manufacturer's label.
2) Units of Application Rate: An example of units for the application rate are gal of product per acre foot. The units need to be provided for clarification.
3) Concentration of Active Ingredient at Application Rate: The concentration of the active ingredient should correspond to the target dosage rate in the water column for the product based on the manufacturer's label. Note: the spreadsheet assumes a concentration at the dosage rate is given in parts per billion (ppb).
4) Starting Concentration of Product Being Modeled: The starting concentration of the product being modeled should be the concentration corresponding to the dosage rate unless the applicator can apply whole lake dilution. We are looking for the pounds of the acid equivalent (ae) of the active ingredient per gallon or pound of the pesticide product that is the ionized pesticidal form of the active ingredient. This is usually found on the front page of the pesticide label in the ingredient statement. (e.g. 4.23 lbs. ae per gallon). For some products, it is found in the directions for use when determining the application rate as pounds of ae. For some products, like copper sulfate, where you are determining the dosage rate based on volume or acre/feet, you can calculate the starting concentration at the outlet by extrapolating the ppb per acre/foot to the whole water body volume of acre/feet.
5) Reference Gage Number: Please use the websites below, or any other USGS gages to identify the closest gage to your waterbody and enter the gage number.
*The reference gage ideally would be a gage on the receiving watershed. When this is not available a gage on a nearby water with similar watershed characteristics (eg. topography, soil type, land use, rainfall, etc) can be used. Gages are operated and maintained by the (USGS).
*Historical gages can be found in the USGS bulletin 74, a pdf document providing historical gage information and location:
http://archive.org/details/usgswaterresourcesnewyork-nydec_bull_74
*A webpage containing current operating gages and locations can be found at:
http://waterdata.usgs.gov/ny/nwis/rt
6) Reference Gage Flow 7Q10: The 7Q10 needs to be entered in cubic feet per second.
*USGS Bulletin 74 provides the minimum average 7-day 10 year flows for 926 stream sites in New York, excluding New York City and Long Island. The minimum average 7 day 10 year (MA7CD10 or 7Q10) flow has historically been used by the DEC for conducting water quality based effluent limit calculations for determining effluent limits for state pollution control discharge elimination system (SPDES) permits.
*The reference gage 7Q10 can be determined by the following means: USGS bulletin 74 provides the 7Q10 (link above), or use the USGS WaterWatch websites toolkit. Streamgage statistics needs to be selected then enter the streamgage number and select annual 7-day lowest flow. Results will be presented in a probability table the flow with a probability of 10% (p10 in table) is the 7Q10. This website is:
http://waterwatch.usgs.gov/?m=real&r=ny
7) Reference Gage Watershed: All of the references above provide the watershed area for the reference streamgage.
8) Watershed Area at Point of Application/Outlet: The watershed area at a given location downstream needs to be entered in square miles.
*The watershed area at a point of interest can be determined using USGS streamstats:
http://water.usgs.gov/osw/streamstats/new_york.html
For detailed instructions on how to use streamstats please see the user guide located at:
http://water.usgs.gov/osw/streamstats/Version3UserInstructions-20150706(1).pdf
*A new watershed area should be determined for each location identified on map. Generally these can be added whenever a tributary enters the receiving waterbody. Alternatively, a user may select downstream locations at an easily identified feature, e.g., Mill Creek at Barracks Road. Entering this area into the spreadsheet estimates the additional stream flow added to the system by each additional watershed area. The additional watershed area will provide more to the dilution.
9) Target Concentration: The target concentration is any concentration of interest. This can be the pesticide water use restrictions on the label, the water quality standard as given in 6 NYCRR Part 703, a maximum contaminant level (MCL) as established by the Department of Health, a minimum concentration that is reportable or of interest, or it can be set at the detection limit. For target compounds that do not have a specific water quality standard a value of 50 ppb should be used as it is NYSDEC's water quality standard for unspecified organic contaminants.
10) Name: Enter the name of the point that corresponds to the information listed below it. The name can be of a tributary, or a feature, e.g., Intersection of Blue River and Route 9.
11) Watershed Area at Point Downstream: Area of watershed at a point of intersection (POI) downstream needs to be provided in square miles. See **Watershed Area at Point of Application / Outlet** above.
12) Stream Slope: Slope can be considered the average main channel slope determined from the streamstats basin characterization report. Alternatively, this can be determined through ArcGIS or Google Earth by determining the elevation between two points and divide that by the distance, as seen below:
Slope = Change in Elevation/Distance
13) Distance from outlet: Distance from the outlet can be determined using measurement tools on the web, e.g., Google Earth or Google Maps.

WHOLE LAKE DILUTION DIRECTIONS:

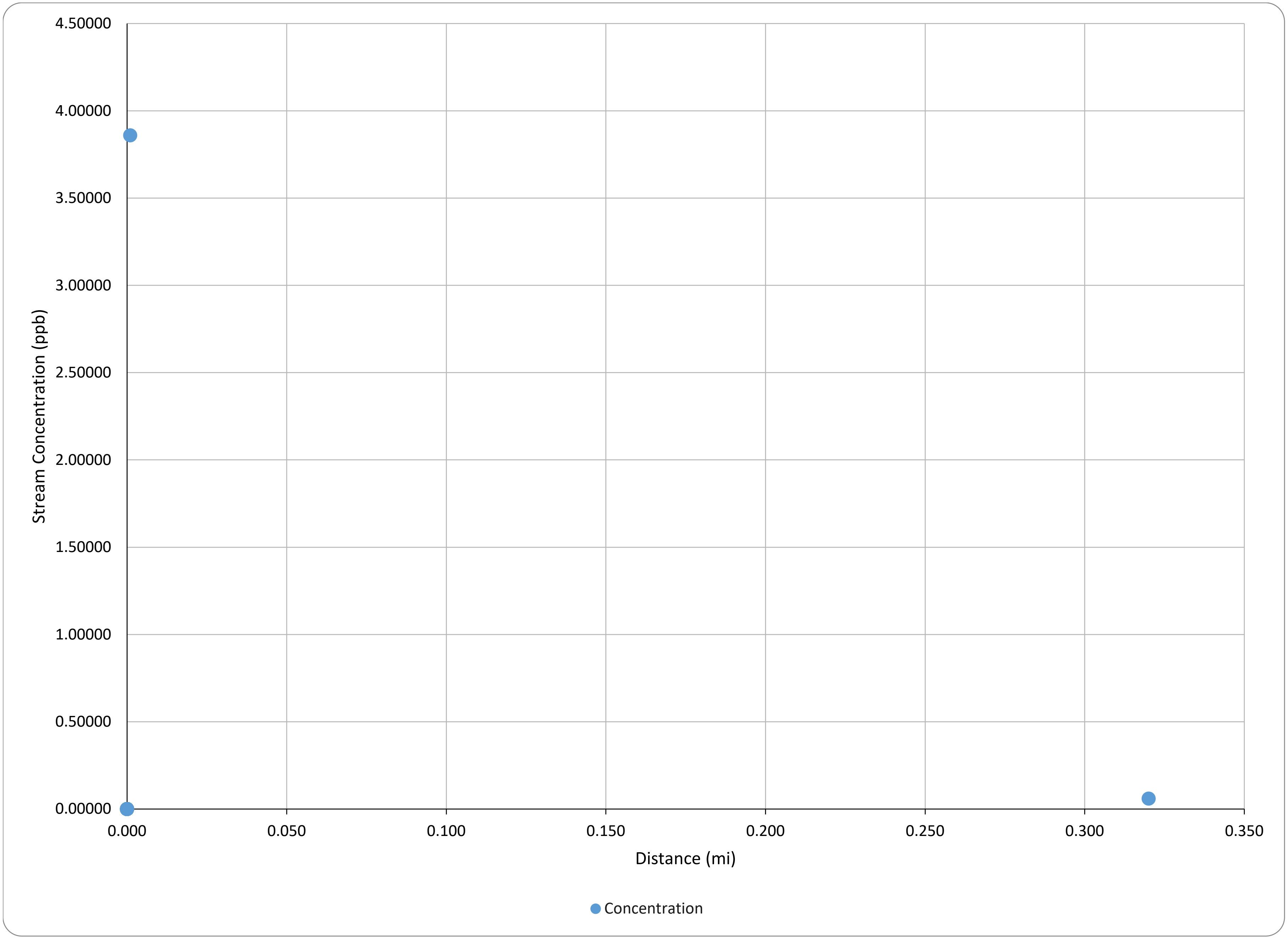
*Dilution: choose dilution calculation based on formulation type volume or mass.
14) Mass to be Added: For mass applications enter mass for the application to be added at any one time.
15) Ratio of Active Ingredient: Enter the ratio of pounds of active ingredient to pounds of product. This is usually found on the pesticide label in the ingredient statement.
16) Total Area of Lake: Enter the total surface area of the lake in acres.
17) Average Depth of Lake: Enter the average depth of the lake in feet.
18) Volume to be Added: For volume applications enter the volume to be added at any one time.
19) Ratio of Active Ingredient: Enter the ratio of pounds of active ingredient per gallon of product. This is usually found on the pesticide label in the ingredient statement. (e.g. 4.23 lbs. per gallon).
20) Total Area of Lake: Enter the total surface area of the lake in acres.
21) Average Depth of Lake: Enter the average depth of the lake in feet.

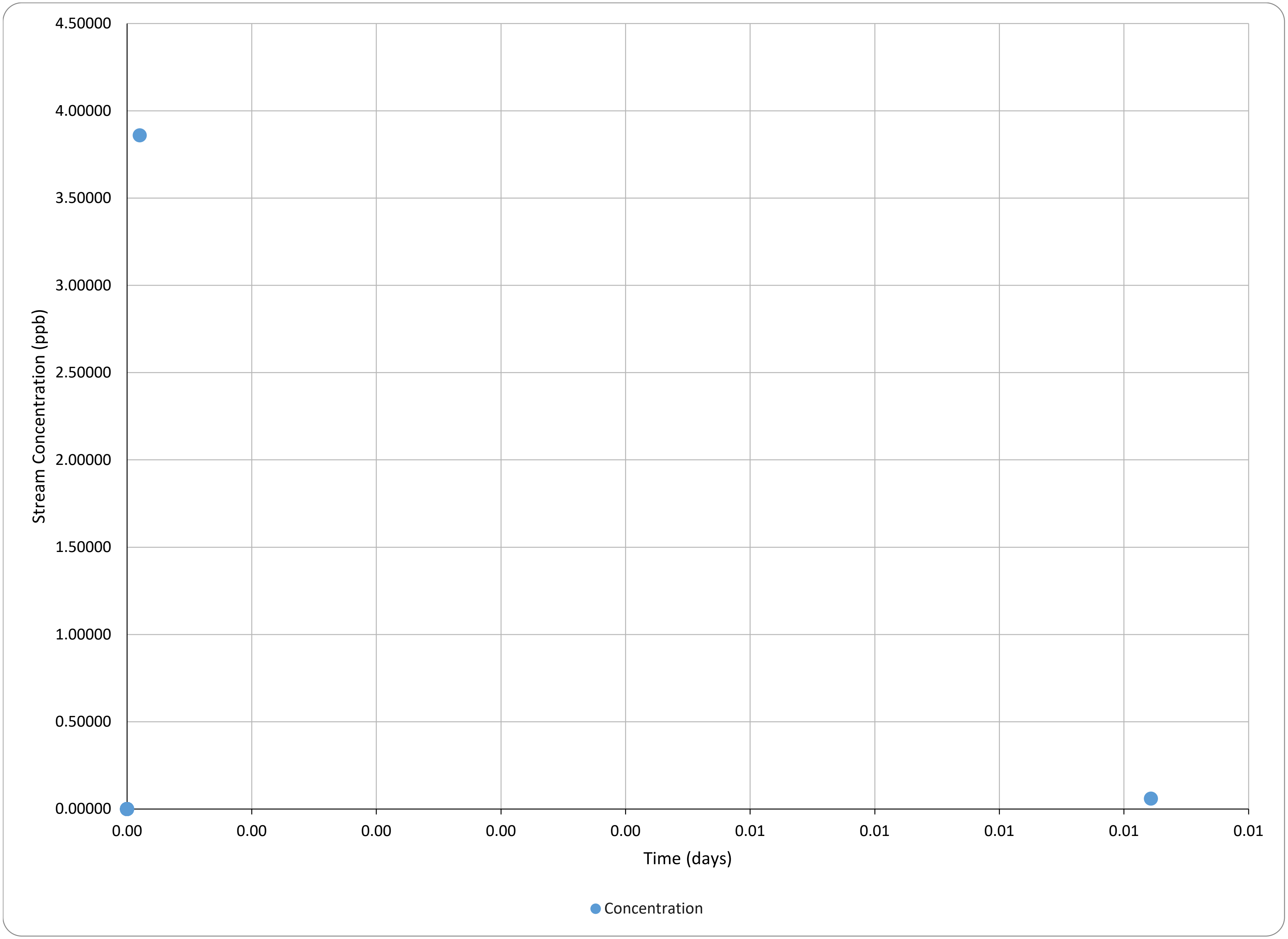
OUTPUT

Time of Travel: The time of travel is based on the flow and slope of the watershed. Below is the equation for estimating time of travel. The time of travel can be used to determine the distance downstream required for riparian owner/user notification when using products that have a time frame water use restriction by adding additional tributary watershed areas until the time of travel exceeds the time frame water use restriction.
Time of Travel = Distance / (0.38 X Flow^0.4 X Slope^0.2)
Total Flow 7Q10: The first point for this analysis is the starting point or the outlet. The outlet is defined as the outlet of the ponded waterbody being treated or the starting point from where downstream dilutions will occur. Other points are areas downstream of the starting point where a tributary enters the main stem of the stream in question, or some other point like the location of a known water supply intake or other water user. The flow at a POI is calculated as:
Flow at point = Reference Gage Flow x (Watershed Area at point/ Watershed Area at Reference Gage)
The total stream flow 7Q10 is obtained by subsequent delineations using USGS streamstats at POIs.
Stream Concentration: Stream concentration is determined through the use of mass balance equations where the downstream concentration is found by the following formula:
Stream Concentration = (Total Flow 7Q10 at a previous point) X (Stream Concentration at previous point) / (Total Flow 7Q10 at a current point)
Notification Distance: The notification distance is based on the information provided in the input table on the Model worksheet. The result is based on a linear interpolation between the three concentrations that are closest to the target concentration provided. The notification distance will return an "unknown" distance if the notification distance is not within the inputted table. To fix this the user will have to add additional segments until the concentration falls below the target concentration.

t Distance
oncentration:

iu	0.001	miles	X's	Y's	
ioı	3.86000	ppb	0.00	4	
iu	0.00		0.001	4	
ioı	3.86000		0.32	0	
	0.32	miles			
	0.05930	ppb	-11.91443517		4


4.50000
4.00000
3.50000
3.00000
2.50000
2.00000
1.50000
1.00000
0.50000
0.00000
Stream Concentration (ppb)
0.000
0.050
0.100
0.150
0.200
0.250
0.300
0.350
Distance (mi)
Concentration


4.50000
4.00000
3.50000
3.00000
2.50000
2.00000
1.50000
1.00000
0.50000
0.00000
Stream Concentration (ppb)
0.00
0.00
0.00
0.00
0.00
0.01
0.01
0.01
0.01
0.01
Time (days)
Concentration

OVERVIEW

This spreadsheet can be used to estimate concentrations of substance and travel time to a given point in flowing waters. It is assumed that the only major processing is dilution and a half-life process (if applicable). Dilution is estimated using the area of the target watershed or point on a stream and a corresponding United States Geological Survey (USGS) reference gage from which the flow of the watershed in question may be obtained by correlating it to the flow and corresponding area from the reference gage. It

Sheet Name: Procedure

Sheet is a summary of the steps required to use this tool. No inputs are required.

Sheet Name: Title

Sheet summarizes key project information. Required inputs are outlined below.

Treated Waterbody Name: Name of waterbody being treated needs to be identified.

County: The name of the county in which the waterbody is in needs to be provided.

Product Name: Name of product needs to be provided, e.g., Navigate.

Active Ingredient: The active ingredient as listed on the product label needs to be identified. Common active ingredients are provided as a drop down selection. If the active ingredient of your product is not listed simply type over and name in the cell. For example, Navigate lists 2,4 D as the active ingredient, 2,4, D should be selected from the

Applicator: The name of the applicator or the company applying the pesticide needs to be

Today's Date: The date in which this file is being filled out.

Total Waterbody Size: The surface area in acres needs to be provided.

Total proposed Treated Surface Area: The total proposed area to be treated in a single

Total Proposed Volume to be Treated: Similar to above, the total volume of each

Provide the total proposed treated surface area and volume within the waterbody that

Name of Outlet Stream: The name of the stream immediately downstream on the

Date of Application: The date for this specific application needs to be provided. If there

Description: Any additional or relevant information as identified in this cell should be prov

Sheet Name: Model
Application Rate: The application rate should be rate that the applicant has indicated

Units of Application Rate: An example of units for the application rate are gal of product

Concentration of Active Ingredient at Application Rate: The concentration of the active

Starting Concentration of Product Being Modeled: The starting concentration of the

Only use the calculations for partial lake applications. This will factor in whole lake
- Sum of the application areas is less than 1/2 of the entire lake surface area,
- Significant portion of that 1/2 area is located in the upper half of the waterbody away fro

If a significant portion of the partial lake application occurs in the lower half of the lake

Dilution: choose dilution calculation based on formulation type volume or mass.

Mass:
Mass to be Added: For mass applications enter mass for the application to be added at an
Ratio of Active Ingredient: Enter the ratio of pounds of active ingredient to pounds of
Total Area of Lake: Enter the total surface area of the lake in acres.
Average Depth of Lake: Enter the average depth of the lake in feet.

Volume:
Volume to be Added: For volume applications enter the volume to be added at any one ti
Ratio of Active Ingredient: Enter the ratio of pounds of active ingredient per gallon of
Total Area of Lake: Enter the total surface area of the lake in acres.
Average Depth of Lake: Enter the average depth of the lake in feet.

Reference Gage Number: Please use the websites below, or any other USGS gages to

The reference gage ideally would be a gage on the receiving watershed. When this is not

Historical gages can be found in the USGS bulletin 74, a pdf document providing
http://archive.org/details/usgswaterresourcesnewyork-nydec_bull_74

A webpage containing current operating gages and locations can be found at:
http://waterdata.usgs.gov/ny/nwis/rt
Reference Gage Flow 7Q10: The 7Q10 needs to be entered in cubic feet per second.

USGS Bulletin 74 provides the minimum average 7-day 10 year flows for 926 stream sites

The reference gage 7Q10 can be determined by the following means: USGS bulletin 74
http://waterwatch.usgs.gov/?m=real&r=ny
Reference Gage Watershed: All of the references above provide the watershed area for tl

Watershed Area at Point of Application/Outlet: The watershed area at a given location
The watershed area at a point of interest can be determined using USGS streamstats:
http://water.usgs.gov/osw/streamstats/new_york.html

For detailed instructions on how to use streamstats please see the user guide located at:
http://water.usgs.gov/osw/streamstats/Version3UserInstructions-20150706(1).pdf

A new watershed area should be determined for each location identified on map.

Target Concentration: The target concentration is any concentration of interest. This

Name: Enter the name of the point that corresponds to the information listed below it.

Watershed Area at Point Downstream: Area of watershed at a point of intersection

Stream Slope: Slope can be considered the average main channel slope determined from
Slope = Change in Elevation/Distance

Distance from outlet: Distance from the outlet can be determined using measurement

Output
Time of Travel: The time of travel is based on the flow and slope of the watershed.
Time of Travel = Distance / (0.38 X Flow^0.4 X Slope^0.2)

Total Flow 7Q10: The first point for this analysis is the starting point or the outlet. The

Flow at point = Reference Gage Flow x (Watershed Area at point/ Watershed Area at Refe

The total stream flow 7Q10 is obtained by subsequent delineations using USGS streamsta

Stream Concentration: Stream concentration is determined through the use of mass
Stream Concentration = (Total Flow 7Q10 at a previous point) X (Stream Concentration

Notification Distance: The notification distance is based on the information provided in

Additional Sheets
Other sheets are graphical outputs of the data input into the spreadsheet. These are very

Conc vs Dist: Graph of stream concentration versus distance traveled downstream. This

Conc vs Time: Graph of stream concentration versus travel time. This graph can be used

Flow vs Dist: Graph of flow in the stream as you move downstream. This graph provides

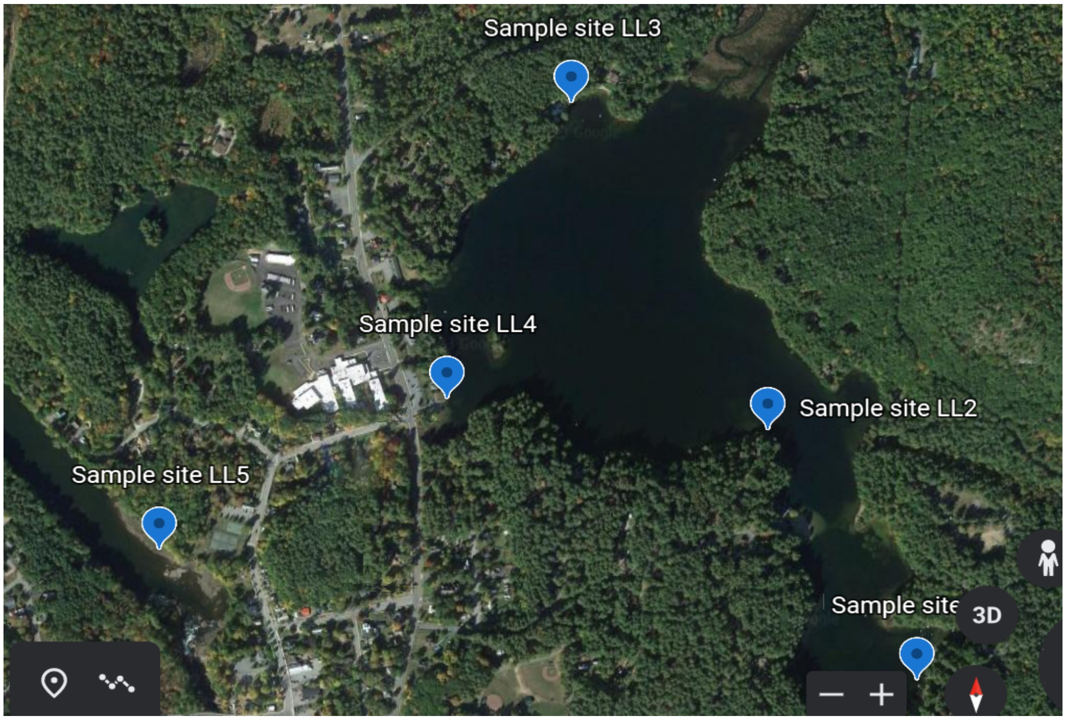
Time vs Dist: Graph of travel time versus distance. This graph provides information about

he reference streamgage.

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency
RECEIVED
Date: March 10, 2023

Lake Luzerne 2023 ProcellaCOR EC Sampling Plan

Sample sites
The location of the sample sites are shown on the map below.



Sample Site coordinates

Site 1 - 43°19'03"N, 73°49'39"W
Site 2 - 43°19'18"N, 73°49'50"W
Site 3 - 43°19'37"N, 73°50'05"W
Site 4 - 43°19'19"N, 73°50'14"W
Site 5 - 43°19'12"N, 73°50'36"W

Collection schedule
After application, samples will be collected at each site on the following schedule:
1-3 hours,10-12 hours,~24 hours ,3 days and 7 days
Samples at each site will continue to be collected every 7-14 days until lab analysis confirms that the ProcellaCOR EC concentration is below 1 ppb in all of the samples collected during a single sampling event. If results from all samples collected 3 days after application are below 1ppb, sampling will not be conducted 7 days after application.

Sampling protocol
The following manufacturer sampling protocol will be followed: For ProcellaCOR FasTEST use the clear glass vial to collect the sample. Submerge the bottle upside down until elbow deep. Cap the clear glass vial underwater. The contents of the clear vial should be transferred to the amber glass vial until completely filled to preserve the sample. Place the amber vial in bubble wrap sleeve to protect the glass vial during shipping, and overnight all samples to SePRO's SRTC lab in Whitakers, NC. If samples are collected on a Friday, store samples in a refrigerated area, and ship samples on Monday.

Cross-contamination prevention
Each sample collected contains two bottles - one unpreserved bottle for collection and one preserved bottle for transfer and shipping. Once used, collection bottles are not reused for other sample sites.

Town of Lake Luzerne, New York

P.O. Box 370, 539 Lake Avenue 12846

Gene Merlino
Supervisor
E-mail: supervisorlakeluzerne@hotmail.com

Cynthia Sherwood
Town Clerk
E-mail: lakeluzerne@albany.twcbc.com

Town Council
Michael Fazio
Timothy Hanlon
Paul Lewandowski
James Niles
Phone - 518-696-2711
Fax - 518-696-2773

Website: townoflakeluzerne.com

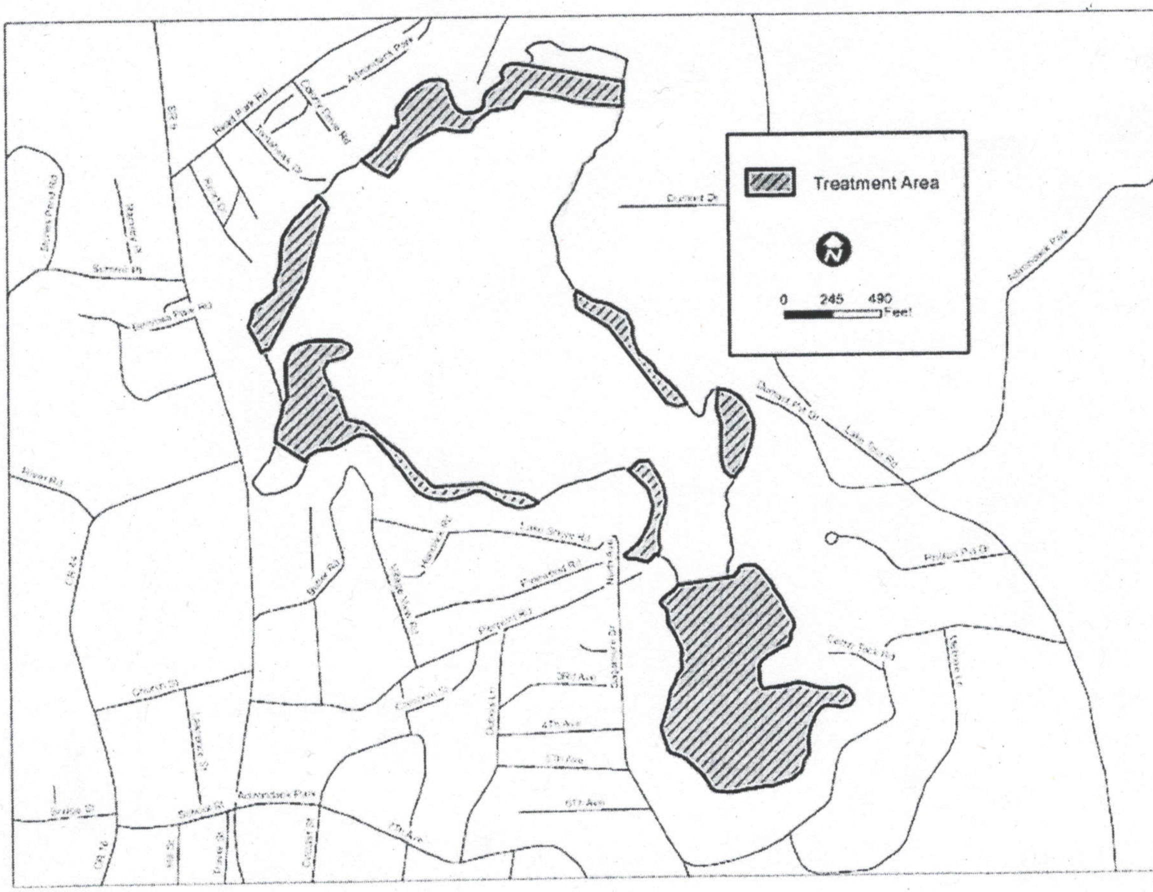
NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency
RECEIVED
Date: March 10, 2023

LETTER OF NOTIFICATION

Date: February 20, 2023

Re: Proposed Invasive Aquatic Plant Management Program – Lake Luzerne

The Town of Lake Luzerne is applying to the NYSDEC and the APA to use an aquatic herbicide in the spring of 2023 to control the invasive plant Eurasian Watermilfoil in the lake. A map of the treatment areas appears below.



This treatment will augment the Town's ongoing hand harvesting program. The herbicide, ProcellaCOR EC, will control invasive Eurasian watermilfoil for multiple seasons in the treatment areas, but has minimal impact on native plants. ProcellaCOR EC will be applied at less than 8 parts per billion, which equates approximately to one drop in a large swimming pool, a rate that is significantly less than most traditional herbicides. The Program will be conducted by licensed biologists and technicians with the lake management firm Solitude Lake Management, NYSDEC Pesticide Business Reg. No.17886. NYSDEC and APA permit applications are being submitted for approval for the treatment.

It is anticipated that the treatment will take place on one day sometime between May 15 and June 30, pending permit approvals and the appropriate stage of target plant growth. Notification of the actual date of the treatment will be submitted to the Town, APA and NYSDEC at least 7 days prior to application. The roads along the lakeshore will be posted at the time of the treatment indicating applicable water use restrictions. A restriction on all water uses in the treatment zone during the application will be in effect to prevent disruption to the application process. Following application, livestock watering and irrigation (except for turf) will be restricted until the concentration of the herbicide measures < 1 ppb.

ProcellaCOR EC applications to control in-lake invasive plants have no impact on public health, and there are no restrictions on swimming, fishing or potable water use once the application is complete.

Water samples will be collected to determine the concentration of herbicide in the water and identify when the livestock watering and non-turf irrigation restrictions can be removed. The herbicide is typically undetectable in the water after 2-3 days, but the water restriction is anticipated to take 8-10 days to complete sampling and receive approval from NYSDEC to remove restrictions.

The product label is available for review on Solitude Lake Management's website *https://www.solitudelakemanagement.com/product-labels-new-york-updates.* In the event that you as a riparian owner/user have any questions or objections to the proposed aquatic plant management program or water use restrictions, please contact the following agency within 21 days of receipt of this notice. Your objection must be in writing. Lack of comment will be considered consent to the treatment and water use restrictions.

Brian Primeau
Bureau of Pesticides Management, NYSDEC, Region 5
232 Golf Course Road
Warrensburg, NY 12885-0220

If you wish further information about the proposed management program or need a printed copy of the product label, please contact the Town of Lake Luzerne or Glenn Sullivan of SOLitude Lake Management at gsullivan@solitudelake.com or 908-310-8775 between 9:00 am and 4:00 pm, Mon - Fri.

In addition, the Town will supply Project Fact Sheets and will conduct informational public workshops to discuss any questions or concerns.

Sincerely,

Eugene J. Merlino

Eugene Merlino, Supervisor

Lake Luzerne Lake Management Plan

Town of Lake Luzerne, Warren County, New York

JANUARY 2020

This project was partially funded through a grant under the New York State Department of Environmental Conservation 2019 Invasive Species Grant Program.

ACKNOWLEDGEMENTS

Lake Luzerne Town Board Members
Gene Merlino, Supervisor
Dan Waterhouse
Dave O'Neal
Anthony Cirillo
Mark McLain

Consulting Team
Tracey Clothier, Project Manager, Certified Environmental and Land Use Planner
Dean Long, Environmental Scientist and Lake Manager
Larry Eichler, Research Scientist, Darrin Freshwater Institute
Jim Lieberman, Executive Director, Warren County Soil & Water Conservation District

Other Partners
Howard Schaffer, President, Lake Luzerne Association
New York State Department of Environmental Conservation

Lake Luzerne Lake Management Plan

EXECUTIVE SUMMARY

PROJECT DESCRIPTION

A long-term management plan for Lake Luzerne has been completed. The goal of the project was to prepare a report that compiles information and evaluates trends for the watershed and the lake. The Lake Management Plan creates a new baseline of information about the lake's water quality and the type and distribution of aquatic vegetation throughout the lake. It outlines a set of recommendations to maintain the Lake's water quality, manage aquatic vegetation, and prevent the introduction of new aquatic invasive species. The Plan is intended to provide the Town of Lake Luzerne and Lake Luzerne Association guidance on how to effectively manage the invasive aquatic vegetation in the lake.

The Plan was funded by the New York State Department of Environmental Conservation under its Invasive Species Grant Program. The $13,000 grant was supplemented by a $3,250 contribution from the Town for the required local match. Completion of the project will make the Town eligible for future funding of lake management projects.

The Town assembled a team of professionals to develop the Lake Management Plan. The team included Tracey Clothier, project manager and certified environmental and land use planner; Dean Long, environmental scientist and lake manager; Larry Eichler, research scientist, Darrin Freshwater Institute; and Jim Lieberman, executive director, Warren County Soil & Water Conservation District. The Lake Luzerne Association was tasked with educating landowners about the project, recommending ways to protect homeowners' shorelines, and providing actions to help prevent aquatic invasive species from entering the lake.

Much research has been conducted on Lake Luzerne prior to 2005. Between 1982 and 1990, DEC and the Darrin Freshwater Institute performed evaluations of water quality trends. In 2004, the Town participated in DEC's Citizens Statewide Lake Assessment Program (CSLAP) program where volunteers from the Lake Luzerne Association collected water samples and made observations about the lake every other week between May and October. The Warren County Soil and Water Conservation District conducted an evaluation of the soils, land use and stormwater issues in the watershed in 2000 and, in 2006, completed an Onsite Wastewater Improvement Project.

CHARACTERISTICS OF THE LAKE AND WATERSHED

Number of Surface Acres:	*111*
Lake Surface:	*623 feet above sea level*
Maximum Depth:	*52 Feet; Average 24 feet*
Hydraulic Retention Time:	*one month*
Water Quality Class:	*"B" – suitable for contact recreation and fishing*
Size of Watershed:	*16,349 acres*
Lake Tributary:	*Second Lake Outlet*
Number of Aquatic Plant Species:	*27 in 1989 and 38 in 2019*
Number of Watershed Residences	*300 in 2004*

CONDITION OF THE LAKE

Aquatic Plant Species

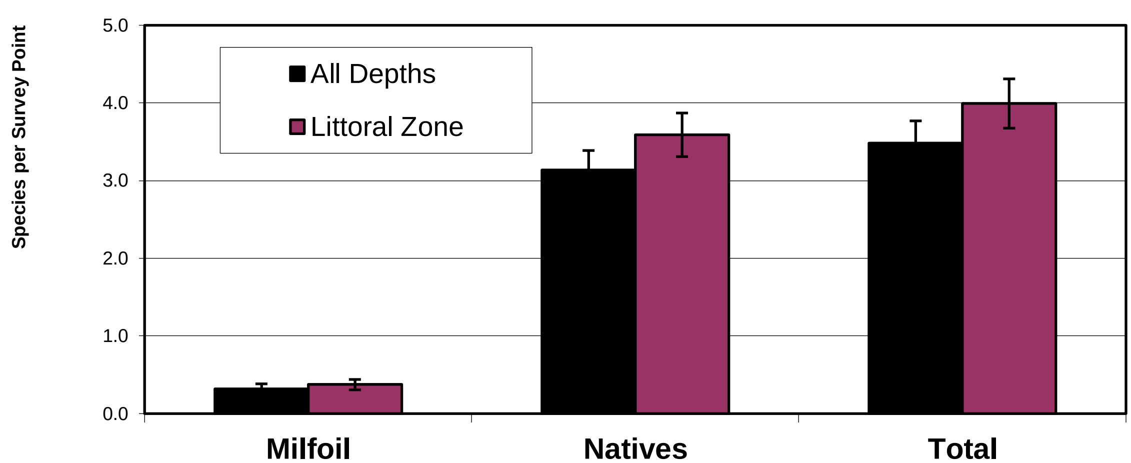
Discovered in 1989, Eurasian watermilfoil is the primary invasive species in the lake. Plant surveys were conducted regularly through 2004. Treatment included the use of benthic mats and a pilot application of the chemical Renovate® was permitted in limited area in 2010. Hand and suction harvesting continued in the years that followed.

A survey of aquatic plants with a focus on the invasive aquatic Eurasian watermilfoil, was completed in the summer of 2019. The survey consisted of frequency of occurrence of all aquatic plant species for points distributed within the whole lake, and comparison of historical survey results to current conditions, with reference to changes in the relative abundance of Eurasian watermilfoil.

Findings include:

- Dense growth occurs in depths from 3 to 10 feet between the island and the shore.
- Moderate density growth was observed in the southeast bay and in the northwest bay.
- Depth distribution of native species remained like past surveys with rooted aquatic plant growth observed to a maximum depth of 16 feet.
- Macroalgae form a carpet at the outer margin of plant growth, in depths from 16 to 19 feet, interspersed with moss.
- Species richness was high, with many species occurring in more than 5% of survey points.
- A total of 38 species of aquatic plants were observed. Eurasian watermilfoil was a dominant invasive species found throughout the lake.
- Native species dominate the lake vegetation. The most observed species included Robinson pondweed, Chara-Nitella spp., water nymph, and eastern purple bladderwort.

Lake Luzerne Aquatic Vegetation Species Richness Levels



Water Quality Summary

During the summer of 2019 water samples were taken and analyzed to help determine the water quality of the lake. Findings include:

-Water chemistry results from the inlet to the lake show low phosphorus and chlorophyll *a* readings, which indicate that the water quality coming into the lake is relatively good.

-Water clarity as measured by Secchi depth readings shows very little variation over 37 years. The 1999-2004 average Secchi depth was 13.8 feet while the average in 2019 was slightly less at 12.7 feet.

-Chlorophyll *a* (Chl-*a*) is a measurement of green plant pigment found in the water column. This value indicates the amount of algae in the water or how green the water appears. The Chl-*a* values varied from 0.98 ppb to 13.2 ppb (1982-2004) and an average of 3.4 ppb. The 2019 value was 2.39 ppb in the deep-water area of the lake west of the island and 2.17 ppb at the inlet of the lake. The Chlorophyll *a* values are consistent over the 37 years.

LAKE MANAGEMENT RECOMMENDATIONS AND IMPLEMENTATION STRATEGIES:

Water Quality Recommendations

1. The Lake Luzerne Association should join the New York State Federation of Lake Associations (NYSFOLA) and enroll in the Citizen's Statewide Lake Assessment Program (CSLAP), a water quality testing program conducted by volunteers and supported by NYSDEC and NYSFOLA. ***Implementation Strategy:*** Make a 5-year funding commitment to CSLAP and form a volunteer team of individuals that can complete simple water quality tests and annually report on general conditions of the lake.

2. The Town of Lake Luzerne should conduct a study of the Lake Luzerne sub-watershed (below Second Lake outlet) to determine the source of pollutants. **Implementation Strategy:** Request Warren County Soil & Water Conservation District to conduct this study. Continue to test coliform levels at the Second Lake inlet on an annual basis.

3. The Town of Lake Luzerne should undertake an annual shoreline water quality sampling program geared to determining septic influences to more quantitatively determine if there is a problem which may be impacting the lake. ***Implementation Strategy**:* Develop a shoreline water quality sampling program with consultants and Darrin Freshwater Institute. Consider funding sources through NYSDEC's Technical Assistance Program.

4. The Town of Lake Luzerne should work with NYSDOT to address the two identified areas of stormwater runoff concern on Route 9N. ***Implementation Strategy**:* Request a proposed course of action with WCSWCD.

Invasive Species Management Recommendations

5. The Town of Lake Luzerne should continue and intensify the diver and suction harvesting program. Refine the program to go beyond managing vegetation on an annual basis. Measuring the amount of work done annually is necessary to track the success of the management effort. Keep detailed records of diver time, or hours of pumping and

measuring the treatment area so that changes in the plant community can be tracked. Map annual the annual harvesting effort on a simple map that has a grid with letters and numbers so that each grid square can be recorded as work is completed. ***Implementation Strategy:*** Replace current program with a structured, consistent and sustained program that tracks and records all areas monitored and/or worked on using GPS. Carefully record the location and amounts of vegetation extracted daily. Intensify suction harvesting efforts for 2020. Purchase an underwater camera to record pre-harvest conditions.

6. The Town of Lake Luzerne should investigate the feasibility of using the new herbicide known as ProcellaCor® to treat aquatic invasive species in the south bay. ***Implementation Strategy:*** Work in partnership with the Lake George Park Commission to find an approach for chemical treatment to the Adirondack Park Commission.

7. The Town of Lake Luzerne should file an application for the February 2020 of funding for lake management techniques through the NYSDEC's Terrestrial and Aquatic Invasive Species Rapid Response Program. ***Implementation Strategy****:* Identify the appropriate project and apply for funding with the assistance of a consultant.

<u>Outreach and Education Recommendations</u>

8. The Lake Luzerne Association should provide residents with educational materials that show how to minimize their use of phosphorus and reduce excess runoff and erosion from a property such as the use of rain barrels, green space protection, infiltration and filtration through green infrastructure. Small increases in phosphorus from lawn fertilizers or failing septic systems can cause increases in lake algae content and a corresponding decrease in water clarity and quality. ***Implementation Strategy****:* Investigate appropriate educational materials from WCSWCD and FOLA which could be distributed to residents.

9. In partnership with the Lake Luzerne Association, the Town should erect strong signage about the Clean Drain Dry program at the launch and encourage self-inspections of all small boats entering Lake Luzerne. ***Implementation Strategy:*** Consult the NY Federation of Lake Associations for the type of signage and language that most effectively conveys the Town's intentions to keep new invasive species out of the lake.

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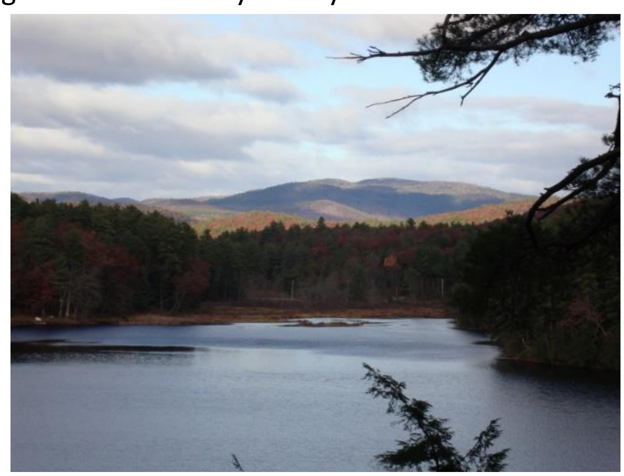
1. Introduction

1.1 Project Description

The project is the development of a long-term management plan for Lake Luzerne, a 111-acre lake in Warren County. The goal is to provide the Town of Lake Luzerne and Lake Luzerne Association guidance on how to efficiently manage the invasive aquatic vegetation in the lake with cost effective strategies. The outcome will be a report with a comparison of past and present conditions and a set of recommendations for the town for the management prevention of future aquatic invasive species. The Town of Lake Luzerne owns the land under the lake and therefore makes all management decisions on the lake. The Lake Luzerne Association is a very active organization that serves as a direct partner with the Town tasked with providing education about the state of the lake, efforts for landowners to take to improve water quality, and actions to prevent aquatic invasive species from entering the lake.

1.2 Community History

Lake Luzerne is a community located in the southwestern portion of Warren County near the Hudson River border with Saratoga County. It has a significant seasonal population, reflected in the fact that nearly 31% of the residential parcels are classified as seasonal residences. Most seasonal residences are clustered around the shoreline of Lake Luzerne. The population of Lake Luzerne as of the 2010 Census was 3,347 and the projected population in 2017 was 3,298 (Cornell Program on Applied Demographics). Population growth is relatively steady and is consistent and on par with overall growth in Warren County. Lake Luzerne, due to its location and amenities, is a summer tourism destination and therefore experiences a significant increase in population during the summer months. The population of Lake Luzerne is becoming older and wealthier, with fewer young children and more second homeowners and working professionals. Self-employment is also on the rise, creating a wealthier and more independent workforce.



1.3 Lake Management Efforts

There are two invasive species in the lake – Eurasian watermilfoil and Curly Leaf Pondweed. It is unknown currently if there are any invasive animal species. A fair amount of research has been conducted on Lake Luzerne. Between 1982 and 1990, DEC and the Darrin Freshwater Institute performed evaluations of water quality trends. In 2000, Warren County Soil and Water Conservation District developed a Watershed Assessment. In 2004, the Town participated in the CSLAP program and there does not appear to be water quality testing since that date. EWM was discovered in 1989 and hand harvesting was implemented in 1992. Plant surveys were conducted through 2004 followed by the installation of benthic mats and an application of Renovate® in a limited area in 2010. Hand harvesting continued in the years that followed.

This project is needed to create a new baseline of information about the water quality and the amount and distribution of aquatic vegetation throughout the lake.

In recent years, the Town has pursued the mission of controlling the mass of the milfoil beds and distribution of the invasive by hand harvesting with a private contractor. Based on reports from lake residents and fishermen this practice has been expensive and only moderately effective. No plant surveys have been prepared since 2011 following the use of the chemical Renovate®. The preparation of the Lake Management Plan will result in an evaluation of the condition of aquatic vegetation of the lake and will recommend a long-term management strategy that can be easily implemented by the Town of Lake Luzerne and the Lake Luzerne Association. A funding strategy with a combination of volunteer efforts and professional assistance will be provided that could potentially cover most costs of the recommended actions.

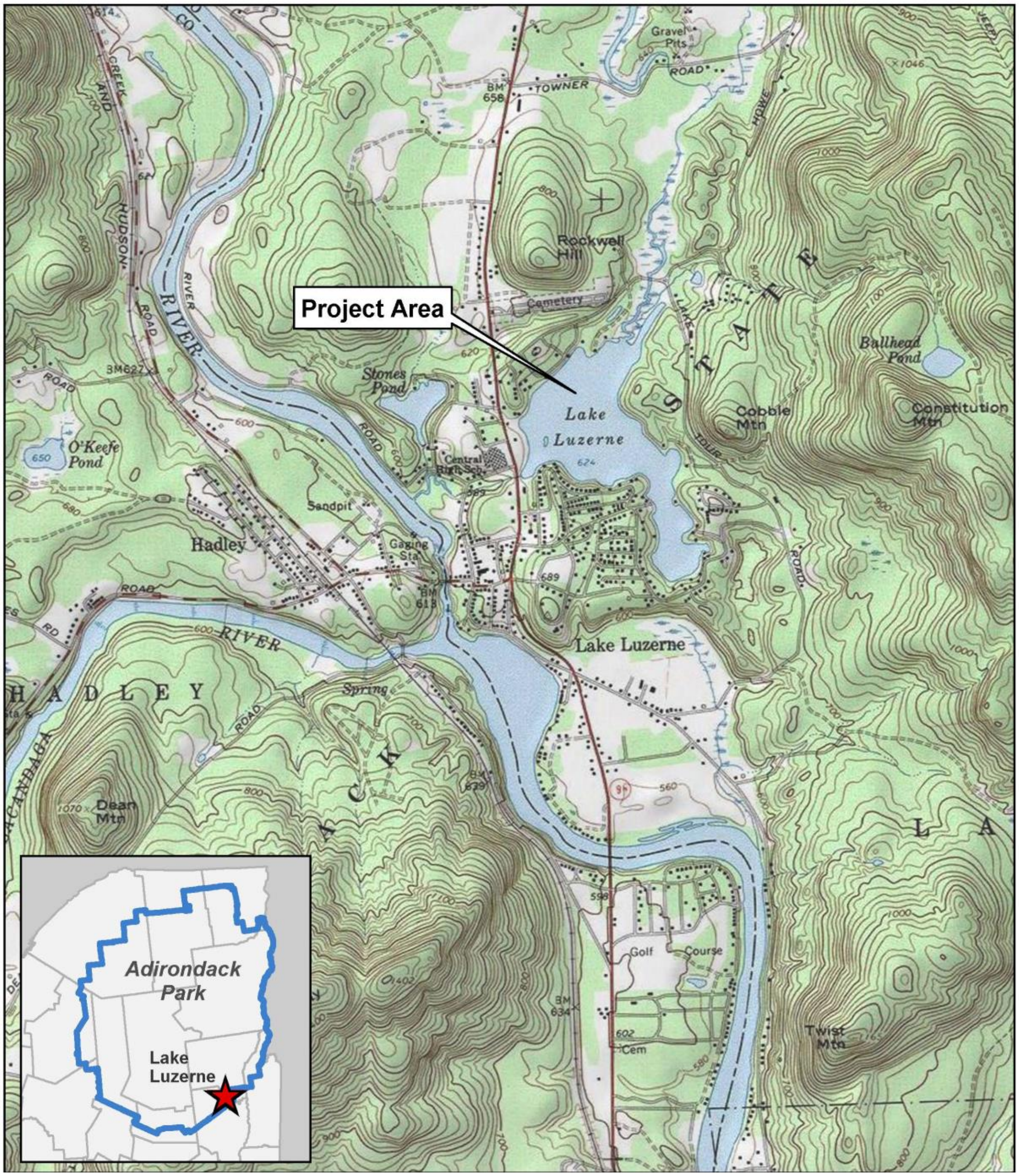


Figure 1 Location Map

2. Existing Conditions of the Lake and Watershed

2.1 Characteristics of the Watershed

Introduction

This study is primarily intended to get a snapshot in time as to the condition of Lake Luzerne including the overall water quality of the lake, and to determine the existing and potential pollutant sources to Lake Luzerne. The first step was to determine the extent of the lake's watershed. Being the last in a chain of lakes including Lake Vanare, Forest Lake, Fourth, Third, and Second Lakes, Lake Luzerne has a very large overall watershed (16,369 acres). However, most of the water from this large watershed ends up in one mainstream which flows into Lake Luzerne from Second Lake. This being the case, it is relatively simple to determine whether pollutants are coming from the nearshore areas of Lake Luzerne or whether they are coming from up higher in the watershed from the other surrounding lakes and lands. By analyzing the water quality of the inlet stream into Lake Luzerne, it can be determined whether it was needed to look at the land uses in a much larger geographical perspective or whether the focus should be on the shoreline area of Lake Luzerne.

Water samples were taken from the inlet to Lake Luzerne and analyzed for phosphorus and chlorophyll to help determine if the water quality of the inlet tributary was better, worse, or about the same as the water quality of the lake itself. Water chemistry results from the inlet to the lake showed low phosphorus and chlorophyll readings, which indicate that the water quality coming into the lake is relatively good overall. With these results, a more localized focus could be taken which resulted in the study of the Lake Luzerne sub-watershed (below Second Lake outlet) to determine where existing and potential sources of pollutants may be coming from. This study and the land related issues discussed below focus on this sub-watershed rather than the larger watershed.

Summary of Watershed Findings

- The watershed is dominated by forest cover.
- Wetlands are mostly located along streams, pond and lake areas.
- High intensity and agricultural development is limited.

Location

Lake Luzerne is in the Town of the same name in Warren County, New York. The Town of Lake Luzerne is also with in the, Park that is both a n area of unique geology and special land use control created in the New York State (NYS) Constitution Article 14 and by the Adirondack Park Agency. Figure 1, "Project Location," illustrates the location of Town of Lake Luzerne in NYS and Warren County as well as the shape of the lake, the community road network, and NYS Route 9L.

Lake George is approximately 12 miles to the east of Lake Luzerne. The Hudson River is the border between Saratoga County to the south and Warren County.

Community History

Lake Luzerne is the location of the confluence of the of the Sacandaga and the Hudson River, making it both a pre-historic and historic travel route. This region was a part of the that was influenced by Iroquoia, or Iroquoian borderlands that extended to the St. Lawrence River with many Mohawk communities (Preston D.L, 2009).

Settlement by Euro-Americans began after the Seven Year War and grew slowly until after the War of 1812. The south east portion of the Adirondack settlement history includes the development of tanneries, due to the ready availability of large eastern hemlock trees. The eastern hemlock was cut, stripped of the bark, and the bark was soaked in water to produce tannin. From 1850-1890, the largest number of tanneries operated in the Adirondacks. Most tanneries had to be within a day wagon ride of rail, therefore there were many in Warren County. The tanneries would exhaust the supply of accessible hemlock within 10 miles of the factory with 10-20 years (McMartin B.,1998). In the region around Lake Luzerne, by 1875, approximately 40% of the land had been cleared for farming and tanning industries (McMartin B.,1998). Large tanneries were found in Lake Luzerne, Stony Creek and North Creek (Lake Luzerne website). The last tannery in Lake Luzerne closed in 1905 and by that time, tanning of hides had changed to a chemical process. http://www.townoflakeluzerne.com/townhistory.asp

The tanning industry was followed by paper production. In 1869, there was a paper mill and dam constructed at the outlet of Lake Luzerne(Lake Luzerne Town History). The production of paper required both trees and a steady supply of water. Tourism became more established once the forest had recovered from widespread clearing associated with tanning industries.
The forest surrounding the lake and depth of water in the lake has changed over the last 150 years. Changes in the forest included loss of eastern hemlock that supported the tanneries, American chestnut loss due to the blight, and more agriculture would have been found in the watershed 150 years ago. The dam changed water levels and may have caused fluctuation in the water levels that supported paper production. Areas of the lake that are now shallow water would have been wetlands and marshes prior to construction of the dam.

The lake has a well-defined basin that was is a remnant of a kettle lake formation, as well as an S-curve that shows it was a river channel. A kettle lake forms when a large block of ice is buried by sands, gravel (till) and eventually melts leaving a depressed area. Figure 2, “Lake Luzerne Bathymetric Map,” illustrate the approximate bottom contours of the lake. There is a central basin that is over 50 feet deep. The immediate area around the lake is made up of till that form steep sand and gravel slopes.

Figure 2 Lake Luzerne Bathymetric Map

Watershed Characteristics

The description of the watershed includes the geology, land use and vegetation, and soils. This evaluation will focus on the lake watershed that is the area around the lake, draining to the lake by the way of streams and ponds. The watershed is represented in Figure 3, Watershed Boundary Map." Below are the descriptions of the various land uses and vegetation cover that are in use for the Land Cover Database 2016 (NLCD,2016). The definitions of these classes can be found in Appendix C. The NLCD has used the same land use categories since the first inventory. As improvements in data assembly and satellite images have occurred the precision of various categories has increased. Impervious surface analysis is one of the land cover data set that has improved over the years. The data is labeled as 2016 but the images were compiled years earlier.

Table 1 Watershed Land Use and Vegetation Cover

Land Cover & Vegetation	Lake Sub-watershed Acres	%	Watershed Acres	%
Open water	114.1	5.30	363.8	2.20
Developed Open Space	138.1	6.40	629.0	3.80
Developed Low Intensity	21.1	0.90	65.0	0.33
Developed Medium Intensity	4.6	0.20	12.7	0.07
Developed High Intensity	0.9	0.04	2.2	0.01
Barren Land	5.9	0.20	5.9	0.03
Deciduous Forest	410.7	19.20	5093.9	31.1
Evergreen Forest	765.1	35.80	5485.6	33.5
Mixed Forest	374.0	17.50	3587.4	21.9
Shrub/Scrub	71.4	3.30	325.2	1.90
Herbaceous	64.8	3.00	47.3	0.20
Hay/Pastures	38.8	1.80	38.8	0.20
Cultivated Crops	0.9	0.04	50.3	0.30
Woody Wetlands	112.2	5.20	627.6	3.80
Emergent Wetlands	14.2	0.60	34.9	0.20
Total	2,136		16,369.6	

The National Land Cover Data set is a collaborative effort of various federal agencies that producing mapping data to develop a standard data set that describe land use and vegetation cover of the United States. The land use and vegetation cover were assembled for both the watershed and the lake sub-watershed. Table 1, “Land Use and Vegetation Cover for the Lake Luzerne Watersheds,” shows the characteristics of the complete watershed and the immediate lake water shed. This table also shows the land use and vegetation found within the watersheds as a percentage and that the lake watershed and lake sub-watershed are mostly covered by forest.

The immediate lake watershed land use and vegetation is represented in Figure 4 and shows the dominance of forest cover. The immediate lake watershed is the land that contributes water to the lake in a short period of time, within hours rather than days. The lake watershed is within the complete watershed that covers 16,369 acres and includes ponds and wetlands that flow into multiple other surface waters prior to entering Lake Luzerne. The immediate lake watershed is 2,136 acres and includes the area where water enters the lake by sheet flow, overland flow, storm drains or small water courses.

Lake Luzerne is in Warren County, in the Upper Hudson River watershed drainage. The lake itself is encompassed solely within the Town of Lake Luzerne, and its surface area coverage is approximately 114 acres. The lake elevation is 624 feet above mean sea level (msl). The maximum depth of Lake Luzerne is 52 feet, with an average lake depth of approximately 24 feet. The volume of Lake Luzerne is approximately 2,664 acre-feet (acre foot equals the amount of water which would cover an acre to the depth of one foot). With this volume of water, the hydraulic retention time within the lake is approximately one month. In other words, it takes about one month for the lake to flush itself out. The NYS DEC water quality classification of Lake Luzerne is a “B”, which is suitable for contact recreation, fishing, and other related uses.

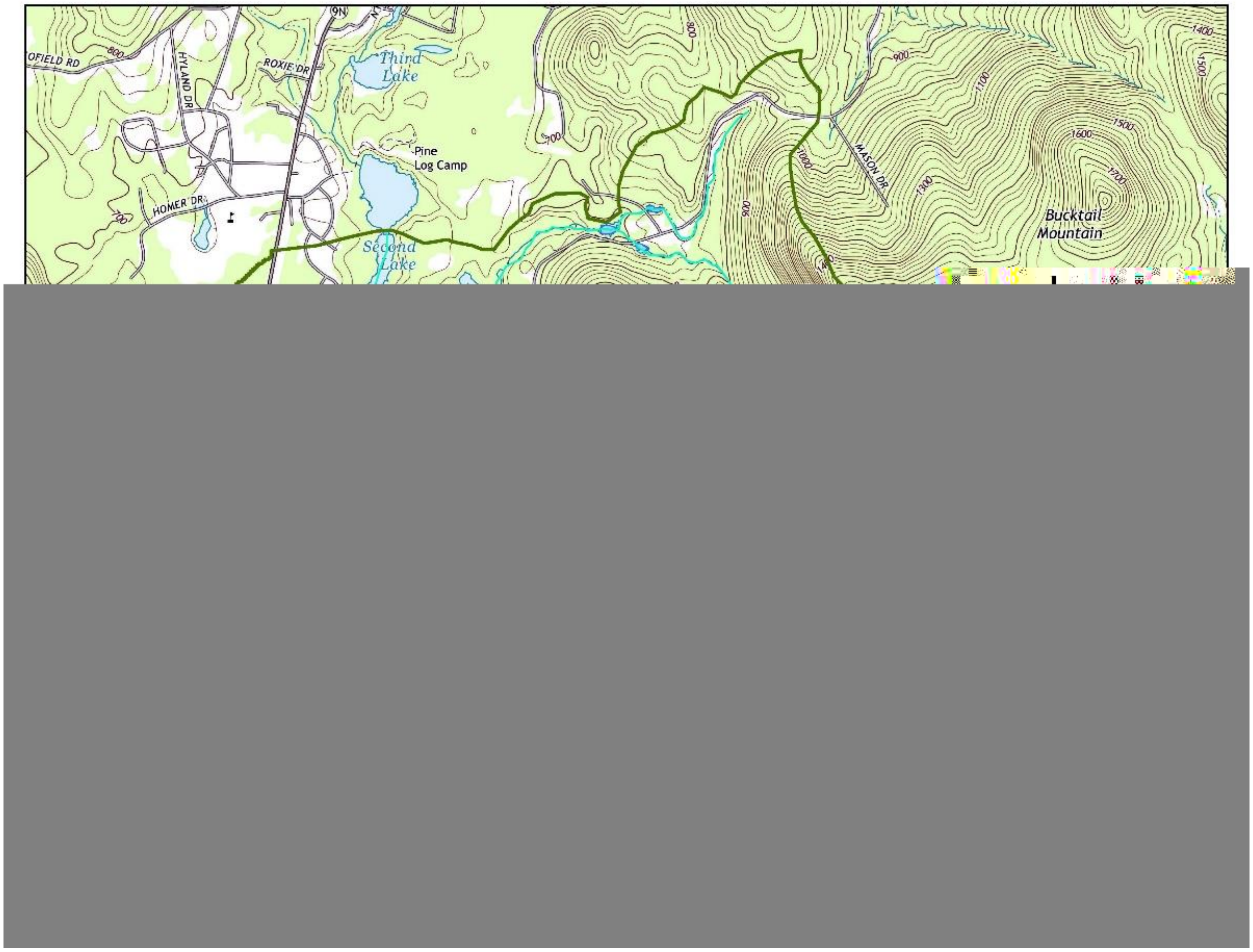


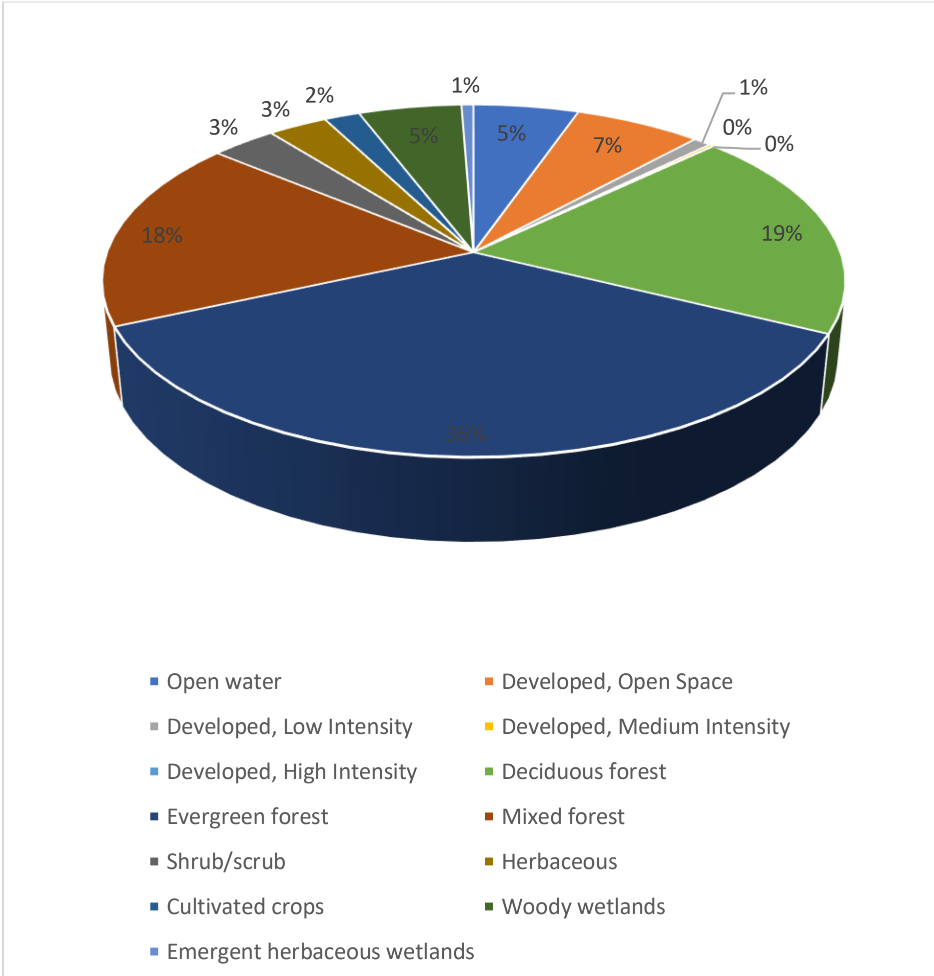
Figure 3 Watershed Boundary Map

The immediate lake watershed is a mix of vegetation and land use but is still dominated by forest. The largest forest cover is evergreen in the immediate watershed. The percentage of forest cover in the immediate water shed is 72.5%, while the complete watershed has 86.5% forest cover. Developed land categories are not overrepresented in the immediate watershed when compared to the whole watershed. Figure 4, “Land Class Map,” shows the locations of the various vegetation and land uses in the immediate watershed.

Within the developed area of the immediate lake watershed are a few stormwater discharges. As noted in the Y2000 watershed assessment, stormwater drainage structures were identified that collect stormwater from Route 9N by the Lake Luzerne High School and coveys it, untreated to the lake. To date there has not been a comprehensive attempt to address this with NYS DOT for designing and installing a stormwater improvement structure. However, a structure could be in the NYSDOT right of way or roadway and would likely be a hydrodynamic flow separator style treatment system.

Figure 4 Land Class

Table 2 Immediate Lake Watershed Land Use and Vegetation Cover



There is limited area and availability to reduce the volume of stormwater flowing through this system due to the roadways and small workable spaces. If the property owner where the system flows through to the lake is amendable, a subsequent design may indicate that infiltration of water is feasible based on water table separation. Generally, NYSDOT would have a drainage easement on a system before conducting such work, but the Town may be able to aid with moving this forward.

During 2019, District staff identified another direct input to the lake from Route 9N. A drop inlet collects stormwater runoff from Route 9N, south of the outlet and discharges to the lake at a point south of the lake's outlet (near pedestrian staircase). Due to the limited working area the only practical solution at this site would likely be a hydrodynamic flow separator type system. As with site #1, this would require NYSDOT cooperation and support, due to the location of the system.

The Wayside Beach boat and beach access acts as a flume for stormwater running of the upper parking area and portions of Route 9N, to enter directly to the lake. Prior to 2019, the bottom of the ramp was unimproved and was consistently eroded (shoulder stone material) after heavy runoff events. In 2019, the main transition area from the macadam of the access road to the lake was changed to concrete. While this does significantly reduce erosion and subsequent maintenance of the site, there is no change to the volume of stormwater, nor does it provide water quality treatment.

The sub catchment drainage above Pierpont Beach is a mix of narrow improved and unimproved roads, small homes/camps and forested areas. Pierpont Beach parking area has a drywell installed to capture and infiltrate runoff.

Sylvan Road is a dead-end road that terminates at the lake, southeast of the lake's outlet. Water appears to flow from the town park and a small residential area, converging off the macadam roadway and eroding the sand and item 4 that is found at the end of the road, into the lake. Snow is also plowed into this area due to the narrowness of the road and lack of ability to place it elsewhere.

Lake Morphology

Lake Luzerne has a well-defined basin that was is a remnant of a kettle lake formation as well as an S curve that shows it was a river channel. A kettle lake forms when a large block of ice is buried by sands, gravel (till) and eventually melts leaving a depressed area. Figure 2, "Lake Luzerne Bathymetric Map," illustrate the approximate bottom contours of the lake. There is a central basin that is over 50 feet deep. The immediate area around the lake is made up of till that form steep sand and gravel slopes.

Lake Luzerne is 114 -acres (46.3 hectares) with an average depth of 24 feet (7.3 m) and shoreline length of 2.7 mi. (4.35 km)(Swart J. and J. Bloomfield 1985) (Mikol G.F. and D.M. Polsinelli 1985). . Lake average depth is the lake volume divided by the surface area. The lake surface area varies from 96- 114 acres depending on the source of information and for this project the water surface area of 114 acres was selected based on geographic information system (GIS) mapping data and hydrological surface model.

The lake is identified as a class B suitable for contact recreation (swimming) and this rating sets the overall water quality management strategy for the water body.
The volume is estimated as 2,664-acre feet or 116,043,840 cubic feet or 3,285,996 cubic meters (Warren County Lake Luzerne Assessment 2000). The estimate hydraulic retention time is 0.1 year or 36.5 days (Mikol G.F. and D.M. Polsinelli 1985).
The lake elevation is 623 feet above mean sea level (msl).
The lake is controlled by a dam

Geology

Lake Luzerne is like many lakes in upstate New York, since its formation was the result of glaciers and subsequent erosion. The geologic map of the area show that Lake Luzerne is in area of glacial alluvial deposits that were formed approximately 2.5 million years ago with the last glacial period ending between 12,000-14,000 years ago. During the last period when glaciers dominated the region, Lake Warrensburg formed, and it submerged the area from Deadwood in the Schroon River valley to Corinth. This would have included the Lake Luzerne. Lake Warrensburg was held back by an ice dam that extended from Glens Falls to Saratoga Springs (Isachsen YW. et.al. 2000). The same area is identified as out wash gravel on the surficial geology map (Caldwell D.W. and R. Dineen 1980).

Slope

A feature of Lake Luzerne are the slopes along the lake shore. From the water's edge there are steep slopes that surround the lake and cause development to be push back from the lake shore. Figure 5, "Steep Slopes Map," illustrates the slope of the land in the lake sub-watershed. Figure 5 shows that much of the sub watershed and the immediate lake watershed have slopes of over 20%. When slopes are greater than 20% conventional and most other types of septic systems and leach field cannot be built. Figure 5 illustrates that homes are located on slopes of under 20% or are located adjacent to the slopes of 20% or greater. The limited number of homes on slope of over 20% either took advantage of small localized areas of low slope or re-graded the site to accommodate development of the home.

The general character of the lake sub-watershed is that it has variable terrain that can be either gently rolling but in places steep. The highest elevation in the lake sub-watershed is 1,662 feet, southwest of Bucktail Mountain on a separate peak.

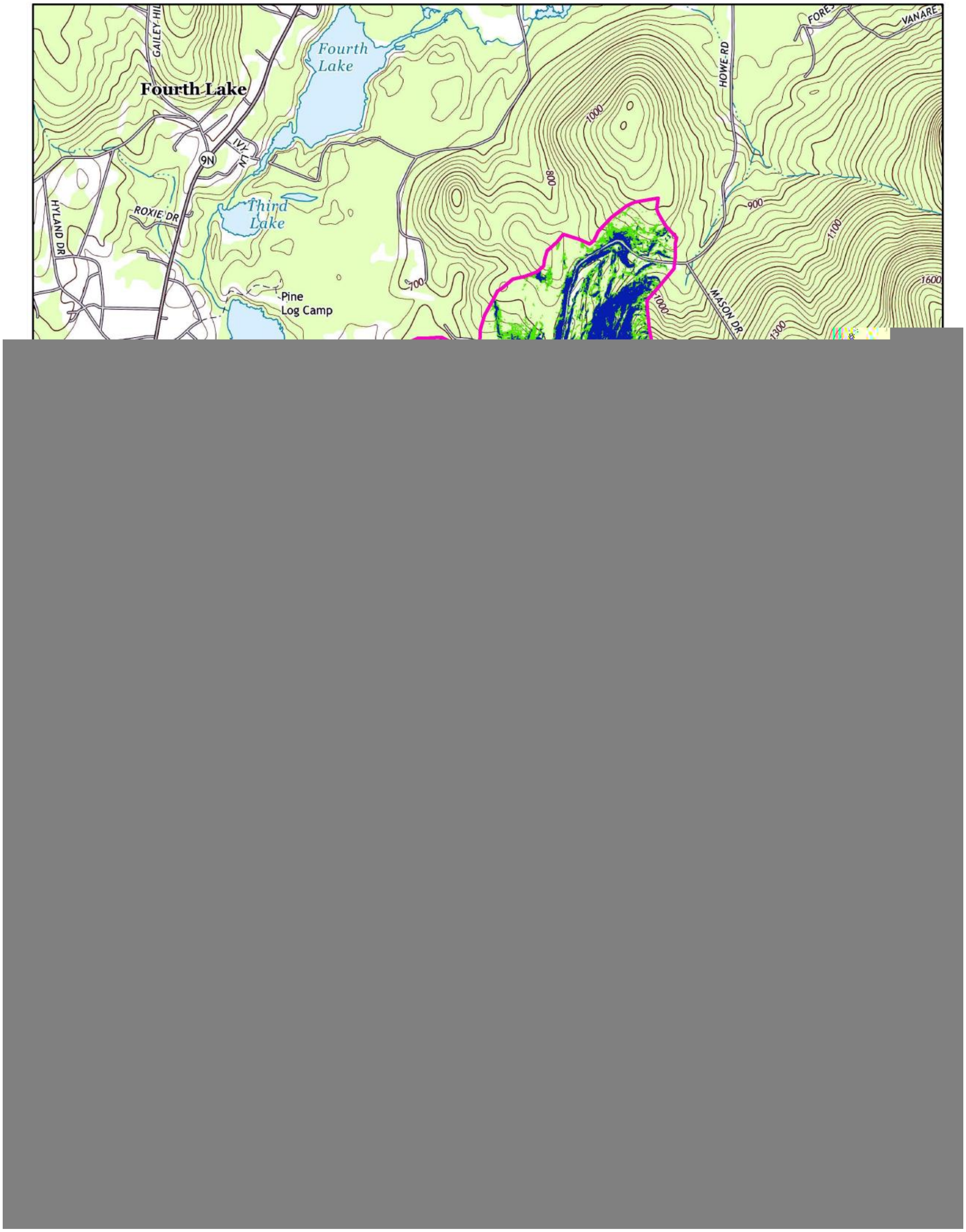


Figure 5 Steep Slopes Map

Hydrological Soils Group/ Soils

There are many different characteristics of soils that can be used to describe relevant properties of soils. The hydrological soil groups found around Lake Luzerne is illustrated by Figure 3.3 Hydrological Soils Group in the Lake Watershed. The hydrological soil groups (HSG) has four classes of soils based on the movement of water in the soils. Hydrological group A is an excessively well drain to well drain soils that allows water to move quickly in the soil profile. HSG B is a well drain to moderately well drained, HSG C is moderately to poorly drain and HSG D is poorly drained or saturated soils found in wetlands.

The development of onsite wastewater system is easiest and at lower cost on HSG A and becomes more costly on B and C. HSG D will not support on-site wastewater systems. In each category in some locations on site wastewater system may not be feasible due to steep slopes or confining layers that limit the percolation rate of soil preventing the construction conventional wastewater system. In these cases, alternative fill systems may be required. Wastewater systems that have low loading rates such as small seasonal homes, with infrequent use may work well for many years. A small system that is rested annually (no occupancy for winter early spring months) may also work well.

The HSG A soils will rapidly allow water or wastewater to be dispersed. In 2006 Warren County Soil and Water Conservation Districted completed a program of outreach and septic tank pumping. This work was focus on the area that is identified as HSG A in this report and was identified as Oakville soil in 2006 (Wick D. 2006). The 2006 effort including pump outs of 34 septic tanks and distribution of information packages to homeowners. The analysis in that report identified 101 homes within 200 feet of the lake with bathrooms. Many of the home sites are at elevations of 640-680 feet msl, and well above the lake elevation of 624 feet msl. The Oakville soil is a deep well drain soil with depths of over 60 inches and without boundary layer. The percolation can be too rapid and therefore wastewater may not sufficiently filter. In a low dose system, the excessive percolation rate may not create a problem since the dose is small and will not saturate the soil and continue to move downward in the soil profile.

The lake elevation is 624 feet while the developed lands are at 640-689 msl. The soil profile below the possible septic tank discharges is 10-70 feet deep. This great depth of soil mitigates for some of the high percolation rate in the top 60 inches of the profile described above. The deeper soil profile below the first five feet is a mix till of sand and stone.

Table 1, presented as Figure 4, shows that 75% of the lake sub watershed is made up of forest. Approximately 86% of the entire lake watershed has forest cover.

The ratio of watershed to lake is used to describe the amount of land and runoff that is directed towards the lake . For Lake Luzerne it is 143 (16,369/114= 143) this indicates that there is a very large watershed that is supporting the lake. Lake with large watersheds tend to be more nutrient rich, yet in the case of Lake Luzerne, the dominance of forest reduces the amount of runoff and nutrient loading.

Figure 5 shows the lake watershed mix of development and vegetation. There are narrow bands of development along the roads and around the lake. This figure clearly shows that the area around the lake has limited development, yet is dominated by a mix of evergreen, and deciduous forest.

Various wetland maps were prepared using different sources of information. The NLCD estimated that there were 126 acres of wetland in the lake sub-watershed. The NLCD map is a fully automated mapping process. The Adirondack Park Agency (APA) mapping of the lake sub-watershed identified 138.4 acres of wetland. The wetland mapping prepared by the APA is compiled by APA staff and contractor using various aerial photographs to determine the wetland boundary. 6, “APA Wetlands Map,” illustrates the estimate wetland boundaries in that watershed. Most of the wetlands are located along the inlet stream , along the lake perimeter and near Second Lake. The National Wetland Inventory by the United State Fish and Wildlife Service estimate 206 acres of wetlands. The NWI mapping is an automated process, with some field reviews and technician review. Figure 7, National Wetland Inventory Map,” illustrates the entire 114-acre lake as a wetland category.

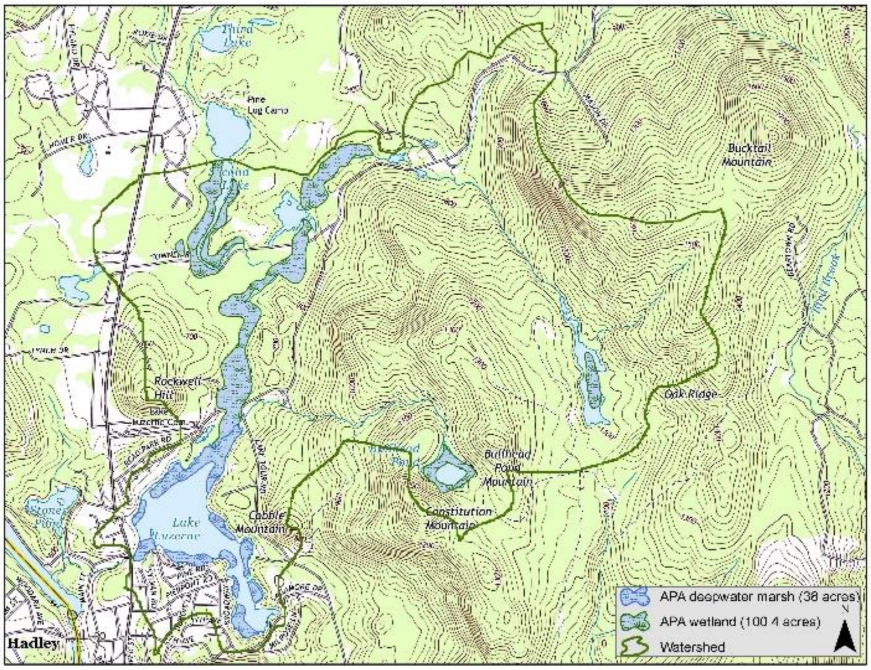


FIGURE 6 APA WETLANDS MAP

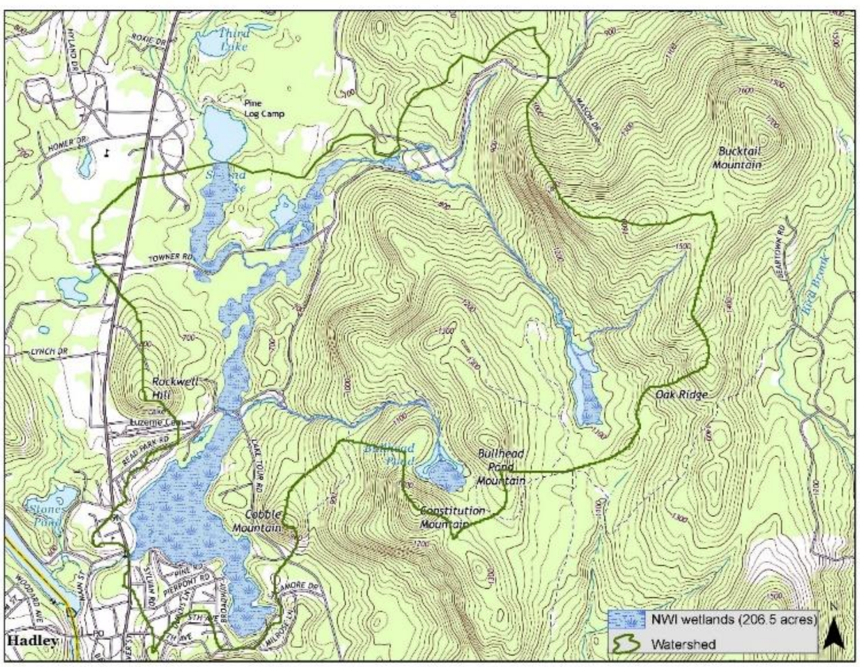


FIGURE 7 NWI WETLANDS MAP

2.2 Characteristics of the Lake

Introduction
Water quality sampling has been completed on Lake Luzerne in 1982,1987, 2000-2004 and in 2019. The 1982-1987 samples were taken by NYSDEC, while the 1999-2004 samples were gathered by the NYS Citizen Statewide Lake Assessment program (CSLAP). In August and October 2019 additional water samples were collected at Lake Luzerne. Lake Luzerne has a neutral pH, low buffering capacity, low concentration of nutrients, and low density of algae.

Related to pH is the measurement of acid neutralization(ANC) capacity and alkalinity. Both ANC and alkalinity measure the calcium carbonate buffering capacity of water. The level of alkalinity at 20 mg/L calcium carbonate measurements indicate that the lake has limited buffering capacity The ANC values are above those that are normally associated with acidification stress (ALSC 2005). The range of pH value and alkalinity may be reduced during spring runoff to levels that would interfere with fish reproduction. This would tend to occur when there is a deep snowpack.

Water Quality Summary

- Water quality data is limited for Lake Luzerne.
- Water quality information is consistent for years with above average rainfall.
- Lake Luzerne is a low to moderate levels of plant nutrients, and mid-range water clarity the lake has been rated as mesotrophic and continues to be mesotrophic.
- The water quality meets Class B standard for swimming.
- During the summer of 2019 water samples were taken and analyzed to help determine the water quality of the lake.
- Water chemistry results from the inlet to the lake show low phosphorus and chlorophyll *a* readings, which indicate that the water quality coming into the lake is relatively good.
- Water clarity as measured by Secchi depth readings shows very little variation over 37 years. The 1999-2004 average Secchi depth was 13.8 feet while the average in 2019 was slightly less at 12.7 feet.
- Chlorophyll *a* (Chl-*a*) is a measurement of green plant pigment found in the water column. This value indicates the amount of algae in the water or how green the water appears. The Chl-*a* values varied from 0.98 ppb to 13.2 ppb (1982-2004) and an average of 3.4 ppb. The 2019 value was 2.39 ppb in the deep-water area of the lake west of the island and 2.17 ppb at the inlet of the lake. Chlorophyll *a* values are consistent over the 37 years.

Water Quality Data

Temperature and Dissolved Oxygen

Lake Luzerne is dimictic, meaning the lake stratifies thermally twice per year - under the ice (winter) and during the summer months. Winter stratification is limited to a temperature near $0^{o}C$ ($32^{o}F$) directly under the ice to $2^{o}C$ ($36^{o}F$) near the lake bottom (26 feet). Summer stratification generally occurs in late June, with formation of a thermocline (zone of rapid temperature change). The thermocline is found at between 10 and 13 feet deep (3 – 4 meters, see Figure 2). Once stratified, the deeper waters of the lake frequently begin to lose oxygen and by late summer, levels less than 4.0 parts per million (ppm) dissolved oxygen are common below a depth of 5 meters (19 feet). These low, deep-water oxygen levels were observed between 2003 and 2019. These oxygen levels are too low to support gamefish, although they may venture into these waters briefly to feed. The summer thermocline typically remains in place until early September when the lake cools and the waters once again fully mix (See Appendix B). Nutrients present in deeper parts of the lake are once again mixed with the surface waters, spurring the growth of algae and frequently causing a decline in late summer water clarity, observed by Secchi values.

Table 3 Profiles of Temperature and Dissolved Oxygen

Depth (m)	T (°C)	DO (mg/l)	% Saturation	Specific Conductance (uS/cm)
0	24.8	8.38	100.0%	126.4
1	24.2	8.36	98.8%	126.4
2	23.8	8.25	96.8%	126.4
3	22.5	6.96	79.9%	126.5
4	17.1	10.36	107.7%	126.6
5	13.2	9.4	90.4%	126.6
6	9.5	6.82	60.6%	126.6
7	8	5.7	48.9%	126.6
8	6.8	4.15	34.6%	126.5
9	6	3.45	28.2%	123.9
10	5.4	2.7	21.8%	123.6
11	5.2	1.8	14.4%	124
12	5	0.6	4.8%	123.8
13	4.9	0.5	4.0%	123.4
14	4.8	0.5	4.0%	123.5
15	4.8	0.5	4.0%	123.6
16	4.8	0.4	3.2%	123.4

	secchi (m)	4.6		

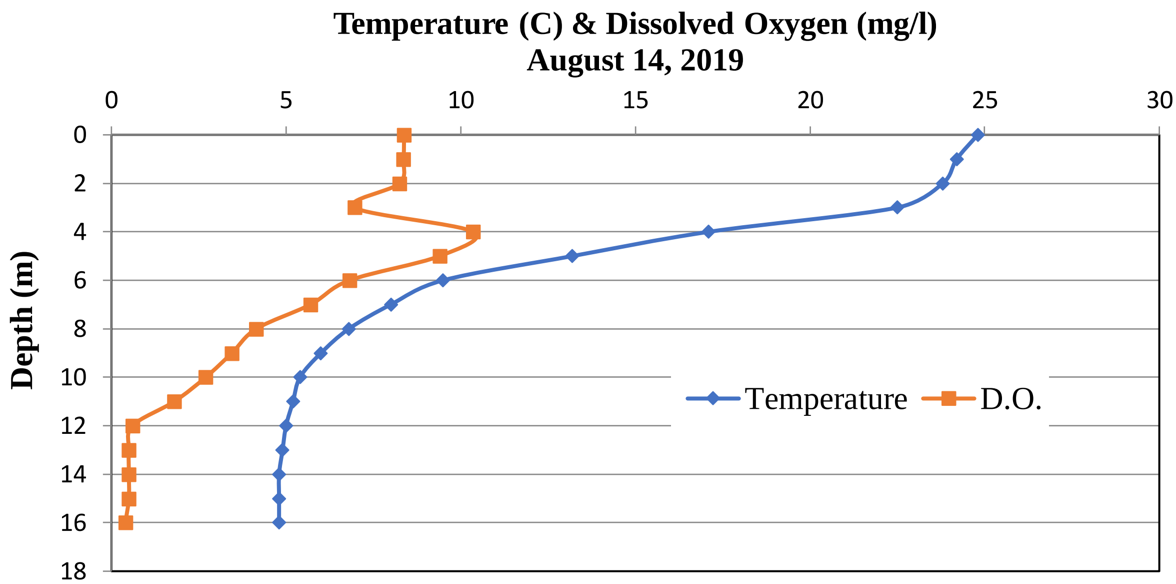


Table 4 Temperature and Dissolved Oxygen Trends for Lake Luzerne

Water samples have been obtained in the deep-water area that is 50 feet (14 m) deep east of the island and the shallow water sample depths at this location has been 1.0m-1.5 m (approximately 3-4 feet). The CSLAP program included water samples at depths of 9- 16m in the deep-water area. The CSLAP program is a cooperative project of the NYS Federation of Lake Associations, and the NYSDEC . This program trains lake associations volunteers to collect and process lake water samples. Water samples are taken during from June to October or November. The water samples are analyzed by an approved laboratory. Lake Luzerne association participated from 2000-2004 and collect water from both shallow and deep water. The NYS CSLAP data is available on the NYSFOLA web site https://nysfola.org/cslap-report-search/ .

The shallow water samples represent the quality of the water that is seen by most lake users . The deep water samples are most useful to understanding the annual nutrient loading to the lake, and internal loadings. Appendix 1 Shallow Water Samples provides the water quality data from samples collected by the volunteers of the CSLAP program, and the deep water samples collected during the same effort. The Secchi depth is a simple measure of water clarity that is taken with a black and white disk that is 200 mm (7 7/8 inches) in diameter that is lower into the water column until it is no longer visible. The Secchi for Lake Luzerne in 2019 was 3.5 m and 1982-2004 the average was 3.9 . The Secchi depth varied from a low of 2.0 m to a high of 5.6 m between 1999-2004. The low value was recorded in November which would have been after lake turn over. The CSLAP report for 2004 provides a detail summary of the water quality tests from that program. The 1999- 2004 Secchi average was 4.2, with a range of 2.95-5.64 m. The average in 1982 was 3.88 m and in 2019 3.5 m. This shows very little variation over 37 years and the 2019 values is based on three measurements.

Chlorophyll *a* (Chl-a) is a measurement of green plant pigment found in the water column. This value indicates the amount of algae in the water or how green the water appears. The Chl-a values varied from 0.98 ppb to 13.2 ppb(1982-2004) and an average of 3.4 ppb. The 2019 value was 2.39 ppb in the deep water area of the lake west of the island and 2.17 ppb at the inlet of the lake. The CSLAP 1999-2004 average was 3.10 ppb and ranged from 0.98 to 13.22 ppb (CSLAP 2004) . The 1982 average was 3.80 ppb. The Chlorophyll *a* values are consistent over the 37 years.

Total phosphorous (TP) mg/l or ppm is the measure of an important plant nutrient that is normally in a limited supply in freshwater lakes. Total phosphorous includes dissolve , particulate, phosphorous and phosphorous in bacteria or algae cells (Wetzel,1975). All these forms of phosphorous may enter the water column when water chemistry changes or by decomposition. On some occasions other phosphorous measurements are made of a water sample. Molybdate reactive phosphorous is the readily available phosphorous that can be immediately utilized by plants and bacteria. The measurement total filterable phosphorous is the dissolved portion of phosphorous and is abiotic. The range of values for total phosphorous was from 0.005-0.017 mg/l and the average was 0.009 mg/l . The peak concentration TP on 7/2/2002 did follow 1.6 inches of rain 6/26/2002, and 0.4 inches on 7/1/2002, peak on 6/11/2003 followed continuous rainfall between 5/24-31/ 2003. The CSLAP average for 1999-2004 was 0.008 mg/l of ppm and the range was 0.0005 to 0.017 mg/l. The 1982 average was 0.013 mg/l . There seems to be a trend towards lower TP values.

Nitrogen is another important plant nutrient that is measured in water. The common forms of nitrogen are nitrate, total nitrogen, nitrite and ammonia. Nitrite is rarely found in lakes. The nitrate level varied from non-detectable to 0.04 mg/l and the average 0.014 mg/l. The ammonia levels 0.01- 0.11 mg/l an average . The CSLAP average for 1999 to 2004 was 0.01 mg/l and a range of 0.00-0.04 mg/l (CSLAP 2004). The 1982 average was 0.03 mg/l .

Conductivity is a measurement of the amount of dissolve ions in the water. Water with high amount of dissolve ion have higher conductivity. The range of values was 35-106 *u*mhos/cm^2 and an average of 84.4 *u*mhos/cm^2 for 1982-2004. The CSLAP average from 1999 to 2004 was 93 *u*mho/cm^2 and a range of 59-106 *u*mhos/cm^2. The 1982 value was 53 *u*mhos/cm^2 and the 2019 was 132 *u*mhos/cm^2 .

The pH of water is the amount hydrogen ions in the water. Neutral lake water will have a pH of between 6.5-8.3 units that is caused by the equilibrium of calcium carbonate. When lake is acidified the pH will be below 6.0 units. The pH of Lake Luzerne was 6.5-8.2 units and average of 7.2 units. The CSLAP for 1999 to 2004 was 7.13 , and a range of 4.21 to 8.24.The 1982 pH was 6.83 and 2019 was 7.40 There does not appear to be a consistent seasonal pattern in the changes of pH.

Related to pH is the measurement of acid neutralization(ANC) capacity and alkalinity. Both ANC and alkalinity measure the calcium carbonate buffering capacity of water. The level of alkalinity measurements indicate that the lake has limited buffering capacity. .

Climate is a major factor in water quality on a year to year basis. The amount of, seasonal variation, intensity of precipitation all change how water enter and leave a lake in a given year. The amount of sunlight, ice in and ice out lake water heating and cooling among the items that will change both abiotic and biotic environment of a lake.

National Oceanographic and Atmospheric Administration (NOAA) collects assembles and interprets weather data in a wide variety of information summaries. NOAA prepared annual summary of precipitation based on a scale of 1- 110 with one being the driest year on record and 110 being the wettest year. This summary map data set started for the year 2001.
[https://www.ncdc.noaa.gov/temp-and-precip/us-maps/6/200109?products[]=regionalpcpnrank&products[]=statewidepcpnrank#us-maps-select](https://www.ncdc.noaa.gov/temp-and-precip/us-maps/6/200109?products[]=regionalpcpnrank&products[]=statewidepcpnrank#us-maps-select)

Table 5 Regional Weather Patterns April-September

Year	Numerical Rating	Text Description
2001	12	Below Normal
2002	71	Above Normal
2003	108	Much above normal
2004	110	Much above normal

During years with higher runoff the retention time will be shorter than expected estimate of 36 days.

Table 6, “Total Phosphorous and Secchi Depth,” illustrate the variation of these two measures during the years 1982-2004. The gaps in the information are during winter months when samples are not collected. It is normal for higher TP values to be followed by decreased Secchi depth as is shown for the 5/11/1982 and 7/2/2002. The increase in TP will cause a more rapid growth of algae which reduces water clarity. When algae response to TP concentration it verifies that the lake is most often phosphorous limited. Table 5 show a light blue line that is the trend line for TP, this indicates a decreasing level of TP.

Table 7, “Chlorophyll *a* and Secchi Depth,” illustrate the variation of these two parameters over the various sampling years. As the chlorophyll *a* increases the Secchi should decrease. The chlorophyll *a* is a measure of plant pigments and is in the greatest concentration when there is a large volume of algae in the water column. Some of the peak values are in the late season on dates of 10/2/2000 and 10/3/2003 and are likely due to in TP entering the water column from the lake bottom following mixing of the lake.

During the summer months as the lake water becomes warmer the lake will stratify since the cooler denser water will be isolated to the deeper water depths. The warm water will be found on the lake surface. The vertical temperature profile will show a zone of rapid temperature change of two degree Celsius over a single meter. This stratification zone or thermocline. The thermocline will prevent deep water from mixing with the surface water. At the bottom of the lake(hypolimnion) ,the water is sealed off from mixing and will become depleted of oxygen if there is enough bacterial decomposition occurring in the sediment of the lake. Once the oxygen is depleted then sediment and water chemistry shifts causing a release of phosphorus. The CSLAP program both shallow water and deep water samples were collected. The surface water average was 0.008 mg/l and deep water was 0.012 mg/l. This is a small increase in TP, but it will drive added algae growth when the lake mixes in the fall.

At the same time bacterial decomposition will cause the addition of nitrogen compound in the deep water zone. The surface water nitrate concentration for the years of 2002-2004 was 0.01 mg/l, and the deep water zone the nitrate concentration was 0.11 mg/l. During fall turn over or mixing of the lake this would be enough increase growth of algae in the lake.

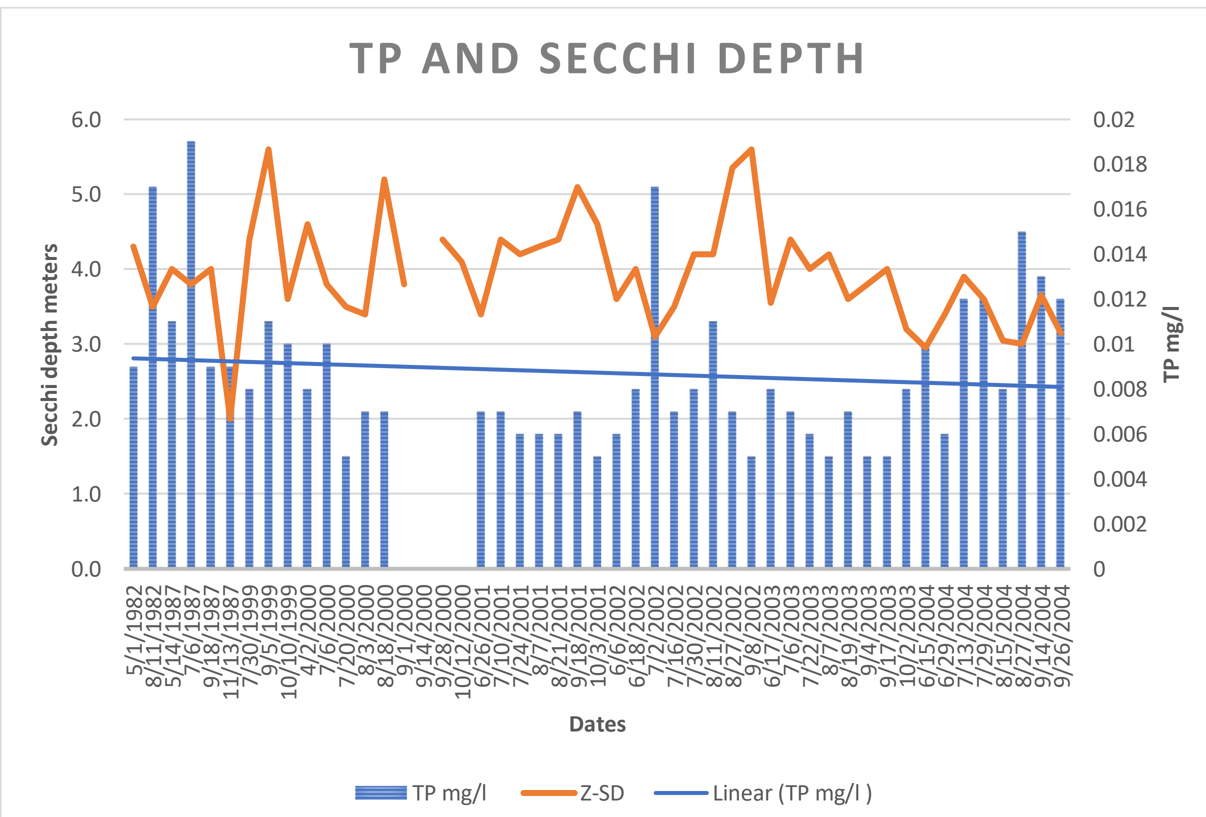


Table 6 Total Phosphorous and Secchi Depth Trends 1982-2004

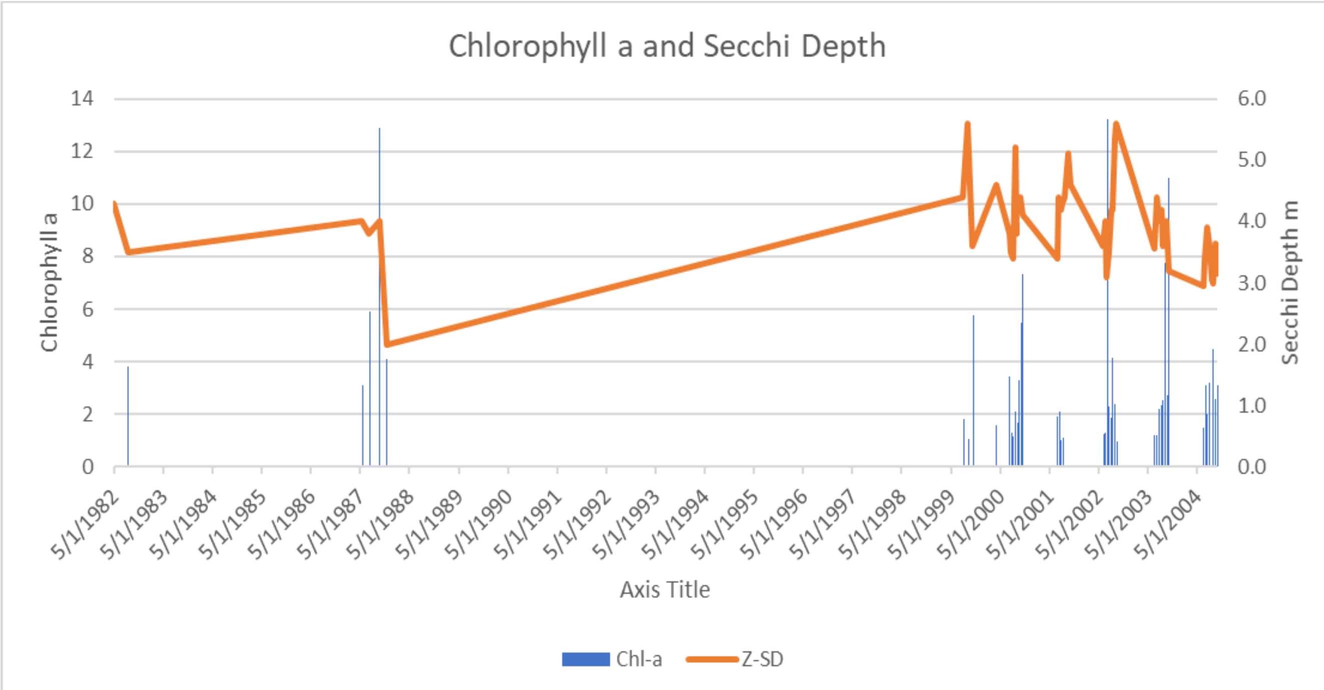


Table 7 Chlorophyll *a* and Secchi Depth Trends 1982-2004

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Lake Trophic Status

Lake trophic status is a general description of the productivity of the water body. The trophic status can be described based on the amount of TP or Chlorophyll *a* in the water, or the water clarity based on the Secchi depth. There are three general groups of lakes: low productivity lakes, oligotrophic, with low levels of TP and Chlorophyll *a* and good water clarity ; medium productivity lakes , mesotrophic with medium levels of TP and Chlorophyll *a* and somewhat limited water clarity: and nutrient rich lakes with high concentrations of TP and Chlorophyll *a* and very limited water clarity. Table 7 Trophic State Classification for New York State Lakes shows the parameters used to identify lakes by concentration of TP and Chlorophyll *a* and Secchi depth.

Table 7 Trophic State Classification for New York State Lakes

Parameters				**1999-2004**
	Oligotrophic	**Mesotrophic**	**Eutrophic**	**Averages**
Total phosphorous	0.0-0.010 ppm	0.01-0.020 ppm	Over 0.020ppm	0.008
Chlorophyll *a*	0-2 ppb	2-8 ppb	Over 8 ppb	3.8 ppb
Secchi Depth meters (m)	Greater than 5 m	2-5 m	Less than 2 m	4.1
TSI SD	Below 40	40-50	Over 51	TSI SD 4.0
TSI TP	Below 40	40-50	Over 51	TSI TP 36
TSI Chl *a*	Below 40	40-50	Over 51	TSI Chl *a* 44

NYSFOLA, 2009

The 1999- 2004 average value for the parameters used for trophic classification are also found in Table 8. The TP value indicates that the Lake Luzerne is oligotrophic, while the Chlorophyll *a* Secchi depth and TSI value indicate a mesotrophic lake.

Trophic State Index (TSI) is a numerical rating use identify or separate the various trophic state categories of oligotrophic, mesotrophic, and eutrophic. Table 7 provides the TSI categories. There are TSI indexes for Secchi, TP, and Chlorophyll *a*. (Kisbaugh,2011, and Cooke D.G.,E.B. Welch, S.A. Peterson, and S.A.Nichols2005).In 2019 a volunteer collect Secchi depths from June to September The average Secchi depth in 2019 was 3.9 m, while the 2001-2004 average Secchi depth was 4.0 m. The TSI Secchi for 2019 is 40.8 and TSI Secchi depth 1999-2004 was 39.4. The

TSI indexes for lake Luzerne are all at the boundary between oligotrophic and mesotrophic. Lake Luzerne 1999-2001 TP concentration was 0.008 ppm and the guidance value for TP (Table 7) of 0.0-0.010 ppm for oligotrophic lakes, this indicates that the lake is oligotrophic. The guidance values for Chlorophyll *a* and Secchi depth indicate that the lake is mesotrophic. In the past reports the lake has been considered mesotrophic and that is consistent with current information. Table 8, “Secchi Depth 1982-2019,” shows a gap in the record between 1982-1987, 1987-1999, and 2005-2019. Table 9, Secchi Depth 2019,” indicates readings taken by volunteers from the Lake Luzerne Association during the last summer season.

Table 8 Secchi Depth 1982-2019

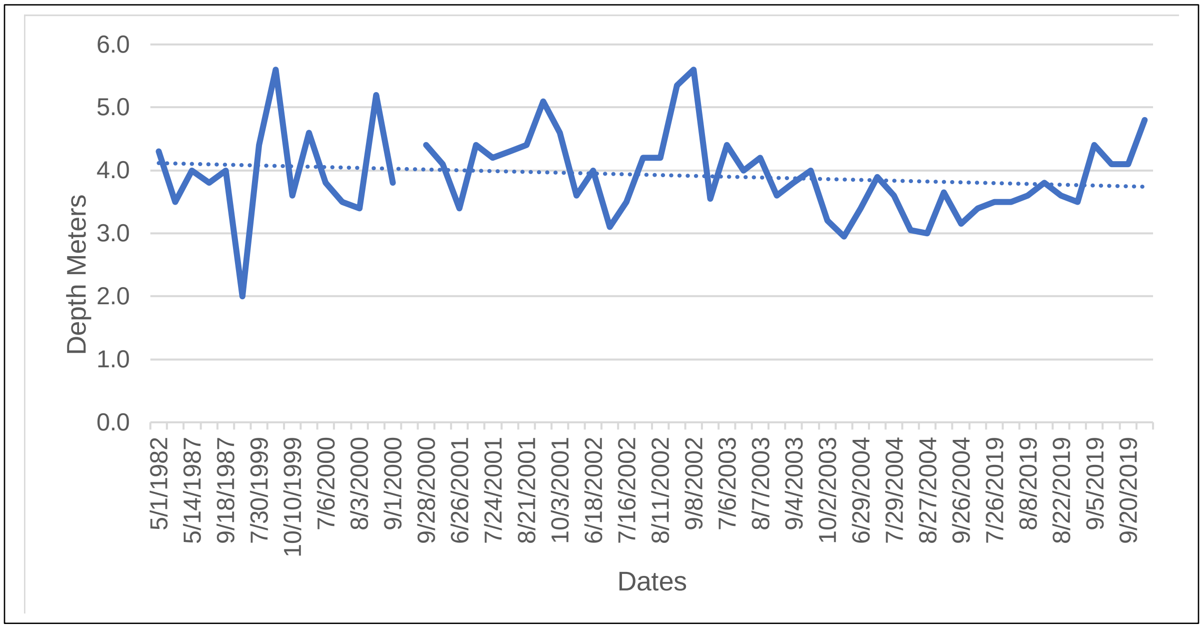


Table 9 Secchi Depth 2019

Date	Water Temperature Degrees @ 4 Feet	Secchi Disc Clarity (feet)	(meters)	Time
7/18/19	-	11.0	3.35	1:30
7/26/19	80	11.5	3.50	2:00
8/01/19	80	11.5	3.50	1:30
8/08/19	78	12.0	3.66	2:00
8/16/19	76	12.5	3.81	2:15
8/22/19	76	12.0	3.66	2:00
8/29/19	76	11.5	3.50	1:30
9/05/19	76	14.5	4.42	3:00
9/13/19	76	13.5	4.12	3:00
9/20/19	64	13.5	4.12	3:00
9/27/19	66	16.0	4.88	3:00
11 Week Average		12.7	3.87	

Note: As measured by Kevin McGuinn and Dave Tisch

Tributary Water Quality

There is one primary stream flowing into Lake Luzerne that comprises most of the lake's water budget: the outflow from Second Lake. This streamflow was measured at four different times in the Fall of 2000 to get a snapshot in time of the tributary component of the Lake Luzerne watershed. The streamflow ranged from 8 to 30 cubic feet per second (cfs) during this period, with an average flow of 15 cfs. This tributary provides the greatest surface water portion of the water budget for Lake Luzerne. Being the largest surface water source to Lake Luzerne, the outflow of Second Lake should be kept as clean as possible and future development and land use changes taken into consideration with careful planning. As mentioned earlier, this tributary was sampled four times in the Fall of 2000 to determine the water quality of the lake's inlet. Phosphorus and nitrogen levels in the inlet samples were found to be at levels at-or-below what was found in the lake proper. Although not a large scale sampling program, this information implies that the water quality coming into the lake is at least as clean as the lake water itself. This information was important when reviewing what portion of the overall watershed to review when looking for potential water quality impacts. With the inlet water quality being very good, it then follows that overall or localized water quality problems are likely coming from the watershed directly adjacent to the lake.

The only other tributary to Lake Luzerne is from Bullhead Pond. The Bullhead Pond outflow did not reach Lake Luzerne as surface water during the sampling period, but instead contributed to recharging the groundwater. During high flow events (after a storm event or spring melt) this tributary enters the lake as surface water.

To help determine the future of a lake in terms of its water quality and aquatic plant community, it is very helpful to evaluate past studies and try to determine a trend of what is happening. For Lake Luzerne, there are both historical water quality data as well as aquatic plant data. This section will look briefly at the water quality of Lake Luzerne.

In 1982 and 1987, the NYS Department of Environmental Conservation undertook water quality sampling on Lake Luzerne. In 1989, the RPI Freshwater Institute also undertook water quality studies of the lake and compiled a comprehensive assessment of the lake in 1990 (FWI Report 90-2, February 1990). The RPI assessment reviewed the earlier data and provided insights into the trends of water quality of Lake Luzerne, with recommendations regarding how to protect and improve this water quality. Their summary findings show that in that seven year timeframe, changes in the lake water chemistry were minor, however Secchi transparency was greater in 1989 than in either 1982 or 1987. The FWI Report 90-2 is comprehensive in a review of water quality and aquatic plant issues and concerns from that time period and serves as an excellent historical document for the lake. This report also provides recommendations for action in relation to these two issues. For more information on this report or its findings, it is available at the Darrin Freshwater Institute in the Town of Bolton, Warren County (518-644-3541).

To continue the evaluation of water quality trends in the lake, in 1999 the Lake Luzerne Association got Lake Luzerne admitted into the NYS Citizens Statewide Lake Assessment Program (CSLAP) for the ensuing five years. The purpose of the CSLAP program is to obtain some relatively general information on the lake's water quality for a five year period, to determine any problems or negative trends in the lake's water quality. In this program, volunteers from the lake association collected samples, offered them to NYS DEC for analysis, and collated the data via an annual CSLAP report. As of this time, the 1999 CSLAP report is complete, and summary results of this sampling period show the lake was in overall good health, with no obvious water quality problems detected.

The water clarity (determined by Secchi depth) during the 1999 sampling period ranged from approximately 4.5 meters in July, to almost 6 meters in September, to 3.5 meters in October. The nutrient levels (phosphorus) were low at levels of 8 to 11 micrograms per liter, which is typical of moderately unproductive lakes. These readings among other characteristics make Lake Luzerne would be classified as an "oligotrophic to mesotrophic" lake, which in plain language means that it is neither crystal clear nor heavily algae laden. Lake Luzerne, viewed from Wayside Beach

In comparison to the 1982 and 1987 sampling dates, the transparency of Lake Luzerne's waters in 1999 was relatively the same. Also, the phosphorus levels found within the lake in 1999 were like what was found in 1982 and 1987, within a total range of 8 to 19 micrograms per liter. For a full review of water quality parameter comparisons from 1982 to 1999, refer to the CSLAP Annual Report of 1999. Lake Luzerne will be in the CSLAP Program until 2003, at which time a full report on the findings and trends over the period of 1999-2003 will be presented by NYS DEC. This report will also review the overall trends from 1982 up until that time as well for a longer-term perspective.

In addition to the sampling of the lake proper, in July of 2000, the Lake Luzerne Association undertook water sampling of the two beach areas on Lake Luzerne. Joseph Bass III of JB3 Consulting took and analyzed water samples to determine if the bacteria levels at those beaches were within NYS Department of Health accepted levels. Results from various locations at both beaches showed that the coliform bacteria (both total and fecal) were well below DOH standards for contact recreation, swimming and diving.

Although Lake Luzerne has good water quality, it is important that people do their part to keep it that way. Small increases in phosphorus from lawn fertilizers or failing septic systems can cause increases in lake algae content and a corresponding decrease in water clarity and quality. Once a lake has reached a lower level of water quality, it is very difficult to regain its original state. Information on lake management and water quality is available through the Warren County Soil & Water Conservation District (518-623-3119), the Darrin Freshwater Institute (644-3541) and the NYS Department of Environmental Conservation (518-623-1200).

Coliform Sampling

At various times water samples for coliform bacteria analysis have been collect on Lake Luzerne. The coliform bacteria are found in the gut of animals and depending on the type of analysis other bacteria commonly found in the soil may be detected. The Total Coliform test will detect bacteria that are found and reproduce in the soil. The E. coli test is more selective and measures bacteria found in mammals and human gut. There are water quality standards for both Total Coliform and E.coli that are applicable natural surface water. Lake Luzerne is a Class B water and the management for the lake will support the continued us of the lake as a location for swimming (contact recreation). For contact recreation the E. coli level for a single sample is to be below 235 colonies per 100 milliliters (ml). On August 23, 2019 a complete set of 20 samples for E. coli analysis were taken along the entire shoreline of the lake. The values ranged from 1- 16 colonies per 100 ml. The highest value of 16 colonies per 100 ml. was at site 7 at the inlet of the lake, and next highest was 8 colonies per 100 ml at site 1 at the outlet.

Coliform samples were also taken on August 29, 2019 at various locations along the lake shore that had bottom dwelling algae or heavy vegetation growth on the shoreline. Four samples were taken, and the results were one or less than one for E.coli.

2.3 Aquatic Invasive Species Management

Introduction

Aquatic macrophytes or aquatic plants are necessary in a lake support a normal ecosystem that is fully functioning. Aquatic plants provide structure for biological community that supports bacteria and algae growth that supports phytoplankton, which in turns support zooplankton, these small plants and animals support young fish, that hide in the plants as they grow, and may eventually become game fish or support gamefish as a part of the forage system . Macrophytes stabilize sediment, produce oxygen, and create a community that will convert toxic compounds that may enter the water (NYSFOLA 2009). In this section the some of the results of the past macrophyte sampling since 1998 will be presented. This will include species present, limit of coverage in the lake and identification of the most common species.

Aquatic Invasive Species Management Summary

- Lake Luzerne has diverse and stable native aquatic plant community that will expand as EWM is removed.

-Eurasian watermilfoil growth has dominated several areas of Lake Luzerne for many years, including the outlet area, inlet area and the southeastern cove.

-The southeast cove of Lake Luzerne was treated with herbicide in 2010, and only a single stem of Eurasian watermilfoil was recorded in the post-treatment survey. In addition, there was very limited damage to long-term non target aquatic plant.

-Frequency of occurrence for Eurasian watermilfoil plants within the treatment zone declined from 58% of survey points pre-treatment to 3% post-treatment. The remainder of Lake Luzerne supported extensive growth of Eurasian watermilfoil in 2010.

-Since 2010, a general decline in relative abundance of Eurasian watermilfoil has occurred, most likely due to management efforts, while frequency of occurrence has increased slightly. The increase is almost exclusively found in the southeastern embayment due to Eurasian watermilfoil recovery since the 2010 herbicide treatment. The current survey results should continue to provide a baseline from which to assess future impacts of both Eurasian watermilfoil growth and management activities.

-Additional bathymetric mapping and plant biomass mapping(Biobase) would support EWM management planning and APIPP may be able to assist in mapping.

-Measuring the amount of work done annually is necessary to track the success of the management effort. Keeping records of diver time, or hours of pumping and measuring the treatment area so that changes in the plant community can be tracked are needed to determine the level of control.

-Underwater cameras are recommended to be used to record pre-harvest conditions, as another means of tracking progress.

-Lake Luzerne supports a diverse native plant community with thirty-three submersed species, three floating-leaved species, and five emergent species. An exotic, invasive aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*) was first confirmed in Lake Luzerne in 1989.

-Periodic hand harvesting efforts were conducted, however by 2004 Eurasian watermilfoil had expanded its coverage. The presence of a second invasive plant species, Curly-leaf Pondweed (*Potamogeton crispus* L.), was confirmed in 2004. In order to address the expanded growth of Eurasian watermilfoil, benthic barrier was incorporated in 2005. Continued expansive growth of Eurasian watermilfoil in the southeast bay spawned a desire to evaluate additional treatment alternatives. Permits were acquired and a sequestered treatment with the herbicide triclopyr () Renovate® was conducted in the Spring of 2010, greatly reducing Eurasian watermilfoil abundance in this area of the lake. Hand and diver assisted suction harvesting (DASH) have been conducted since that time. A third invasive species, Brittle Naiad (*Najas minor*) was first reported in 2019.

-Species richness in Lake Luzerne remains quite high with a total of 40 species recorded in open-lake surveys of Lake Luzerne in 2019, comparable to 27 species in previous surveys 1989 - 1992.

-The large number of aquatic plant species is a testament to the diversity of habitats present in Lake Luzerne and the exceptional water quality of the lake.

Past Aquatic Plant Surveys

Quantitative aquatic plant surveys were undertaken for Lake Luzerne, New York, to obtain post-treatment data for a Eurasian watermilfoil (*Myriophyllum spicatum* L.) management program based on diver assisted suction harvesting. The point intercept survey methods employed were designed to meet with NYS DEC Tier III Survey requirements. The current plant survey was designed to provide data comparable to earlier surveys by the author (Eichler et al. 1989, 1992, 1998, 2004, 2009 and 2010). The survey consisted of a) frequency of occurrence of all aquatic plant species for points distributed throughout the lake, and b) comparison of historical survey results to current conditions, with reference to changes in the relative abundance of Eurasian watermilfoil. During some years emergent marsh plants were not included in the surveys. For the review below it will focus on submerged plants and macro algae. Figure 8, "EWM Distribution in Lake Luzerne," illustrates the history of surveys conducted between 1990-2019.

The first comprehensive report on the aquatic plants was completed in the summer in 1989 (Eichler L. and J. Madsen 1990). This report identified 27 species of aquatic plants and macro algae. Eurasian watermilfoil (EWM) *Myriophyllum spicatum* was first identified in lake Luzerne during this survey. This survey mapped the areas that supported EWM. Lake Luzerne supports three other native milfoils *Myriophyllum sibiricum, M. tenellum, M,alterniflorum* https://plants.usda.gov/core/profile?symbol=MYSI.

On September 15 and 16 1990, the second plant survey was completed (Enviromed Associates 1990). EWM was found in the same locations as was reported in in the 1989 survey (Madsen J. L. Eichler 1990), some EWM beds had become larger and perhaps denser. A limited amount of hand harvesting of EWM starting in 1990.

The next survey occurred in 1992. Dense growth of EWM were found at 11 locations, covering approximately 1.4 acres.

The third report was complete in 1998. There were 33 submersed aquatic plants and macro algae found during the survey. EWM was the second most abundant aquatic plant found in the lake. The EWM was commonly found in depth of 1-3 m (Eichler l. and E. Howe 1998) .

In 2004, the next survey was completed and found 39 submersed aquatic plants and macroalgae species. EWM had expanded to cover 4% of the lake or 3.9 acres. EWM was the third most abundant plant species found at Lake Luzerne (Eichler L. and C. Boylen 2004).

The 2007 report was prepared as a progress report to measure the results of placing ten ,100 sf of benthic barriers or mats to control dense growth of EWM. Some of the dense growth of EWM found in 2004 had reduced growth. There were 50 sample sites and 28 contained EWM. Rake samples are rated as trace, sparse, medium and dense. The 2007 samples containing EWM included 13 trace, 9 sparse,2, medium and 4 dense(King, 2007).

In 2009/2010, the next aquatic plant survey was completed. The 2009/2010 survey found 28 submersed aquatic plants and macroalgae. The 2009/2010 report was recompiled following the 2010 spring Renovate® treatment in the southeast bay was successful and a high level of EWM control was obtained. Limited non-target species damage was noted but non-target plants re-covered by 2011. The post treatment survey found that *Potamogeton amplifolius, Elodea canadensis,* and *Utrcularia minor* frequency of abundance decreased by 7.9%, 23.2% and 44.7%. each species recovered by 2011(Eichler L. 2009/2010).

In 2011, the aquatic plant community was assessed following the treatment of the south east bay with Renovate®. This was a comprehensive survey with 95 survey points. There were 38 species of aquatic plants and macroalgae found in the lake. In the south east bay only a single EWM plant was found in the bay. Outside of the south east bay 23 of the samples had EWM and 16 samples were dense or dominated by EWM (Allied Biological, 2011).

In 2016 and 2018, the Adirondack Aquatic Invasive Species Survey completed sampling at Lake Luzerne. In 2016 the search of the littoral zone included surface observation and rake toss sampling. This effort identified that much of the littoral had a scattering of EWM and areas of dense beds. The dense beds were in locations identified by prior investigation described above and illustrated below.

In 2018, Adirondack Aquatic Invasive Species Survey revisited Lake Luzerne and used Biobase software that integrates Geographic positioning System (GPS) and fish finder (SONAR) to create an estimation of the biodensity. The Biobase system does not identify plant beds but provides mapping of the extent of plant beds. To identify the plants requires surface observations or diver observations, or rake toss sampling. The mapping results show dense areas of plant life in many of the same locations that continue to support EWM.

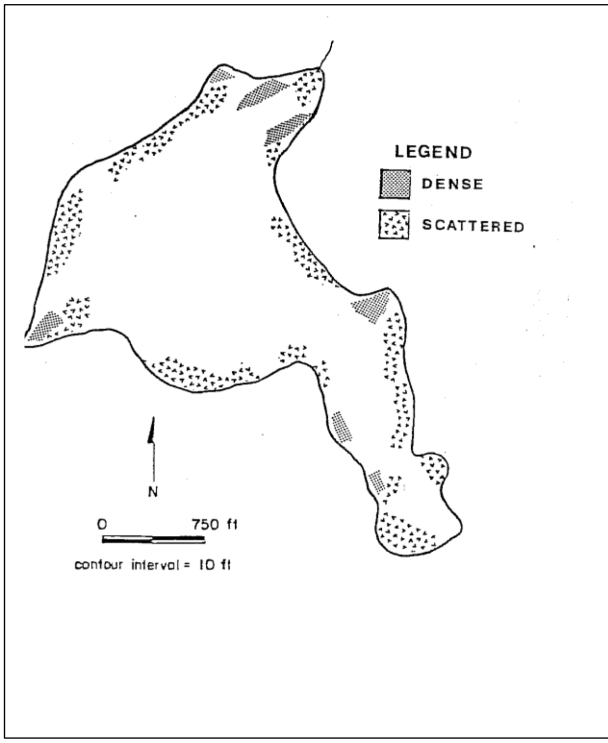
In 2019, an aquatic plant survey was completed with 155 sample points in the shallow water area of the entire lake. A total of 40 aquatic plant and macro algae species were found in 2019. Robbins pond weed was the most common plant found in 45% followed by Chara found in 37% of the samples and EWM was found in 32% of the samples. Comparing the frequency of occurrence between 2010 and 2019 shows that the plant community is stable. Between 2010 and 2019, a total of 19 species declined with eight species per cent frequency decreasing by only 1%. Seventeen plants increased in distribution. EWM was found in at trace level at eight sites scattered density at 32 sites, five sites with moderate density. The heaviest concentration of EWM was west of the island (Eichler L.2019). See Appendix D for the complete report.

Eurasian Watermilfoil in Lake Luzerne

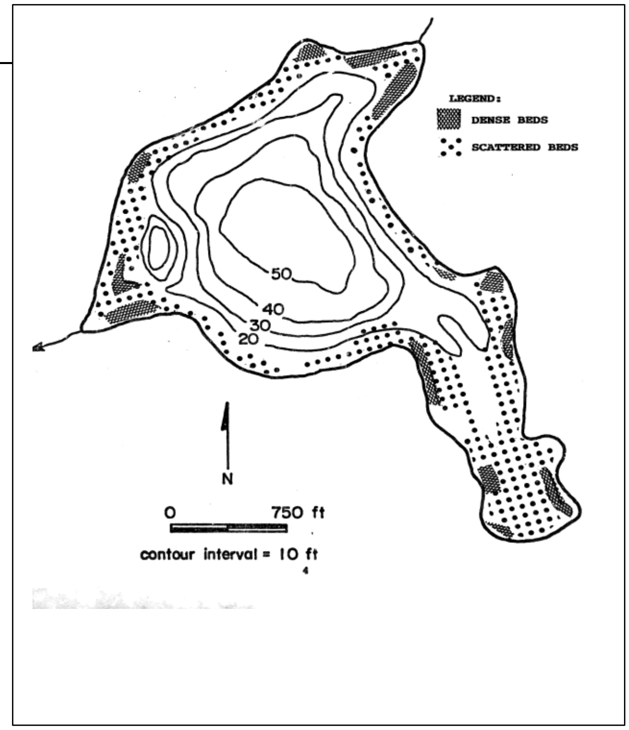
EWM was discovered in Lake Luzerne in 1989, four years after the finding EWM in Lake George in 1985. In Section 5.2 is the description of the eight aquatic plant surveys on Lake Luzerne from 1990-2019. Many of the aquatic plant surveys have been completed by the same lake researchers over the 29 years. This section presents a discussion of the biology of EWM, a review of the past surveys of EWM, and interpretation of the trend of EWM growth.

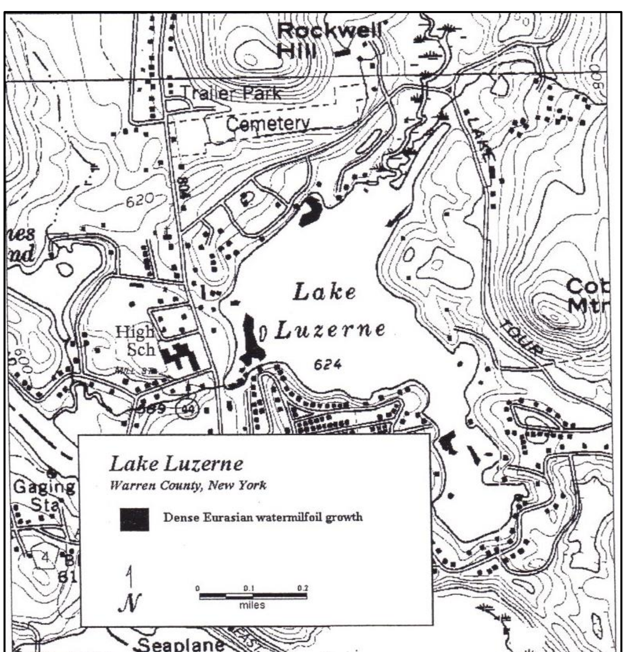
Figure 8 EWM Distribution in Lake Luzerne

(A)9-1989 Madsen J. and L. Eichler 1990

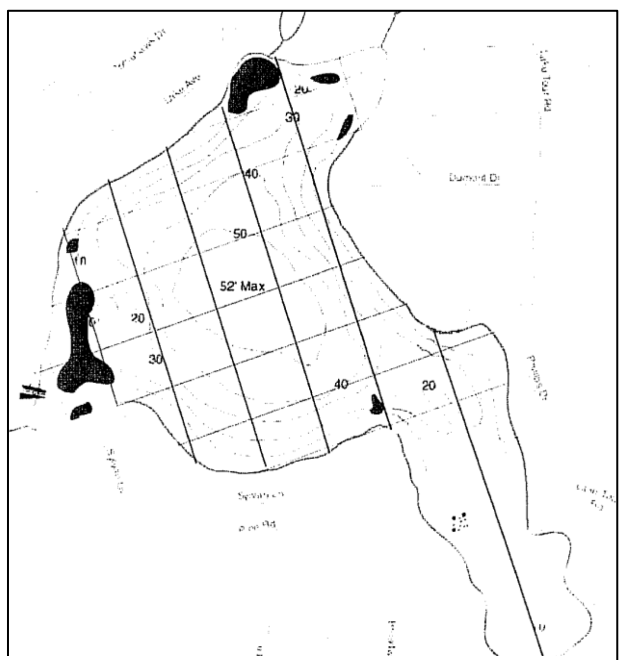


(B) 8-1990 Envriomed Associates 1990



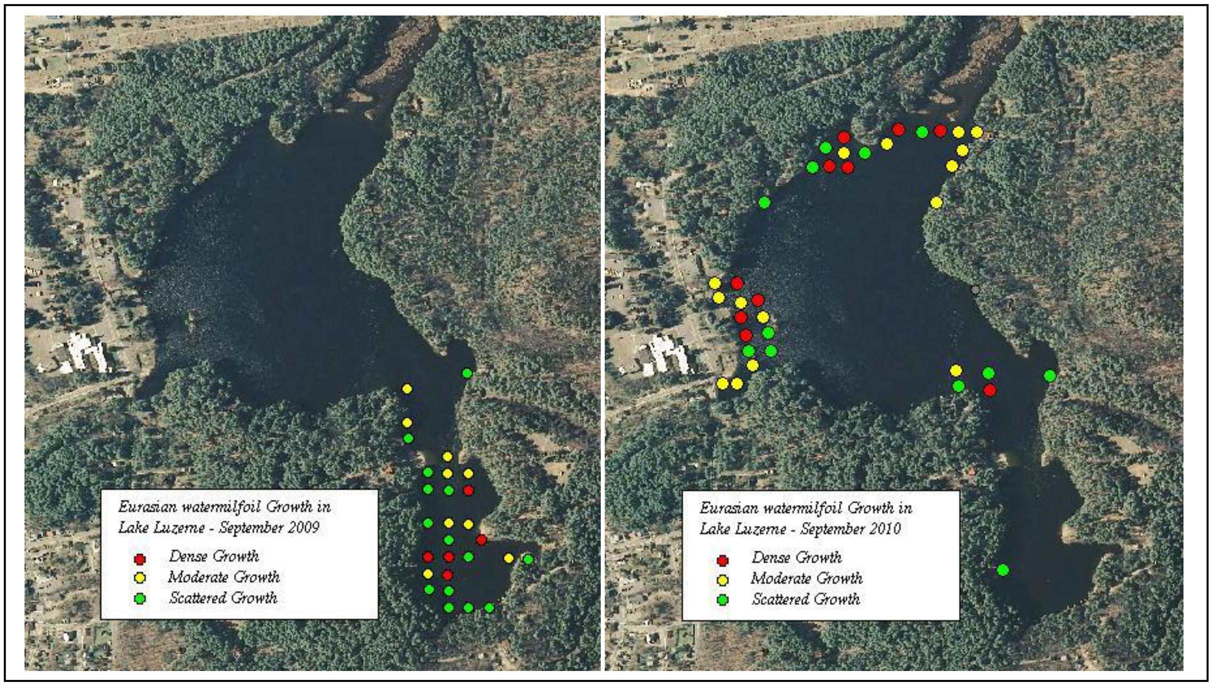


(C) Eichler L. and C.Boylen,2004

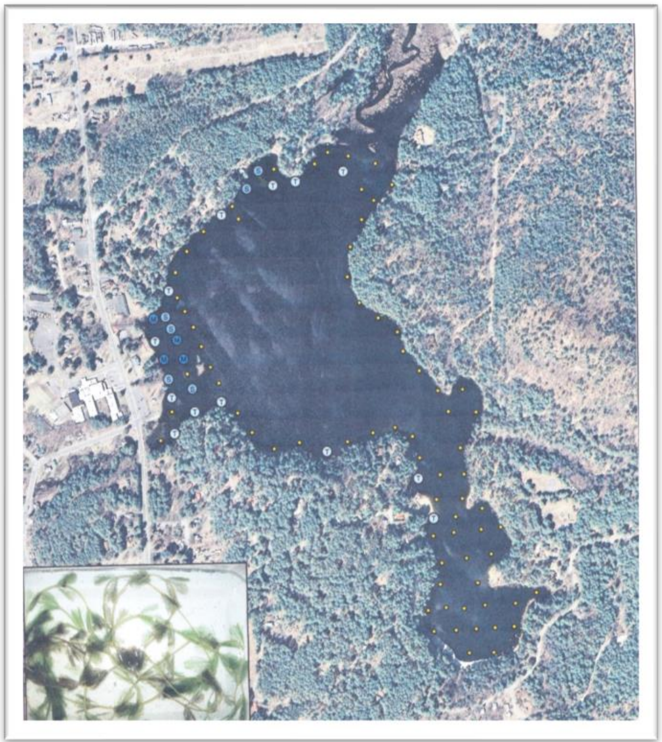


(D) King 2007

(E) Eichler L. 2009, Left image 9/2009 and (F) Right image 9/2010



(G) Post treatment with Renovate ® in 2010.



(G) Allied Biological 2011, the yellow dots are the sampling locations and the dots with small letters is the density of EWM, this is the post treatment with Renovate ® in 2010.

(H) Lake Luzerne EWM distribution 2019 (L. Eichler 2019)

EWM is an aquatic invasive plant that will respond differently depending on the conditions in the lake. The plant has different growth characteristics in warm water, or eutrophic, and oligotrophic clear water lakes(Smart C.S. and J. W. Barko, 1990). The plant grows well under a variety of conditions including different sediment texture and at different depths. The plant does not require seeds in order to spread or grow new plants, small stem fragments will produce new plants well as the stolons (stolons are stems that lay flat and support both leaves and roots). Vegetative spread occurs by auto-fragmentation and mechanical fragmentation (allo-fragmentation). The auto-fragmentation segment is created by the plant at the upper 6-12 inches of the plant. This auto-fragmented segment will include multiple leaf nodes and root like hairs ready to grow once in contact with sediment. The EWM plant also produces a stolon found in the sediment and root mass. The stolon generally supports localized growth and this re-growth peaks in mid-summer. Work at Lake George found that localize spread of EWM was caused by stolon growth, 87 % of the spread and fragments accounted for only 13% of the plant expansion (Madsen et. El. 1988), (Madsen J.D. and D.H. Smith 1997).

In northern clear water lakes EWM has period of rapid growth during the summer with a die back in September of 10% of the plants and senescence in the fall when plants stop growing and fall out of the water column (Madsen et. el. 1988). During winter months EWN can be seen at the bottom of clear ice in shallow water.

EWM rapid early season growth contributes to its ability to form dense surface mats that will interfere with the growth of native species. This has been observed at both Lake George and Saratoga Lake(Madsen J.D. et.al. 1991), (SLPID 2006,2019). Once the surface mat of EWM is formed native species will decline once native species have declined native fish populations will be harmed (Madsen).

Management of EWM is difficult and there have been unsuccessful efforts to control its growth in any number of locations. At the same time in some locations EWM growth or spread has ceased for unknown reasons, therefore with or without control efforts sometimes the plant stops spreading (Helsel D.R.,S.A. Nichols and R.S. Akeman 1999). At Saratoga Lake by a combination of draw down, harvesting and chemical application EWM mats have been eliminated and it is at a level of under 30% frequency in 2018. EWM in Saratoga Lake was at 60 % frequency in 2005 and was clearly the dominate plant. Herbicide applications targeting EWM at Saratoga Lake have occurred annually, since 2007 except in 2014 and 2016 when herbicides were not applied to control EWM, yet in non-treatment years the EWM did not exhibit rapid spread. Renovate® has been successful in both controlling large 100 acre and small 10-acre treatment zones.

In Lake George, the Lake George Park Commission believes that by 2021 EWM will no longer be in dense colonies or topped out on mats (LGPC website). Lake George is using a combination of benthic mats, diver-assisted suction dredging and diver hand harvesting. The Lake George Association has been leading the EWM harvesting program over the last few years. At some sites there is consistent progress towards eliminating the EWM with a trend towards decreasing harvest each year. At other sites there is less progress with variable amounts of EWM collected or increasing amounts of EWM harvested (AECDS 2018).

At Upper Saranac Lake, EWM has been controlled by hand harvesting by divers using hookah air support divers and SCUBA divers. This hand harvesting program has been intensive and required multiple re-visits site during the season to collect the remaining individual stands of EWM (AIM 2017). EWM has been controlled to an extent that the harvesting effort is now only targeting individual plants and clusters of EWM. The project harvested 307.5lbs in 2015, 318.75 lbs.in 2016 and 330.75lbs. in 2017 from all the 39 sites being harvested. At the same time, between 2015 to 2017, in 21 of the 39 sites the amount of EWM harvested has stayed the same or decreased. The remaining 18 sites the EWM volume and stems have increased.

To control or limit the amount of EWM in a water body requires consistent implementation of a control plan that is adequately funded year to year to suppress the spread of the plant. At a specific location, the control effort needs to kill or remove the stolon to be successful. An observation that is common to on-going hand harvesting or DASH collection of EWM is that once the large dense areas are controlled it take more time to find and remove the low-density areas of EWM.

The results of the EWM surveys for Lake Luzerne since 1990 are shown above in Figure 8. The surveys show that EWM beds have been in nearly the same locations since 1990. This is consistent with spread or re-growth by stolons. There was a change in the distribution of EWM as the result of the Renovate® application in 2010, see the Figures 8 E, F, and G for 2009 pre-treatment compared to 2010 and 2011 post- treatment. The Renovate® application eliminated EWM from the southeast bay for some period, and currently EWM in the bay is found in many of same locations where it was located prior to treatment in 2010. In 2010, there were two samples that had dense EWM plant coverage. Comparing the 2010 plant survey (Eichler L. 2010) and the 2011 (Allied Biological 2011), demonstrates that the Renovate® application was successful in selectively controlling the EWM. The EWM was found in a single location in 2011 in the treatment area. The only change in plant cover was the reduction in clasping pondweed, from many locations in the southern embayment treatment area, while Variable and Vasey's pondweed distribution increased. There was no change in elodea, or Robinson's pondweed. Clasping pondweed is identified as intermediate or tolerant of Renovate® active ingredient Triclopyr. The 2019 survey does not show dense EWM cover in the southeast bay.

The suction harvesting effort is limiting the spread but not eliminating EWM from Lake Luzerne. The objectives of the EWM program need to be well defined. It is feasible to eliminate EWM using herbicides. A newly approved herbicide known as ProcellaCor® is more selective than Renovate®. ProcellaCor® is so selective that it can be applied in the summer when the EWM is readily visible. If the objective is to eliminate EWM from Lake Luzerne, ProcellaCor® should be considered as a treatment option. Gaining a high level of control with use of herbicide would allow the suction harvesting team to focus on few remaining plants and possibly fully eliminate the EWM from the lake. Over a period of years using hand and diver assisted suction harvesting supported by accurate records on harvesting locations, EWM could effectively be eliminated. However, the cost will likely increase since searching hours will increase as greater levels of control is achieved.

3. Lake Management Issues

3.1 Wastewater Management

On-site wastewater treatment systems (septic systems), when properly designed, installed and maintained, have no adverse impacts on water quality or public health. When one of these three criteria fall short, there may be impacts to water quality of a nearby waterbody. In addition, there may be health concerns related to improperly treated septic effluent, as bacteria may reach the groundwater and may end up in a private or public well. Effluent from a standard septic system flows out of an absorption trench or a seepage pit and into the ground where the soil provides the final treatment and uptake of nutrients and pollutants. If the system is very old or is not properly maintained, it has a good chance of failing and not providing the treatment that it should. This is a major concern especially on lakes where lot sizes are small and many of the septic structures on these lots are older.

Lake Luzerne has numerous year-round residences and camps upon its shoreline. Many of these residences were built in the mid 1950's and 1960's, when less concern was given to the potential development impacts upon the water quality of the lake than is today. The building lot sizes around the southern side of Lake Luzerne are relatively small, with camps and small homes built close to the shoreline. As many of these structures were seasonal camps, the septic systems generally consist of small septic tanks and seepage pits. There is little room on most of these lots for a standard leach field type system, and therefore very few are likely to exist. The issue that arises is the level of treatment that the septic effluent receives may not be as high as on a larger lot with a leach field system because the effluent is localized in a seepage pit. In addition, many of the residents on the lake do not know exactly what type of septic system is located on the property. This is a concern because it increases the likelihood that this system has been properly maintained.

Most of the residential development within the watershed is clustered on the southwest corner of the lake. The soils at this location (as seen in gray) are Oakville loamy fine sand. As defined in the Warren County Soil Survey, these soils "are used as sites for septic tank absorption fields, and therefore ground water contamination is a hazard because of poor filtering of effluent." In the "Sanitary Facilities" table of the soil survey, it is stated that there are "severe" limitations on siting of septic tank absorption fields due to these soils being a poor filter.

The poor filtering capability of the Oakville soils increases the possibility that some improperly treated septic effluent reaches the lake. However, this has not been documented, and summer 2000 bacteriological sampling of the two public beaches and around the entire perimeter of the lake revealed that bacteria levels were within state guidelines for contact recreation. A shoreline water quality sampling program geared to determining septic influences should be undertaken to more quantitatively determine if there is a problem which impacts the lake.

3.2 Stormwater Management

One of the primary factors in lake quality and health of the aquatic ecosystem is the quality of the runoff which enters the lake. As land gets developed and roads are constructed, the flow patterns of rain runoff get altered in these areas. In most cases, runoff which once infiltrated into the ground before development now runs off into drainage ditches and storm drains. The eventual outlet of these storm drains and ditches is the lowest point in the area, which is usually the lake itself. The result is a larger amount of surface runoff going directly into the lake. In many cases the water quality of this runoff is generally less than it would have been under undeveloped conditions. As this runoff flows across blacktop and other impervious surfaces, it picks up contaminants on the road such as salt and sand from winter de-icing operations, oil and other chemicals, metals, and possibly fecal coliform bacteria from animal wastes. These pollutants are conveyed into the lake via the constructed drainage system, i.e. the stormwater inlets and pipes and roadside ditches.

Lake Luzerne, like most other developed lakes, has this type of roadside drainage network surrounding the lake. Every road within the Lake Luzerne sub-watershed was evaluated on site for potential road runoff impacts to Lake Luzerne. Even with the extensive road network, fortunately there is only one section of road or highway that drains into the lake - Route 9N near the high school. Fortunately, in the case of Route 9N, there is no commercial development such as gas stations, convenient marts, large parking lots and other surfaces which might harbor potentially harmful substances on their surfaces. This is significantly positive in terms of the runoff water quality. The only contaminants coming from this section of highway should be winter road de-icing products (salt and sand), possibly some oil and grease and anti-freeze from leaking automobiles, fecal coliform bacteria from animals, and thermal impacts from hot road surfaces. To date, there has been no comprehensive study of the water quality of the stormwater coming out of these culverts, and therefore no quantitative measure can be given herein. However, the above-mentioned pollutants are likely present on this roadway to some degree based on visual inspection, mandatory roadway maintenance (de-icing activities), and common sense. With having just one area, it will be easier to concentrate on a potential solution that would allow the stormwater to be treated before it goes into the lake.

Overall, the impacts to Lake Luzerne from road runoff are moderate and can be minimized through some roadside drainage improvements.

Specific Recommendations for Stormwater Management

1. The Wayside beach site can be modified to reduce most of the runoff in a simple fashion by utilizing green space on the side of the access road. A slotted trench drain can be installed to capture all the runoff draining off the top of the access road, down to about the midpoint of the road. The water could then be conveyed through a biofiltration system, then outlet to the lake. This system can be installed at the bottom of the grassy area above the beach and could be open channel, closed or a combination. This would leave just a minor section of access road that receives no treatment, but due to the limited size of the impervious area and the elevation and proximity to water, the cost would likely exceed the benefits.

2. The drywell at Pierpont Beach captures some of the volume, but it appears that the paving could be modified to allow for better capture. Above the drywell there is a macadam swale on the inside of the road that conveys the runoff towards the system. Water that does not make it into the drywell continues down a sluiceway along the property's edge and outlets to the lake, with minimal treatment. It may be possible to alter this to a permeable type system that allows for shallow infiltration or capture it in a catch basin, then send it to an infiltration system under the road.
3. Stormwater runoff also concentrates on the outside of the road/parking area, along a stone wall. This water goes to a drop inlet in the parking lot, which is then culverted under the access road to the sluiceway down to the lake. The same type of application as discussed in (1) may be applicable for this site as well. Infiltration near the wall is not recommended as there could be a potential oversaturation of the soil, in proximity to the retaining wall.
4. At Sylvan Road, due to the depth of groundwater and existing grades, it is recommended to install several drop inlet structures to capture runoff and allow for some sediment settling and convey the water to a raised bed/timber bio filtration system. The drop inlets would move the water with no erosion and would provide some pretreatment. The vegetated beds will take up nutrients and bacteria and provide a final "polishing" effect. The filtered water could then be sent to the lake through a small rock lined ditch and as an additional benefit, the overall look of the area is enhanced.
5. Work with landowners to provide education on what can be done at a home to reduce excess water running from a property and to reduce water quality impacts. Rain barrels, green space protection, infiltration and filtration through green infrastructure would go a long way in protecting Lake Luzerne, which in turn provides significant economic sustainability for the town.
6. Evaluate the potential of utilizing prefabricated porous concrete sidewalk panels when replacing existing solid concrete sidewalks. While there is maintenance for these panels in the form of vacuuming debris 2-3 times a year, the panels allow for infiltration of water into their subbase, reduces or eliminates heaving as the act as vapor breaks and reduces the volume of sand and salt necessary during winter, since they don't hold water.
7. Work with NYSDOT to address the two identified areas of concern on Route 9N. These will be expensive projects but getting them in front of the NYSDOT is critical as they can be evaluated and potentially added into a capital project for the future.
8. When conducting any type of ditch maintenance activity, if there is vegetation removal or soil disturbance, erosion control practices should be applied as soon as possible. The Warren County SWCD provides a hydroseeding service at no cost to municipalities when water quality is a concern.
9. Encourage your municipal employees to attend stormwater and erosion control trainings when offered. Reducing stormwater and erosion often leads to a reduction in maintenance costs and issues, which in turn frees up time and money to be utilized for other projects.

4. Recommendations for Lake Management

RECOMMENDATIONS AND IMPLEMENTATION STRATEGIES

Water Quality Recommendations

1. The Lake Luzerne Association should join the New York State Federation of Lake Associations (NYSFOLA) and enroll in the Citizen's Statewide Lake Assessment Program (CSLAP), a water quality testing program conducted by volunteers and supported by NYSDEC and NYSFOLA.
   Implementation Strategy: Make a 5-year funding commitment to CSLAP and form a volunteer team of individuals that can complete simple water quality tests and annually report on general conditions of the lake.

2. The Town of Lake Luzerne should conduct a study of the Lake Luzerne sub-watershed (below Second Lake outlet) to determine the source of pollutants.
   Implementation Strategy: Request Warren County Soil & Water Conservation District to conduct this study. Continue to test coliform levels at the Second Lake inlet on an annual basis.

3. The Town of Lake Luzerne should undertake an annual shoreline water quality sampling program geared to determining septic influences to more quantitatively determine if there is a problem which may be impacting the lake.
   Implementation Strategy: Develop a shoreline water quality sampling program with consultants and Darrin Freshwater Institute. Consider funding sources through NYSDEC's Technical Assistance Program.

4. The Town of Lake Luzerne should work with NYSDOT to address the two identified areas of stormwater runoff concern on Route 9N.
   Implementation Strategy: Request a proposed course of action with WCSWCD.

Invasive Species Management Recommendations

5. The Town of Lake Luzerne should continue and intensify the diver and suction harvesting program. Refine the program to go beyond managing vegetation on an annual basis. Measuring the amount of work done annually is necessary to track the success of the management effort. Keep detailed records of diver time, or hours of pumping and measuring the treatment area so that changes in the plant community can be tracked. Map annual the annual harvesting effort on a simple map that has a grid with letters and numbers so that each grid square can be recorded as work is completed.
   Implementation Strategy: Replace current program with a structured, consistent and sustained program that tracks and records all areas monitored and/or worked on using GPS. Carefully record the location and amounts of vegetation extracted daily. Intensify

suction harvesting efforts for 2020. Purchase an underwater camera to record pre-harvest conditions.

6. The Town of Lake Luzerne should investigate the feasibility of using the new herbicide known as ProcellaCor® to treat aquatic invasive species in the south bay.
   Implementation Strategy: Work in partnership with the Lake George Park Commission to find an approach for chemical treatment to the Adirondack Park Commission.

7. The Town of Lake Luzerne should file an application for the February 2020 of funding for lake management techniques through the NYSDEC's Terrestrial and Aquatic Invasive Species Rapid Response Program.
   Implementation Strategy: Identify the appropriate project and apply for funding with the assistance of a consultant.

Outreach and Education Recommendations

8. The Lake Luzerne Association should provide residents with educational materials that show how to minimize their use of phosphorus and reduce excess runoff and erosion from a property such as the use of rain barrels, green space protection, infiltration and filtration through green infrastructure. Small increases in phosphorus from lawn fertilizers or failing septic systems can cause increases in lake algae content and a corresponding decrease in water clarity and quality.
   Implementation Strategy: Investigate appropriate educational materials from WCSWCD and FOLA which could be distributed to residents.

9. In partnership with the Lake Luzerne Association, the Town should erect strong signage about the Clean Drain Dry program at the launch and encourage self-inspections of all small boats entering Lake Luzerne.
   Implementation Strategy: Consult the NY Federation of Lake Associations for the type of signage and language that most effectively conveys the Town's intentions to keep new invasive species out of the lake.

APPENDICES

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Appendix B

Water Quality Statistical Summary – 2019

Date	TP mg/l	Z-SD	Chl-a	Location	Depth m	Nitrate	Ammonia mg/l	TDNmg/l	TN/TP	Tcolor	pH	cond. microoh mns	Ca mg/l	Alkalinity	CHl.a ppb	ANC	SO4 mg/l	MRP mg/l	TSP	Program
5/1/1982	0.009	4.3		Deep	1	ND					6.5	35				80			0	
8/11/1982	0.017	3.5	3.8	Deep	1		0.01	0.3			7.15	71			3.8	200		0.001	0.008	
5/14/1987	0.011	4.0	3.1	deep	2	0.05	0.018	0.09		15	7	57			3.1	140	7.8		0.005	
7/6/1987	0.019	3.8	5.9	deep	2	0.04	0.023	0.16		26	7.3	58			5.9	160	6.9		0.004	
9/18/1987	0.009	4.0	12.9	deep	2	nd	0.05			22	7.25	67			12.9		6.8		0.003	
11/13/1987	0.009	2.0	4.1	deep	2						7.1	57			4.1		6.7		0.004	
7/30/1999	0.008	4.4	1.84	deep	1.5	0.01				12	7.22	100			1.84					CSLAP
9/5/1999	0.011	5.6	1.09	deep	1.5	0.01				12	7.75	104			1.09					CSLAP
10/10/1999	0.01	3.6	5.75	deep	1.5	0.02				19	6.45	92			5.75					
4/2/2000	0.008	4.6	1.6	deep	1.5	0.01				16	6.19	59			1.6					
7/6/2000	0.01	3.8	3.42	deep	1.5	0.03				19	7.86	77			3.42					
7/20/2000	0.005	3.5	1.32	deep	1.5	0.01				24	6.84	74			1.32					
8/3/2000	0.007	3.4	1.18	deep	1.5	0.02				19	7	77			1.18					
8/18/2000	0.007	5.2	2.1	deep	1.5	0.03				23	6.52				2.1					
9/1/2000		3.8	1.69	deep	1.5	0.01				22	7.29	83			1.69					
9/14/2000			3.28	deep	1.5	0.01				18	6.64	88			3.28					
9/28/2000		4.4	5.5	deep	1.5	0.01				16	7.7	89			5.5					
10/12/2000		4.1	7.35	deep	1.5	0.01				17	6.52	89			7.35					
6/26/2001	0.007	3.4	1.9	deep	1.5	0.02				18	6.81	77			1.9					
7/10/2001	0.007	4.4	2.1	deep	1.5	0.01				17	7.31	83			2.1					
7/24/2001	0.006	4.2	1.04	deep	1.5	0.01				16	7.29	91			1.04					
8/7/2001	0.006	4.3	1.11	deep	1.5	0.01				10	7.14	101			1.11					
8/21/2001	0.006	4.4	na	deep	1.5	0.01				11	7.77	102			na					
9/18/2001	0.007	5.1	na	deep	1.5	0.01				13	7.59	100			na					
10/3/2001	0.005	4.6	na	deep	1.5	0.01				13	6.98	100			na					
6/6/2002	0.006	3.6	1.25	deep	1.5	0.04	0.11	0.42	65.34	32	7.24	74			1.25					
6/18/2002	0.008	4.0	1.3	deep	1.5	0.03	0.03	0.36	45.17	23	7.18	77			1.3					
7/2/2002	0.017	3.1	13.22	deep	1.5	0.02	0.02	0.37	21.42	24	6.8	81			13.22					
7/16/2002	0.007	3.5	2.28	deep	1.5	0.01	0.04	0.44	62.55	16	7.44	84			2.28					
7/30/2002	0.008	4.2	1.89	deep	1.5	0.02	0.06	0.28	36.52	15	7.55	89	3.2		1.89					
8/11/2002	0.011	4.2	4.15	deep	1.5	0	0.02	0.32	30.31	12		92			4.15					
8/27/2002	0.007	5.4	2.42	deep	1.5			0.32	46.94	14	7.57	94			2.42					
9/8/2002	0.005	5.6	0.98	deep	1.5	0	0.01	0.55	102.56	11	7.43	97			0.98					
6/17/2003	0.008	3.6	1.21	deep	1.5	0.02	0.01	0.27	33.04	17	7.03	85	7.1		1.21					
7/6/2003	0.007	4.4	1.2	deep	0.3	0.02	0.02	0.31	44.25	14	7.47	96			1.2					
7/22/2003	0.006	4.0	2.19	deep	1.5	0	0.02	0.2	33.65	11	7.36	101			2.19					
8/7/2003	0.005	4.2	2.37	deep	1.5	0.01	0.06	0.26	49.3	17	7.19	99			2.37					
8/19/2003	0.007	3.6	2.53	deep	1.5	0.01	0.01	0.33	45.36	22	7.18	94	8.6		2.53					
9/4/2003	0.005	3.8	7.74	deep	1.5	0.01	0	0.4	79.77	19	7.36	95			7.74					
9/17/2003	0.005	4.0	2.71	deep	1.5	0	0.01	0.39	79.11	22	7.23	99			2.71					
10/2/2003	0.008	3.2	11.01	deep	1.5	0	0.02	0.3	36.35	22	7.12	89			11.01					
6/15/2004	0.01	3.0	1.5	deep	1.5	0.01	0.01	0.24	24.59	23	6.68	86	7.51		1.5					
6/29/2004	0.006	3.4	3.1	deep	1.5	0.01	0.02	0.2	32.97	25	6.68	97			3.1					
7/13/2004	0.012	3.9	2	deep	1.5	0.01	0.01	0.01	0.41	12	6.82	106			2					
7/29/2004	0.012	3.6	3.2	deep	1.5	0.01	0.01	0.37	31.55	23	7.52	96			3.2					
8/15/2004	0.008	3.1		deep	1.5	0.01	0.03	0.05	6.98	18	8.24	79	8.82							
8/27/2004	0.015	3.0	4.48	deep	1.5	0.01	0.03	0.03	19.77	28	7.72	71			4.48					
9/14/2004	0.013	3.7	2.6	deep	1.5	0.02	0.01			49	7.42	76			2.6					
9/26/2004	0.012	3.2	3.1	deep	1.5	0.02	0.01	0.52	44.64	24	7.15	62			3.1					
Average	0.009	3.9	3.4			0.014	0.023				7.178125	84.375								
ST Dev	0.003	0.7																		

Appendix C

National Land Cover Data Legend 2016

National Land Cover Data Legend 2016

Open Water: areas of open water, generally with less than 25% cover of vegetation or soil.

Developed, Open Space: Areas with a mixture of some constructed materials, but mostly vegetation in the form of grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Developed, Low Intensity: Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.

Developed, Medium Intensity: Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units

Developed High Intensity: Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.

Barren Land (Rock/Sand/Clay): Areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

Deciduous Forest: Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.

Evergreen Forest: Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.

Mixed Forest: Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.

Shrubland

Dwarf Scrub: Alaska only areas dominated by shrubs less than 20 centimeters tall with shrub canopy typically greater than 20% of total vegetation. This type is often co-associated with grasses, sedges, herbs, and non-vascular vegetation.

Shrub/Scrub: Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

Herbaceous

Grassland/Herbaceous- areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.

Planted/Cultivated

Pasture/Hay: Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

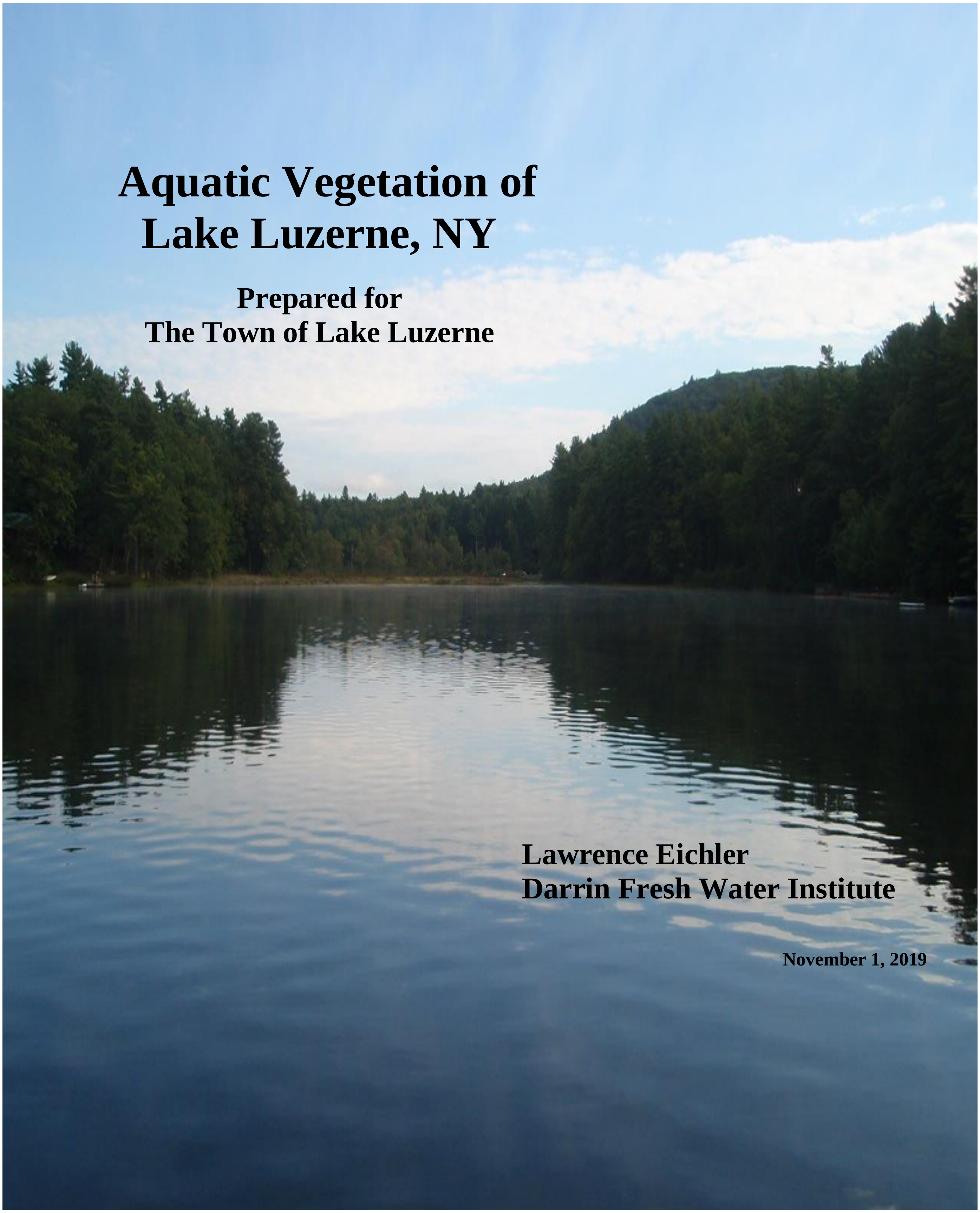
Cultivated Crops: Areas used to produce annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.

Wetlands

Woody Wetlands: areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Emergent Herbaceous Wetlands: Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Appendix D
Aquatic Vegetation of Lake Luzerne, NY 2019



Aquatic Vegetation of Lake Luzerne, NY

**Prepared for
The Town of Lake Luzerne**

**Lawrence Eichler
Darrin Fresh Water Institute**

November 1, 2019

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Acknowledgements

The author would like to thank Tracy Clothier and Bob Sherman of the Lake Luzerne Association for their assistance in coordinating lake access and development of the current survey project.

Background

Quantitative surveys were undertaken for Lake Luzerne, New York, to obtain distribution information on the aquatic plant population with a focus on the invasive aquatic Eurasian watermilfoil, *Myriophyllum spicatum* L. The plant survey was designed to provide data comparable to earlier surveys by the author in 1992, 1998, 2004, 2009 and 2010. The point intercept survey methods employed were designed to meet with NYS DEC Tier III Survey requirements. The survey consisted of: a) frequency of occurrence of all aquatic plant species for points distributed within the whole lake, and b) comparison of historical survey results to current conditions, with particular reference to changes in the relative abundance of Eurasian watermilfoil.

Introduction

Eurasian watermilfoil, *Myriophyllum spicatum* L., an invasive exotic plant species, was first reported in Lake Luzerne, Warren County, New York in 1989. A survey at that time indicated extensive growth of this nuisance species. In 1992, a management program keyed to hand harvesting Eurasian watermilfoil was conducted under the auspices of Warren County and the Town of Luzerne. Post-treatment plant surveys reported that this management program reduced scattered growth of Eurasian watermilfoil, however no attempt was made to address areas of dense growth. Dense growth of Eurasian watermilfoil (beds) covered approximately 1.4 acres (1%) of the lake bottom in 1998 (Eichler and Howe 1998). By 2004, dense growth of Eurasian watermilfoil had expanded to 3.9 acres (4%), with scattered growth reported throughout the remainder of the lake. The presence of a second invasive plant species, Curly-leaf Pondweed (*Potamogeton crispus* L.), was confirmed in 2004. In order to address the expanded growth of Eurasian watermilfoil, benthic barrier was incorporated in 2005. Continued expansive growth of Eurasian watermilfoil in the southeast bay spawned a desire to evaluate additional treatment alternatives. Permits were acquired and a sequestered treatment with the herbicide triclopyr (Renovate®) was conducted in the Spring of 2010. Hand harvesting, diver assisted suction harvesting (DASH) and benthic barrier have been employed over the last decade to manage the expansion of Eurasian watermilfoil.

Surveys of aquatic plants in Lake Luzerne were conducted in 1989 (Eichler and Madsen, 1990), 1992 (Enviromed Assoc., 1992), 1998 (Eichler and Howe, 1998), 2004 (Eichler and Boylen, 2004), 2007 (King 2007), 2009 (Eichler, 2009), 2010 (Eichler, 2010), 2011 (Allied Biological, 2011), and 2015 & 2018 (Schwartzberg, E.G., Hoh, J. and Varin, Z., 2018). The species lists for most surveys are similar. Twenty-seven aquatic plant species were reported in 1989 and 1992, 39 species in 2004, 33 species in both 1998 and 2008 and 36 species in 2010. Between the surveys, a total of 41 species of aquatic plants are reported for Lake Luzerne (Table 1). Differences among the surveys are generally in the less common and emergent species. Emergent species may have been intentionally excluded from past surveys due to their presence at the water's edge rather than submersed. For instance, *Typha latifolia* or cattail is a common emergent species, generally associated with marshlands peripheral to the lake. Cattails were not reported prior to 1998. An additional invasive species, Curly-leaf Pondweed (*Potamogeton crispus* L.) was also first reported in 2004.

Common members of the aquatic plant community of Lake Luzerne include macroscopic alga, or charophytes (*Chara/Nitella*), floating-leafed species (*Brasenia, Nuphar* and *Nymphaea*), emergent species (*Sparganium, Sagittaria* and *Pontederia*) and 31 submersed species. Of these species, the dominant plants were *Myriophyllum spicatum, Myriophyllum sibiricum, Sagittaria graminea, Eleocharis acicularis, Potamogeton robbinsii, Najas flexilis, Isoetes echinospora*, and *Vallisneria americana*. The large number of species observed indicates excellent diversity, typical of low-elevation Northeastern lakes (Madsen et al. 1989). For instance, Lake George has 47 submersed species (RFWI et al., 1988) and 32 were observed in Chazy Lake in 2008 (Eichler and Boylen, 2008). In both of these lakes, high diversity is threatened by further growth and expansion of an exotic plant species, Eurasian watermilfoil, which will have negative implications for the health of the lakes as a whole (Madsen et al., 1989, 1990; Eichler and Boylen, 2008).

The composition of the species list for Lake Luzerne is similar to that of other nearby lakes. For instance, all of the species observed in Lake Luzerne have been noted for other regional lakes (Ogden et al, 1973; Madsen et al., 1989, Eichler and Boylen, 2008). Fifteen species are typical for a lake of this type (low elevation, mesotrophic) in New York State (Madsen et al., 1993; Taggett et al. 1990).

One of the plant species known for Lake Luzerne (*Myriophyllum alterniflorum*) is on the New York State Rare Plant list (Young, 2017). This species is generally found on sandy, wave washed shorelines common to Adirondack lakes. Three other species reported for Lake Luzerne are on the NYS Watch List (*Isoetes lacustris, Megalodonta beckii* and *Utricularia minor*). Their presence on the watch list may be a result of lack of survey data rather than actual scarcity.

Methods

Survey Site. Lake Luzerne is located at the southern edge of Warren County in the Town of Luzerne. The lake's watershed is located in the foothills of the Adirondack Mountains. Elevations within the watershed range from 623 feet above sea level at the surface of the lake to 1000 feet at the highest elevations.

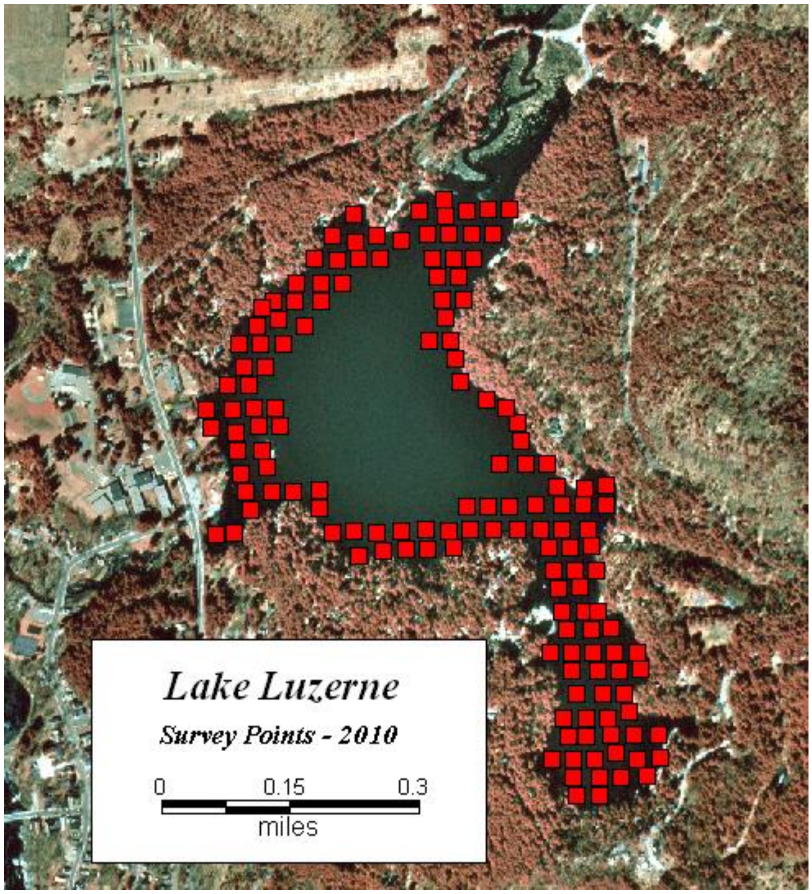
The lake has a surface area of 111 acres and a steeply sloping watershed of 14,109 acres. It is the final link in a chain of lakes including Fourth, Third, and Second Lakes. The lake has a maximum depth of 15.8 meters (52 feet) and a mean depth of 7.3 meters (24 feet). Typical of lakes in the temperate region, it is dimictic, exhibiting both summer and winter thermal stratification. Located on the western margin is the only outlet, which is dammed and used to maintain the level of the lake. The lake is best classified as mesotrophic, which indicates that nutrients necessary for the growth of algae and subsequently the myriad of organisms that feed on these plants, are moderate.

The surficial geology is primarily glacial till, a sand and gravel soil without exposed bedrock. The soil associations are Oakville, Hinckley and Hinckley-Plainfield deposits consisting of loam, fine sands and cobblestones. Drainage in these deposits is rapid and their ability to furnish lime, nitrogen and phosphorus to terrestrial plants is poor. Lake Luzerne is a residential/recreational lake with boating, fishing and swimming as the primary uses. Public access is available via a launch ramp and public beach (Nicks Beach) maintained by the Town of Luzerne.

Species List and Herbarium Specimens. As the lake was surveyed, the occurrence of each aquatic plant species observed in the lake was recorded and adequate herbarium specimens were collected. The authoritative taxonomic reference used was Crow and Hellquist, 2000.

Point Intercept. The frequency and diversity of aquatic plant species were evaluated using a point intercept method (Madsen 1999). At each grid point intersection, water depth and all species present were recorded. Species were located by a visual inspection of the point and by deploying a rake to the bottom, and examining the plants retrieved. A total of 155 points (Figure 1, Appendix A) were selected for Lake Luzerne, on a 50 m grid. A differential global positioning system (DGPS) was used to navigate to each point for the survey observation. Point intercept plant frequencies were surveyed on August 14, 2019.

Figure 2. Point intercept survey points for Lake Luzerne.


Lake Luzerne
Survey Points - 2010
0
0.15
0.3
miles

Results and Discussion

Lake Luzerne Open-Lake Survey Results

In August of 2019, the aquatic plant community of Lake Luzerne included thirty-two submersed species, three floating-leaved species, and five emergent species (Table 1). A total of 40 species of aquatic plants were observed with 35 collected by the point intercept survey. Three invasive species *Myriophyllum spicatum, Potamogeton crispus* and *Najas minor* were present. Brittle Naiad (*Najas minor*) was first reported in 2019. Species richness was quite high, with a large number of species occurring in more than 5% of survey points (Table 2). Native species were clearly dominant, however Eurasian watermilfoil (*Myriophyllum spicatum*) was widely distributed. Common native species for Lake Luzerne included *Potamogeton robbinsii, Chara* sp., *Utricularia minor, Utricularia purpurea, Vallisneria americana, Elodea canadensis, Potamogeton vaseyii, Myriophyllum sibiricum, Potamogeton praelongus,* and *Brasenia schreberi*.

Table 1. Species list for Lake Luzerne.

Species	Common Name	2019	2009	2004	1998	1992	1990
Brasenia schreberi J.F. Gmel	Water Shield	x	x	x	x	x	x
Chara species	Musk Grass	x	x	x	x	x	x
Elatine minima (Nutt.) Fisch. & C.A. Mey.	Little Elatine	x	x	x			
Eleocharis acicularis (L.) Roemer & Schultes	Spike Rush	x	x	x	x	x	x
Elodea canadensis Michx.	Waterweed	x	x	x	x	x	x
Eriocaulon septangulare With.	Pipewort	x	x	x			
Fontinalis sp.	Moss	x	x	x			
Isoetes echinospora Dur.	Quillwort	x	x	x	x	x	x
Isoetes lacustris L.	Large spored Quillwort			x	x	x	x
Lindernia sp.	False Pimpernel	x		x			
Megalodonta beckii Torr.	Water Marigold	x	x	x	x	x	x
Myriophyllum alterniflorum L.	Little Milfoil	x		x	x		x
Myriophyllum sibiricum L.	Northern Milfoil	x	x	x	x	x	x
Myriophyllum spicatum L.	Eurasian watermilfoil	x	x	x	x	x	x
Myriophyllum tenellum Kom.	Leafless Milfoil	x	x	x	x	x	x
Najas flexilis (Willd.) Rostk. & Schmidt.	Naiad	x	x	x	x	x	x

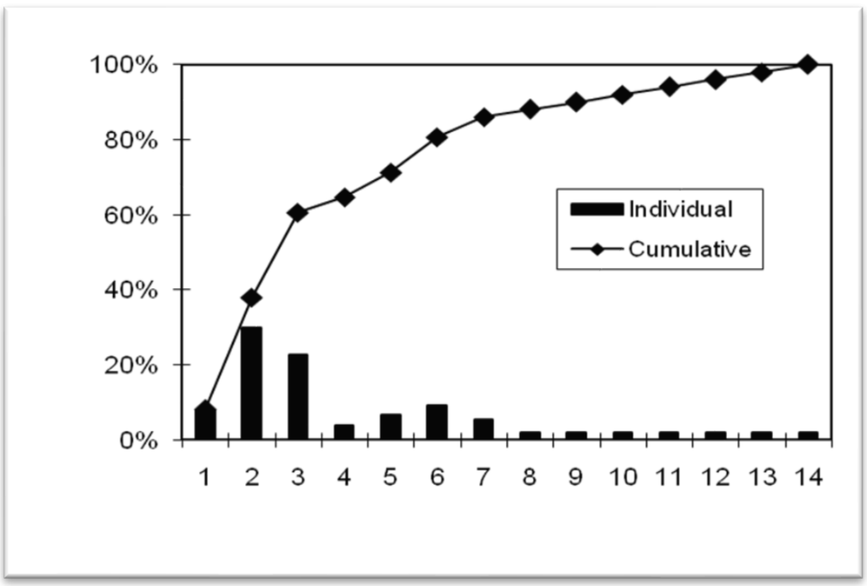
Species	Common Name	2019	2009	2004	1998	1992	1990
Najas guadalupensis (Spreng.) Magnus	Southern Naiad	x					
Najas minor All.	Brittle Naiad	x					
Nuphar variegata Engem. Ex Durand	Yellow Water Lily	x	x	x	x	x	x
Nymphaea odorata Ait.	White Water Lily	x	x	x	x	x	
Pontedaria cordata L.	Pickerelweed	x	x	x	x	x	
Potamogeton amplifolius Tuckerm.	Broad leaf Pondweed	x	x	x	x	x	x
Potamogeton crispus L.	Curly leaf Pondweed	x		x			
Potamogeton epihydrus Raf.	Ribbon leaf Pondweed	x	x	x	x	x	x
Potamogeton gramineus L.	Variable Pondweed	x		x	x	x	x
Potamogeton illinoensis Morong	Illinois Pondweed	x	x	x	x	x	x
Potamogeton perfoliatus L.	Heart leaf Pondweed	x		x			x
Potamogeton praelongus Wulfen	White stem Pondweed	x	x	x	x	x	
Potamogeton pusillus L.	Narrow leaf Pondweed	x	x	x	x	x	x
Potamogeton richardsonii (Ar. Benn) Rydb.	Richardsons Pondweed	x		x	x	x	x
Potamogeton robbinsii Oakes	Robbins Pondweed	x	x	x	x	x	x
Potamogeton spirillus Tuckerm.	Small Pondweed		x	x	x		x
Potamogeton vaseyii Robbins	Vasey's Pondweed	x	x	x	x		x
Potamogeton zosteriformis Fern.	Flat Stem Pondweed	x		x	x		
Sagittaria graminea Michx.	Arrowhead	x	x	x	x	x	x
Scirpus spp.	Rush	x					
Sparganium sp.	Bur Reed	x	x	x	x	x	x
Typha latifolia L.	Cattail	x	x	x	x		
Utricularia intermedia Hayne	Bladderwort			x	x	x	
Utricularia gibba L.	Humped Bladderwort	x	x	x		x	x
Utricularia purpurea Hayne	Purple Bladderwort	x	x				
Utricularia vulgaris L.	Great Bladderwort	x		x	x	x	x
Vallisneria americana L.	Duck Celery	x	x	x	x	x	x

Species present and their relative abundance remain comparable to prior survey results. With this diversity and distribution of native species, the test for non-target impacts of management should be sensitive to numerous species, and the probability of native plant restoration in areas formerly inhabited by Eurasian watermilfoil should be high following management efforts.

Maximum Depth of Colonization

The littoral zone is the area of the lake bottom supporting rooted aquatic plant growth and is generally defined by the maximum depth to which sufficient light penetrates to allow for plant growth. In Lake Luzerne, depth distribution of native species remained similar to past surveys with aquatic plant growth observed to a maximum depth of 5.5 meters (16 feet). Macroalgae or charophytes form a carpet at the outer margin of plant growth, in depths from 5 to 6 meters (16 to 19 feet). While Eurasian watermilfoil occurred throughout Lake Luzerne, dense growth typically was found in depths from 3 to 10 feet. Depth distribution of sampling points (Figure 3) was primarily within the littoral zone (less than 6 meters), however most depths in Lake Luzerne were sampled.

Figure 3. Distribution of Lake Luzerne sampling points in 1 meter depth classes.



Species Lists

Maps of the distribution of all aquatic plant species for Lake Luzerne are included in Appendix B, Figures B1 – B17. These maps are based on the presence of individual species in point intercept samples and the relative abundance of each species within each sample. Species richness in Lake Luzerne was high, with a large number of species occurring in more than 5% of survey points (Table 2). A total of 40 species of aquatic plants were observed with 35 collected by the point intercept survey. Robbins pondweed, *Potamogeton robbinsii* was the most common species (45% of survey points). Eurasian watermilfoil was also a dominant species ranked third by frequency of occurrence lakewide (32% of survey points). A number of native species were also commonly observed, and included *Chara* spp. (37%), *Utricularia purpurea* (22%), *Potamogeton illinoensis* (22%), *Vallisneria americana* (20%), *Elodea canadensis* (15%), *Utricularia gibba* (14%), *Utricularia vulgaris* (9%), *Potamogeton vaseyii* (9%), *Potamogeton*

Table 2. Aquatic plant percent frequency by species for Lake Luzerne.

Species	2019	2010	2009	2004
Brasenia schreberi	7.1%	7.6%	9.7%	
Chara species	37.4%	42.9%	37.1%	77.1%
Eleocharis acicularis (L.) Roemer & Schultes	1.9%	2.5%	3.2%	
Elodea canadensis Michx.	14.8%	14.3%	30.6%	45.8%
Eriocaulon septangulare	0.6%	0.8%	1.6%	
Fontinalis	5.2%	6.7%	4.8%	
Isoetes echinospora	2.6%	1.7%		
Isoetes lacustris		1.7%		
Myriophyllum alterniflorum	0.6%	0.8%		
Megalodonta beckii	2.6%	0.8%	4.8%	
Myriophyllum sibiricum	7.7%	11.8%	12.9%	47.9%
Myriophyllum spicatum L.	32.3%	21.8%	45.2%	60.4%
Myriophyllum tenellum	2.6%	3.4%	4.8%	31.3%
Najas flexilis	13.5%	10.1%		47.9%
Najas guadalupensis	25.2%			
Najas minor	1.9%			
Nuphar variegata	1.9%	0.8%	1.6%	
Nymphaea odorata Ait.	9.7%	6.7%	6.5%	
Pontedaria cordata	0.6%		1.6%	
Potamogeton amplifolius	7.1%	0.8%	6.5%	
Potamogeton crispus	0.6%	0.8%		
Potamogeton epihydrus	1.9%	2.5%	1.6%	50.0%
Potamogeton illinoensis	21.9%	22.7%	8.1%	
Potamogeton gramineus	3.9%			
Potamogeton perfoliatus	1.9%			
Potamogeton praelongus	9.0%	9.2%	9.7%	
Potamogeton pusillus L.	5.8%	14.3%	1.6%	
Potamogeton robbinsii	45.2%	57.1%	58.1%	58.3%
Potamogeton vaseyi	9.0%	11.8%	16.1%	39.6%
Sagittaria graminea	5.2%	0.8%	1.6%	
Scirpus sp.	3.2%	0.8%		
Sparganium spp.	0.6%	1.7%	3.2%	
Utricularia gibba	14.2%	12.6%	46.8%	

Utricularia purpurea	21.9%	37.0%	37.1%	
Utricularia vulgaris	9.0%	23.5%		39.6%
Vallisneria americana L.	20.0%	26.9%	35.5%	62.5%

praelongus (9%), *Myriophyllum sibiricum* (8%), and *Brasenia schreberi* (7%). In 2009, a pre-treatment survey produced comparable results including: *Potamogeton robbinsii* (58% of survey points), *Chara* spp. (37%), *Utricularia minor* (47%), *Utricularia purpurea* (37%), *Vallisneria americana* (36%), *Elodea canadensis* (31%), *Potamogeton vaseyii* (16%), *Myriophyllum sibiricum* (13%), *Potamogeton praelongus* (10%), and *Brasenia schreberi* (10%). Eurasian watermilfoil was ranked third by frequency of occurrence in 2009 (45% of survey points).

Comparing frequency of occurrence between 2010 and 2019 (Table 2), nineteen species showed a decline in frequency of occurrence and 16 species increased. Of the nineteen species showing declines, eight were native species showing declines of 1% or less. Three native species showed substantial declines over time, *Elodea canadensis, Utricularia vulgaris* and *Utricularia gibba*. Getsinger et al. (2002) reported native species experiencing declines following herbicide treatment with fluridone, including *Najas flexilis, Elodea canadensis, Myriophyllum sibiricum, Potamogeton illinoensis*, and *P. zosteriformis*, however he found greater than 50% of survey points remained vegetated with native species during the year of treatment. The majority of these species were observed to increase in frequency of occurrence the following year, after a decline in the year of treatment. One species, *Najas guadalupensis,* was absent prior to 2019 but abundant in the 2019 survey. Getsinger et al. (2002) reported a proliferation of *Potamogeton illinoensis* following herbicide treatments, leading several residents to complain of nuisance levels of growth of this native species. Lake Luzerne has experienced a similar expansion of this species. Eichler and Boylen (2008) reported increases in frequency of occurrence of *Najas flexilis* and *Elodea canadensis* in two Vermont lakes following triclopyr treatments, however these also returned to pre-treatment levels within one year of treatment. All other differences were in the less common species.

Eighty-five percent of whole lake sampling points were vegetated by at least one plant species in 2019 (Figure 4) comparable to the 84% and 89% reported for 2010 and 2009, respectively. In depths of 6 m or less, representing the littoral zone, 98% of survey points contained native species in 2019, while 95% of survey points were reported in both 2009 and 2010 surveys. Eurasian watermilfoil was present in 32% of survey points in 2019 and 24% of survey points in 2010, a slight increase over 9 years. A general decline in Eurasian watermilfoil abundance was observed between 2004 and 2010 (Figure 5), most likely a result of aquatic plant management efforts.

Figure 4. Lake Luzerne frequency of occurrence summaries lakewide in 2019.

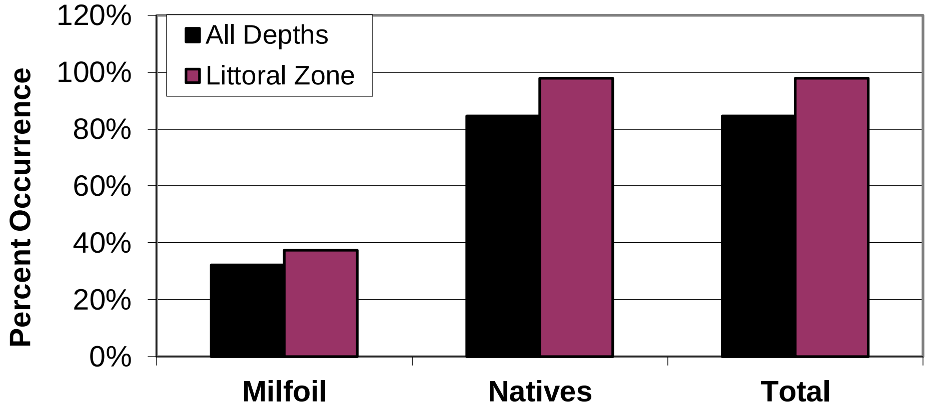
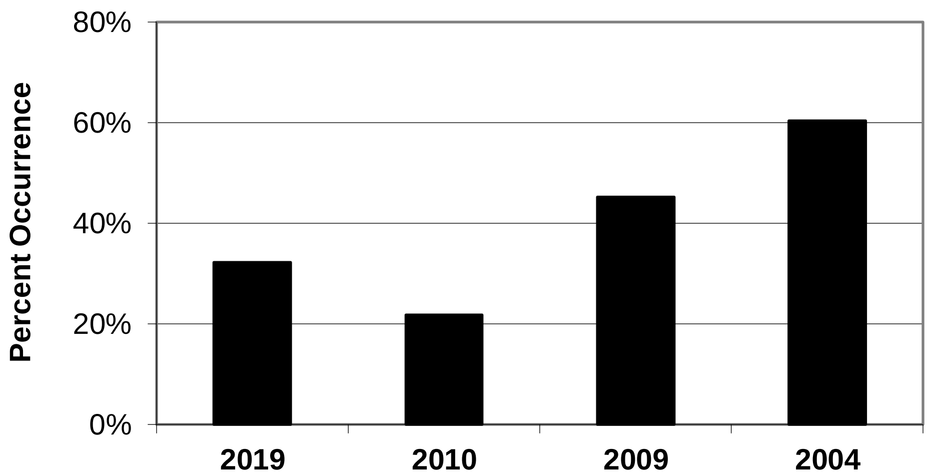


Figure 5. Lake Luzerne Eurasian watermilfoil frequency of occurrence.



The number of plant species present per sample point, or species richness, is presented in Table 4 and Figure 6. Whole lake native species richness is comparable to total species richness, reported at 2.94 and 3.13 species per sample point, respectively. When comparing only survey points within the littoral zone, native and total species richness remain similar, at 3.35 and 3.56 species per sample point, and within the relative error of the measurement. The use of sampling points predominantly within the littoral zone accounts for the similarity of results.

Figure 6. Lake Luzerne species richness lakewide. Error bars are standard error.

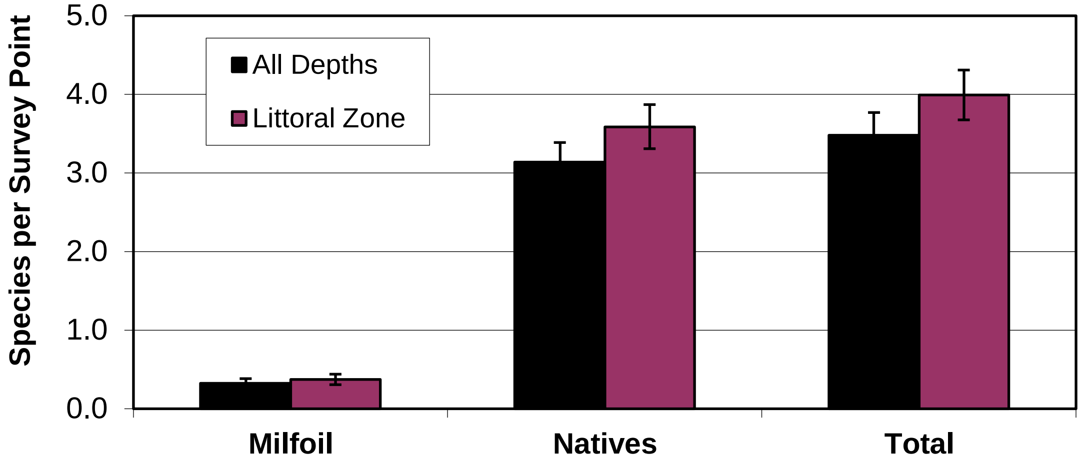

Species per Survey Point
5.0
4.0
3.0
2.0
1.0
0.0
All Depths
Littoral Zone
Milfoil
Natives
Total

Table 4. Species richness comparison between the 2010 (post-treatment) and 2019 surveys

Plant Grouping	Water Depth Class	Summary Statistic	Lakewide Surveys 2010	Lakewide Surveys 2019
Native plant species	Whole Lake (all depths)	Mean	2.94	3.14
		N	152	155
		Std. Error	0.17	0.18
	Points with depths <6m	Mean	3.35	3.59
		N	134	134
		Std. Error	0.17	0.17
	Points with depths <2m	Mean	4.5	4.53
		N	53	58
		Std. Error	0.24	0.23
All plant species	Whole Lake (all depths)	Mean	3.13	3.48
		N	152	155
		Std. Error	0.18	0.20
	Points with depths <6m	Mean	3.56	3.99
		N	134	134
		Std. Error	0.18	0.19
	Points with depths <2m	Mean	4.72	4.95
		N	53	58
		Std. Error	0.26	0.25

Declines in native species richness following expansive growth of *Myriophyllum spicatum* have been well documented (Madsen et al. 1989, 1991). Conversely, species richness increases in areas where Eurasian watermilfoil growth is reduced (Boylen et al., 1996). Comparing survey points pre-treatment and post-treatment (Figure 8), little or no change in native or total species richness is apparent while Eurasian watermilfoil presence has declined.

Summary

Quantitative aquatic plant surveys were undertaken for Lake Luzerne, New York, to obtain post-treatment data for a Eurasian watermilfoil (*Myriophyllum spicatum* L.) management program based on diver assisted suction harvesting. The point intercept survey methods employed were designed to meet with NYS DEC Tier III Survey requirements. The current plant survey was designed to provide data comparable to earlier surveys by the author (Eichler et al. 1989, 1992, 1998, 2004, 2009 and 2010). The survey consisted of: a) frequency of occurrence of all aquatic plant species for points distributed throughout the lake, and b) comparison of historical survey results to current conditions, with particular reference to changes in the relative abundance of Eurasian watermilfoil.

Lake Luzerne supports a diverse native plant community with thirty-three submersed species, three floating-leaved species, and five emergent species. An exotic, invasive aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*) was first confirmed in Lake Luzerne in 1989. Periodic hand harvesting efforts were conducted, however by 2004 Eurasian watermilfoil had expanded its coverage. The presence of a second invasive plant species, Curly-leaf Pondweed (*Potamogeton crispus* L.), was confirmed in 2004. In order to address the expanded growth of Eurasian watermilfoil, benthic barrier was incorporated in 2005. Continued expansive growth of Eurasian watermilfoil in the southeast bay spawned a desire to evaluate additional treatment alternatives. Permits were acquired and a sequestered treatment with the herbicide triclopyr (Renovate®) was conducted in the Spring of 2010, greatly reducing Eurasian watermilfoil abundance in this area of the lake. Hand and diver assisted suction harvesting (DASH) have been conducted since that time. A third invasive species, Brittle Naiad (*Najas minor*) was first reported in 2019.

Species richness in Lake Luzerne remains quite high, with a large number of species occurring in more than 5% of survey points. A total of 40 species were recorded in open-lake surveys of Lake Luzerne in 2019, comparable to previous surveys in 2004 (39 species), 2010 (36 species) 1998 and 2009 (33 species), and 1989 - 1992 (27 species). Between all surveys, a total of 41 species of aquatic plants are reported for Lake Luzerne. The large number of aquatic plant species is a testament to the diversity of habitats present in Lake Luzerne and the exceptional water quality of the lake.

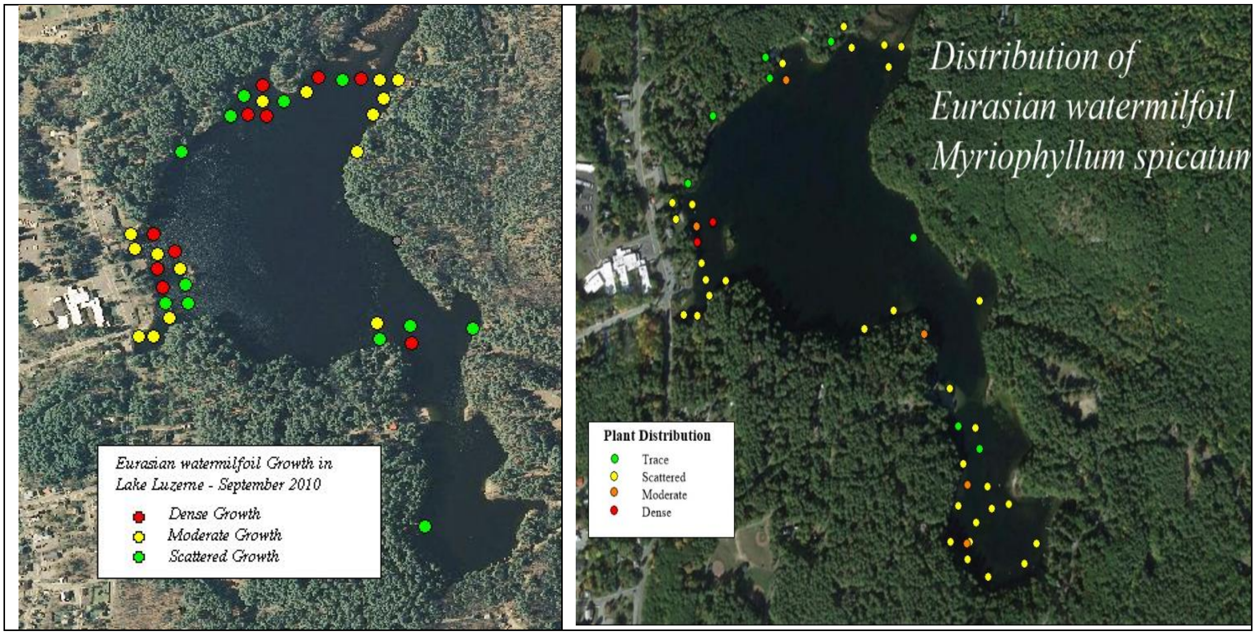
Robbins pondweed, *Potamogeton robbinsii* was the most common species (45% of survey points). Eurasian watermilfoil was also a dominant species ranked third by frequency of occurrence (32% of survey points). A number of native species were also commonly observed, and included *Chara* spp. (37% of survey points), *Utricularia purpurea* (22%), *Potamogeton illinoensis* (22%), *Vallisneria americana* (20%), *Elodea canadensis* (15%), *Utricularia gibba* (14%), *Utricularia vulgaris* (9%), *Potamogeton vaseyii* (9%), *Potamogeton praelongus* (9%), *Myriophyllum sibiricum* (8%), and *Brasenia schreberi* (7%). These results are quite similar to frequency of occurrence results for the 2010 survey: *Potamogeton robbinsii* (57% of survey

points), *Chara* (40% of survey points), *Utricularia purpurea* (30%), *Vallisneria americana* (26%), *Utricularia vulgaris* (16%), *Potamogeton illinoensis* (16%), *Elodea canadensis* (16%), *Utricularia minor* (15%), *Potamogeton vaseyii* (11%), *Myriophyllum sibiricum* (9%), *Potamogeton praelongus* (7%), and *Brasenia schreberi* (7%). The preponderance of native species points to the success of the management effort to generally control the growth of Eurasian watermilfoil.

Eighty-five percent of whole lake sampling points were vegetated by at least one plant species in 2019 comparable to the 84% reported in 2010 and 89% reported for 2009. In depths of 6 m or less, representing the littoral zone, 98% of survey points contained native species in 2019, similar to the 95% reported in the 2010 survey. Eurasian watermilfoil was present in 32% of survey points in 2019 and 24% of survey points in 2010. Regrowth of Eurasian watermilfoil in the southeastern embayment, which was treated with herbicide in 2010, largely accounted for the difference.

Whole lake native species richness in 2019 was comparable to total species richness, reported at 3.14 and 3.48 species per sample point, respectively. For 2010, whole lake native species richness was reported at 2.94 and 3.13 species per sample point respectively. When comparing only survey points within the littoral zone for 2019, native and total species richness remained similar, at 3.59 and 3.99 species per sample point. The use of sampling points predominantly within the littoral zone accounts for the similarity of results. The fact that lake-wide species richness is comparable between the 2 surveys is likely due to ongoing aquatic plant management efforts, given that declines in native species richness following unchecked growth of *Myriophyllum spicatum* have been well documented (Madsen et al. 1989, 1991).

Figure 7. Distribution of Eurasian watermilfoil (*Myriophyllum spicatum*) in the 2010 and the 2019 survey of Lake Luzerne.



One of the plant species in Lake Luzerne (*Myriophyllum alterniflorum*) is on the New York State Rare Plant list (Young, 2017). This species is generally found on sandy, wave washed shorelines common to Adirondack lakes. This species was reported for Lake Luzerne in 2010 and 2019. Three other species present in Lake Luzerne are on the NYS Watch List (*Isoetes lacustris, Megalodonta beckii* and *Utricularia minor*). Their presence on the watch list may be a result of lack of survey data rather than actual scarcity. Both are common species in moderately productive lakes and ponds in our region. *Utricularia minor*, with its small thread-like growth form may be overlooked by surveys. *Megalodonta beckii* is frequently mis-identified as the more common coontail (*Ceratophyllum demersum*). Two of these species were absent in the 2019 survey, *Isoetes lacustris* and *Utricularia minor*. Both of these species are small in size and difficult to sample effectively with the current survey techniques. Declines in these species have been observed in other surveys relative to herbicide treatments (Gettsinger et al. 2002, Eichler and Boylen 2009), however both species returned to pre-treatment levels within one year of treatment.

Eurasian watermilfoil growth has dominated several areas of Lake Luzerne for many years, including the outlet area, inlet area and the southeastern cove. The southeast cove of Lake Luzerne was treated with herbicide in 2010, and only a single stem of Eurasian watermilfoil was recorded in the post-treatment survey (See Figure 8). Frequency of occurrence for Eurasian watermilfoil plants within the treatment zone declined from 58% of survey points pre-treatment to 3% post-treatment. The remainder of Lake Luzerne supported extensive growth of Eurasian watermilfoil in 2010. Since 2010, a general decline in relative abundance of Eurasian watermilfoil has occurred, most likely due to management efforts, while frequency of occurrence has increased slightly. The increase is almost exclusively found in the southeastern embayment due to Eurasian watermilfoil recovery since the 2010 herbicide treatment. The current survey results should continue to provide a baseline from which to assess future impacts of both Eurasian watermilfoil growth and management activities.

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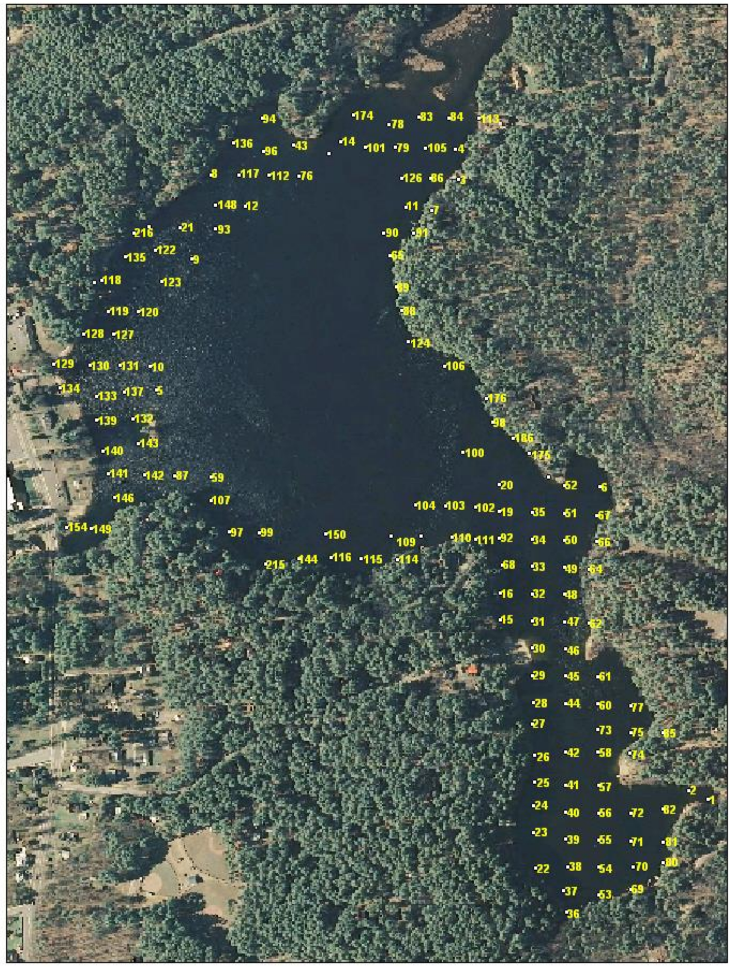
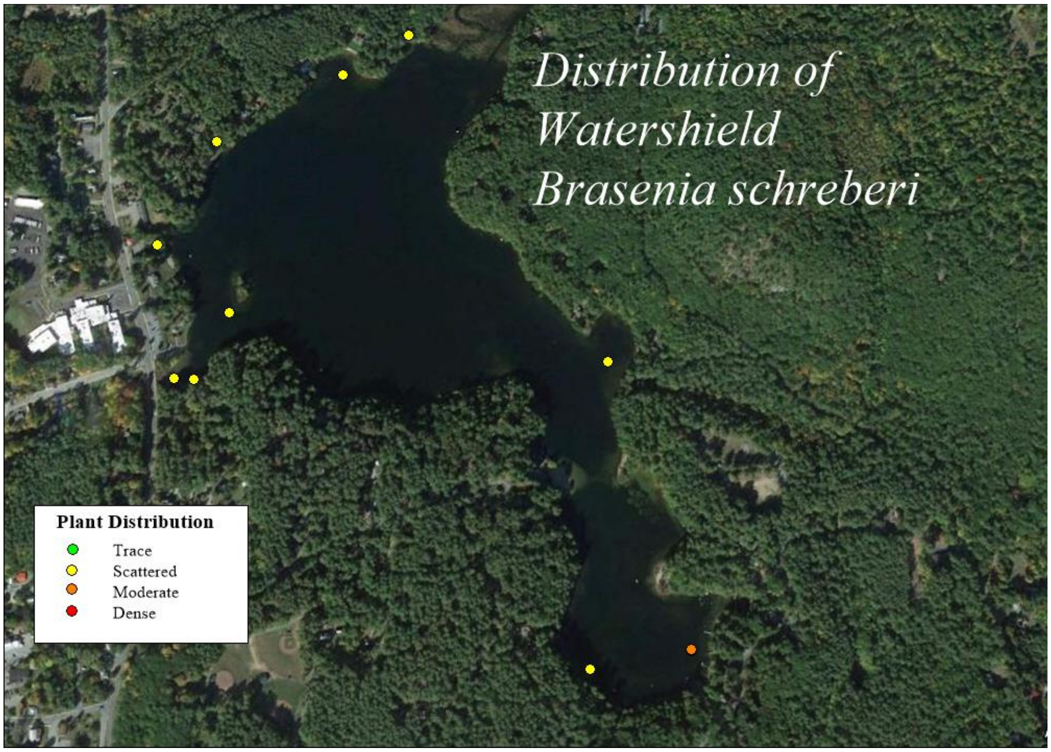
Appendix A.

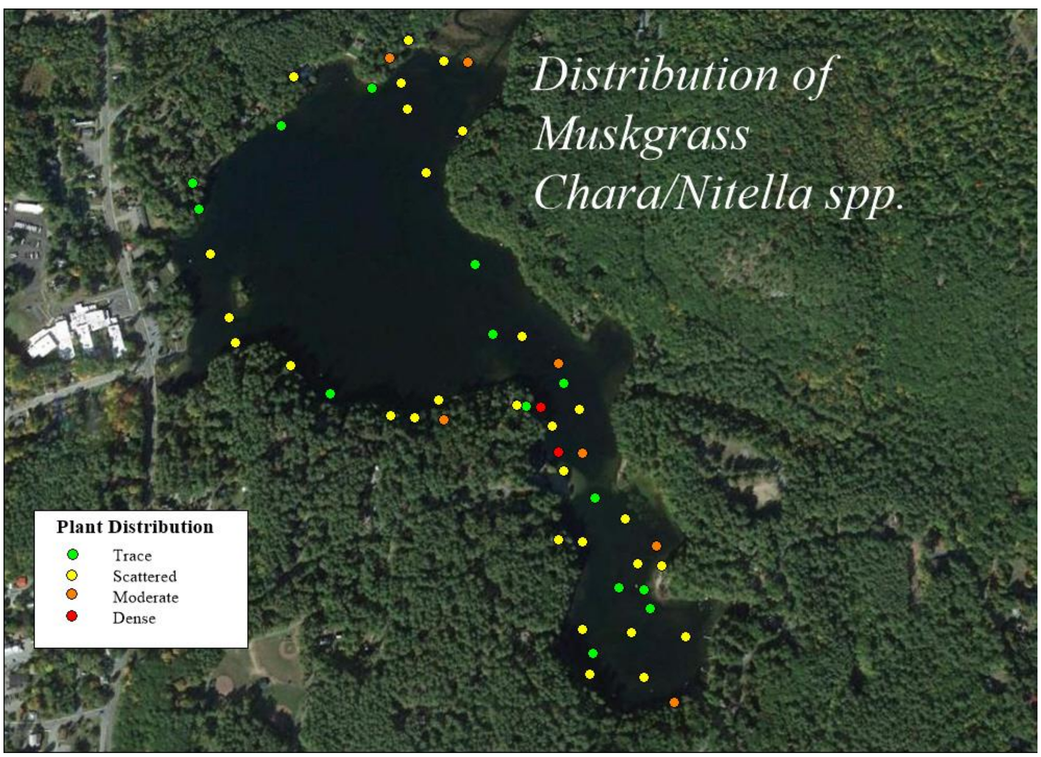
Topographic map showing the approximate locations of the 2019 survey points with GPS number for Lake Luzerne, NY.

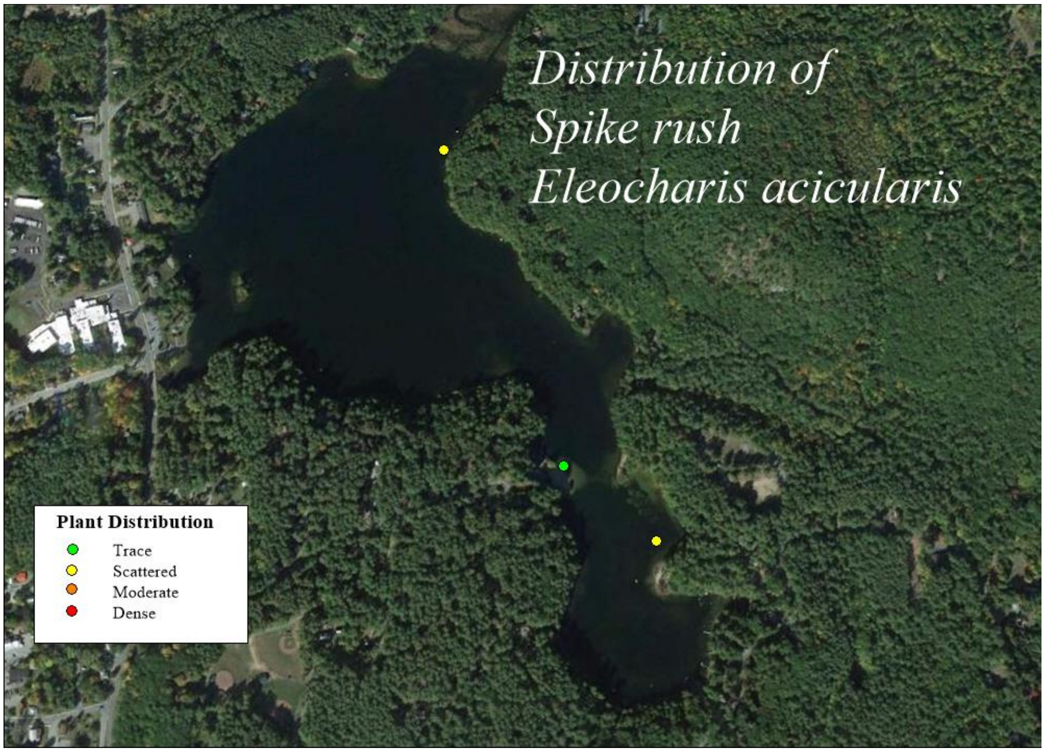


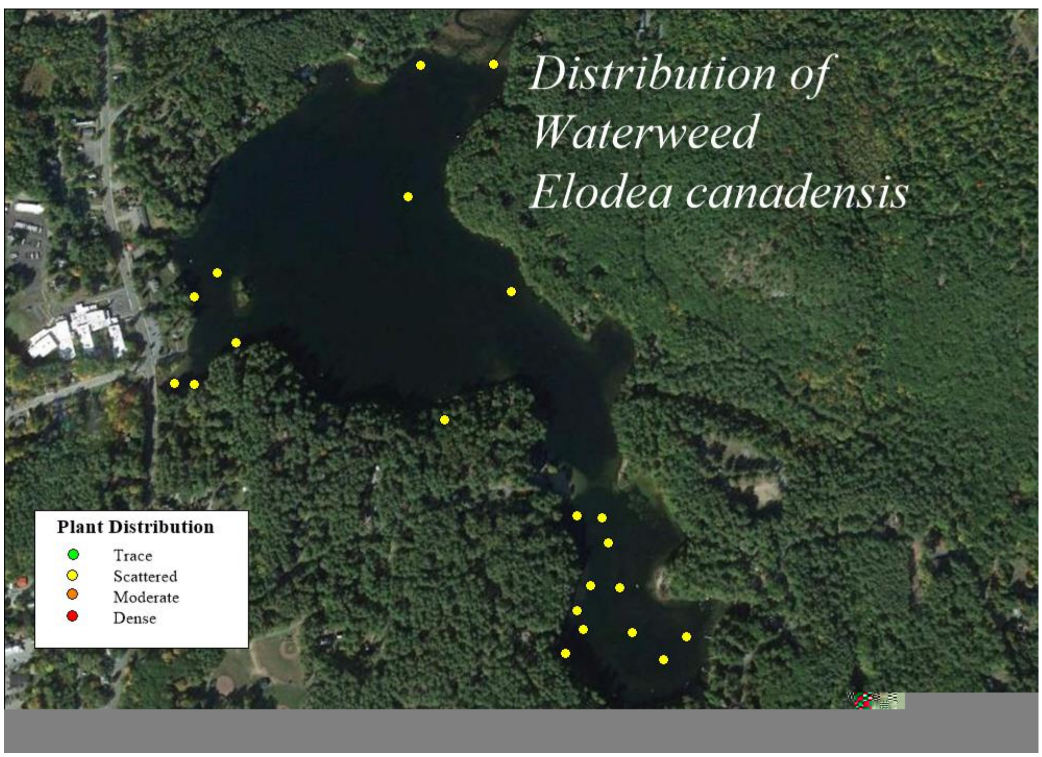
Appendix B.

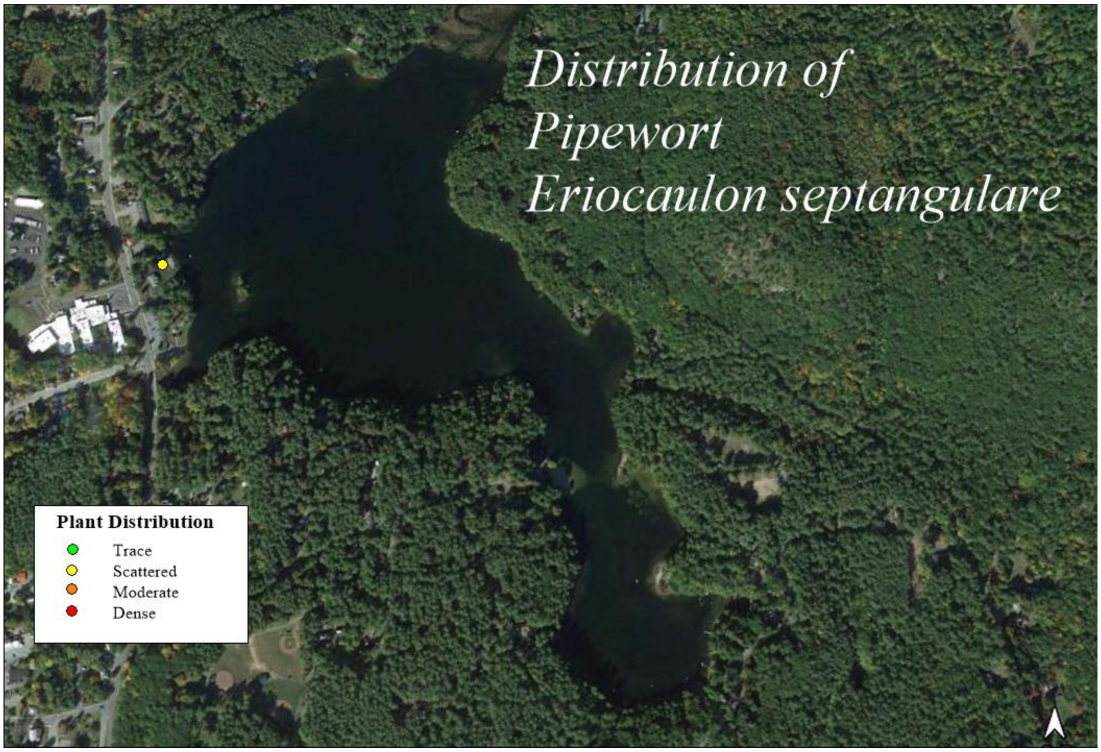
Aquatic Plant Distribution Maps for Lake Luzerne Based on Point Intercept Survey Data

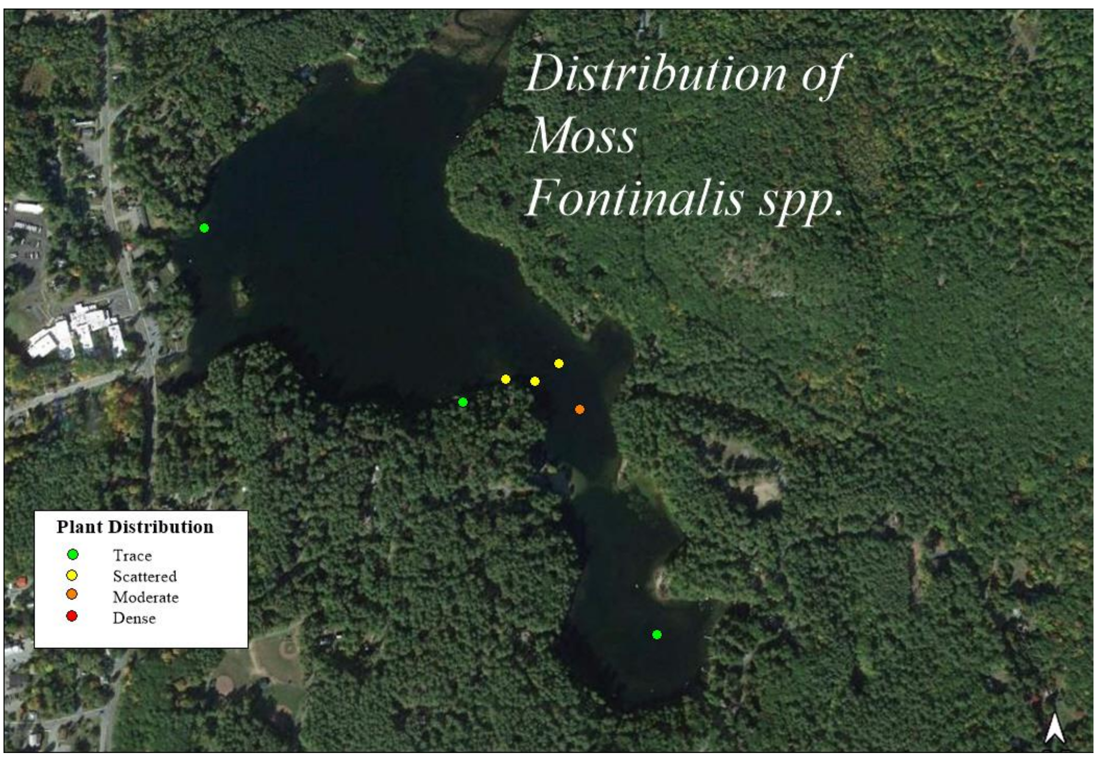

Distribution of
Watershield
Brasenia schreberi
Plant Distribution
Trace
Scattered
Moderate
Dense

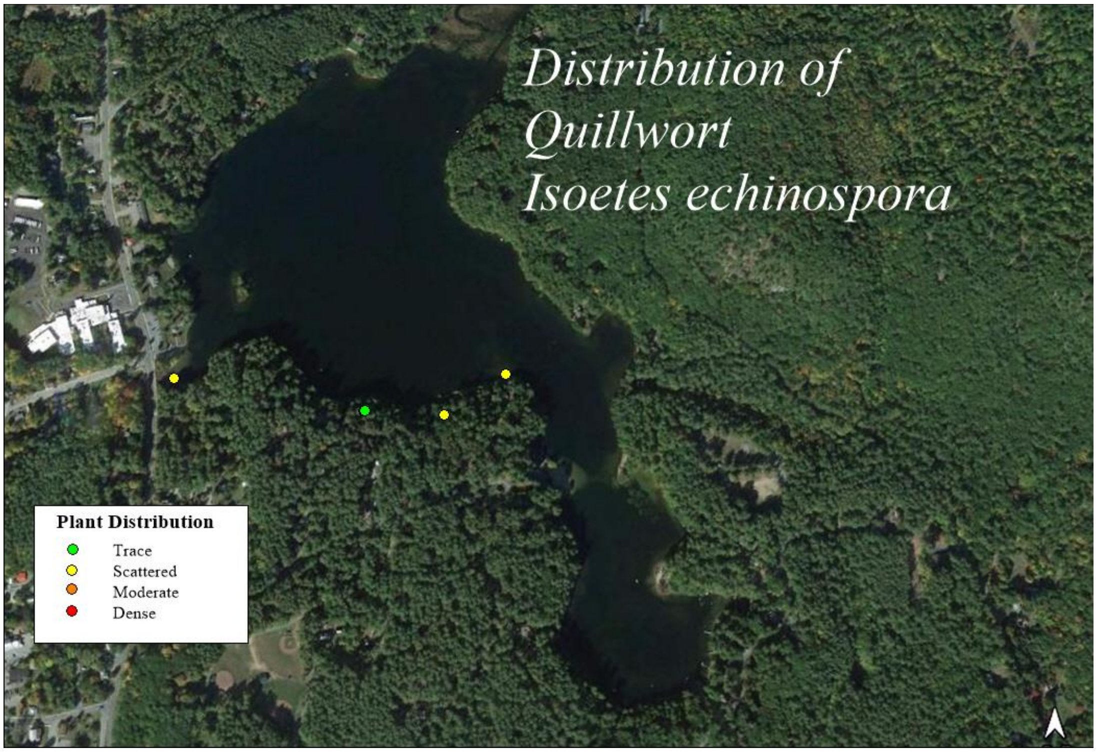

Distribution of
Muskgrass
Chara/Nitella spp.
Plant Distribution
Trace
Scattered
Moderate
Dense

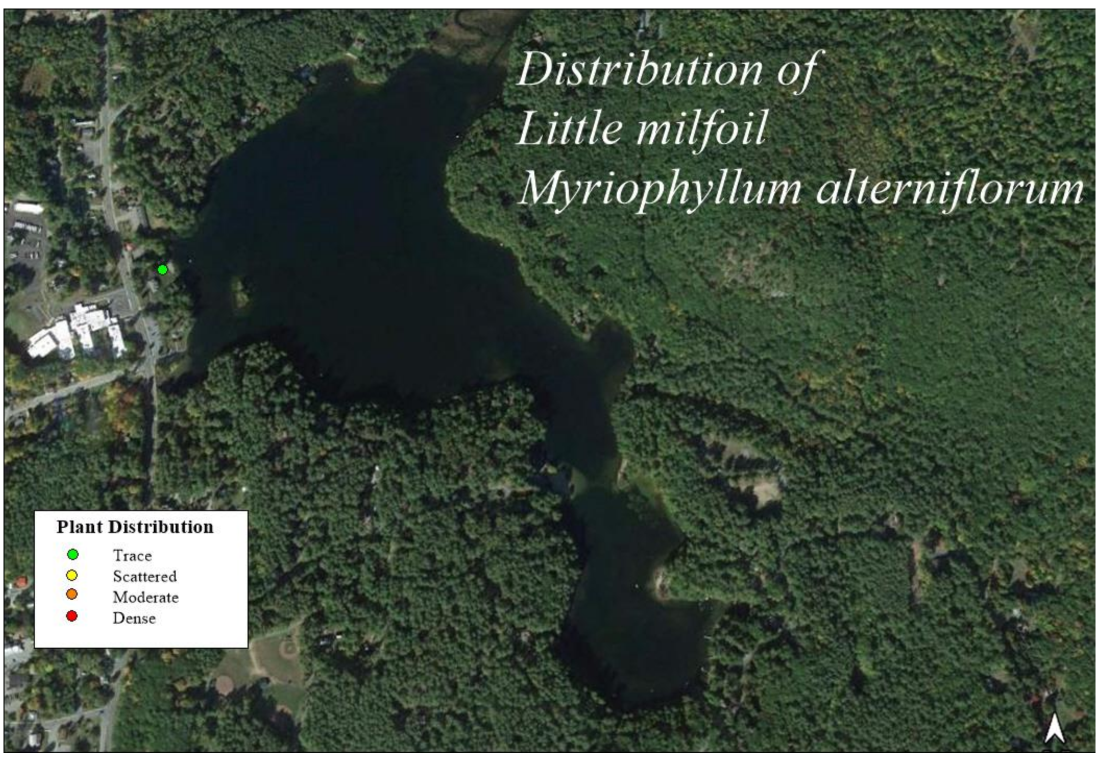

Distribution of
Spike rush
Eleocharis acicularis
Plant Distribution
Trace
Scattered
Moderate
Dense

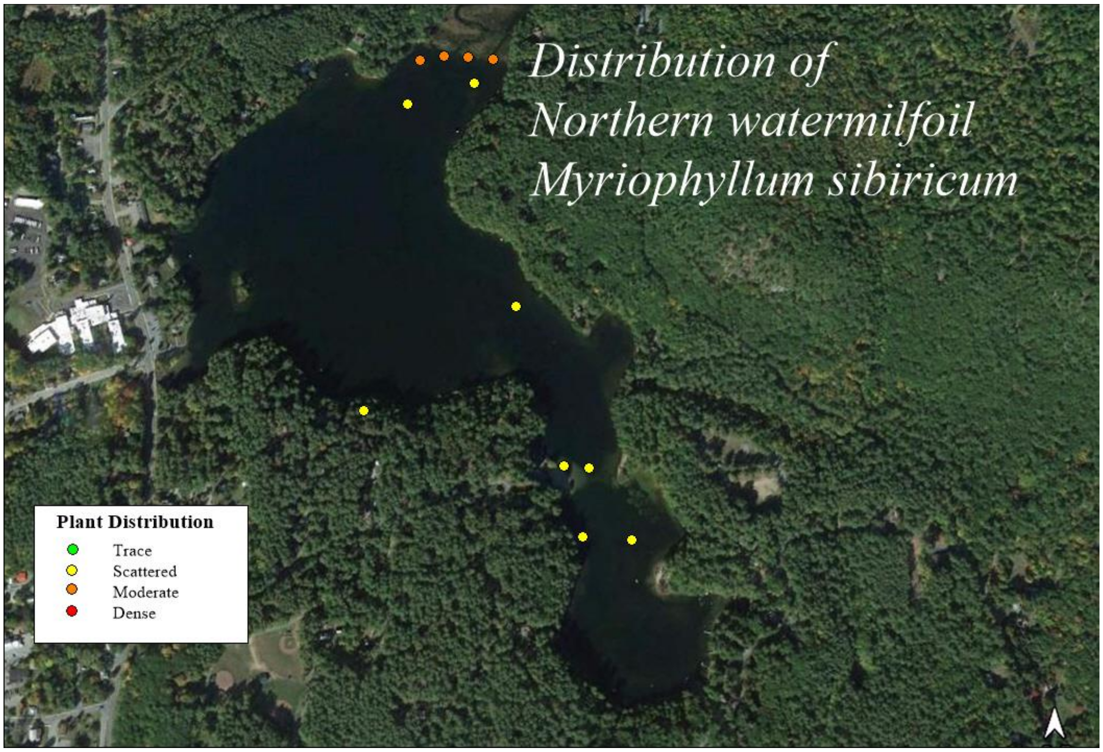

Distribution of
Waterweed
Elodea canadensis
Plant Distribution
Trace
Scattered
Moderate
Dense

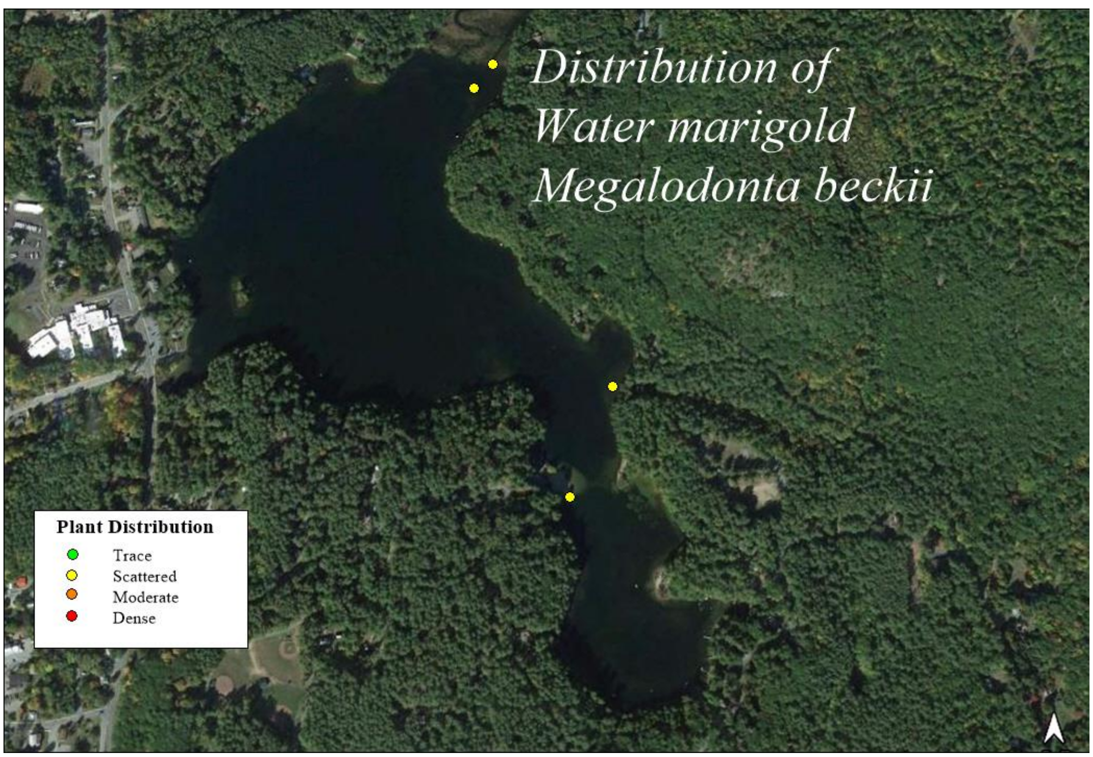

Distribution of
Pipewort
Eriocaulon septangulare
Plant Distribution
Trace
Scattered
Moderate
Dense

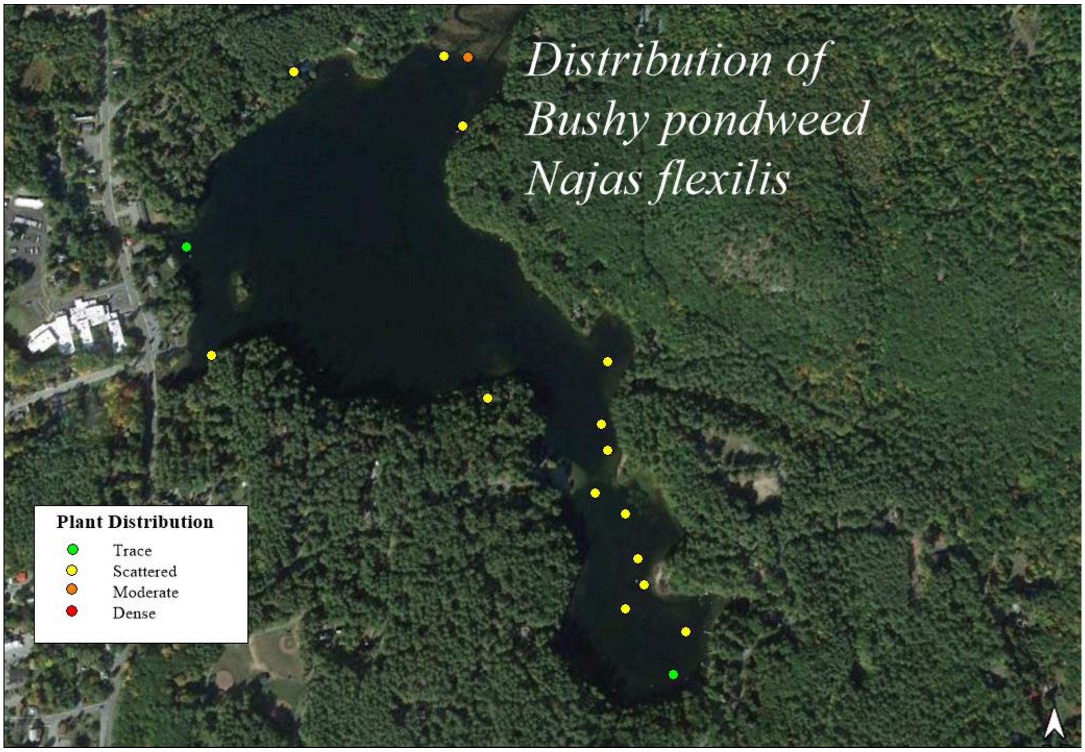

Distribution of
Moss
Fontinalis spp.
Plant Distribution
Trace
Scattered
Moderate
Dense

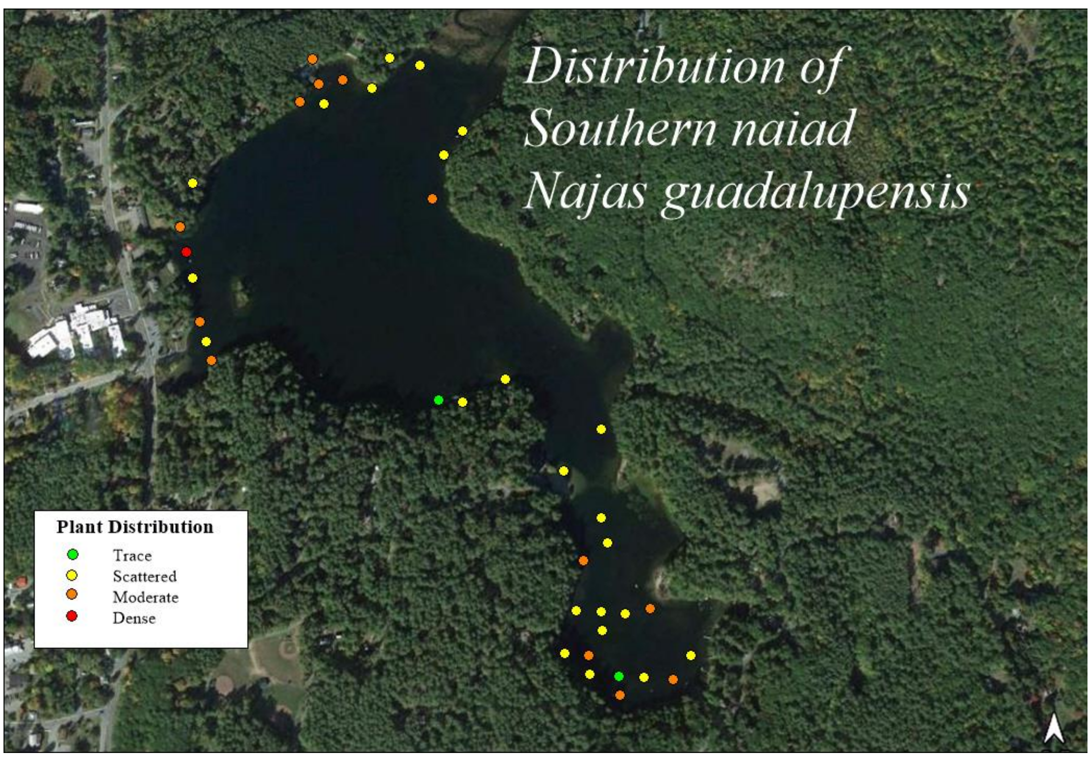

Distribution of
Quillwort
Isoetes echinospora
Plant Distribution
Trace
Scattered
Moderate
Dense

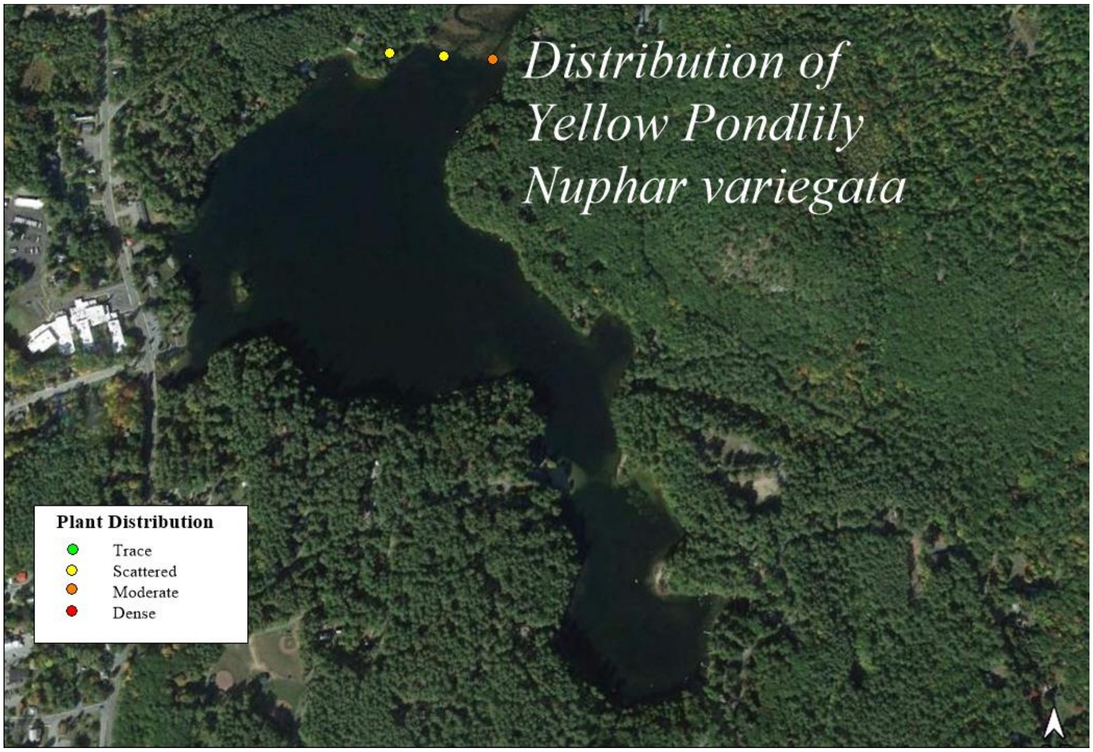

Distribution of
Little milfoil
Myriophyllum alterniflorum
Plant Distribution
Trace
Scattered
Moderate
Dense

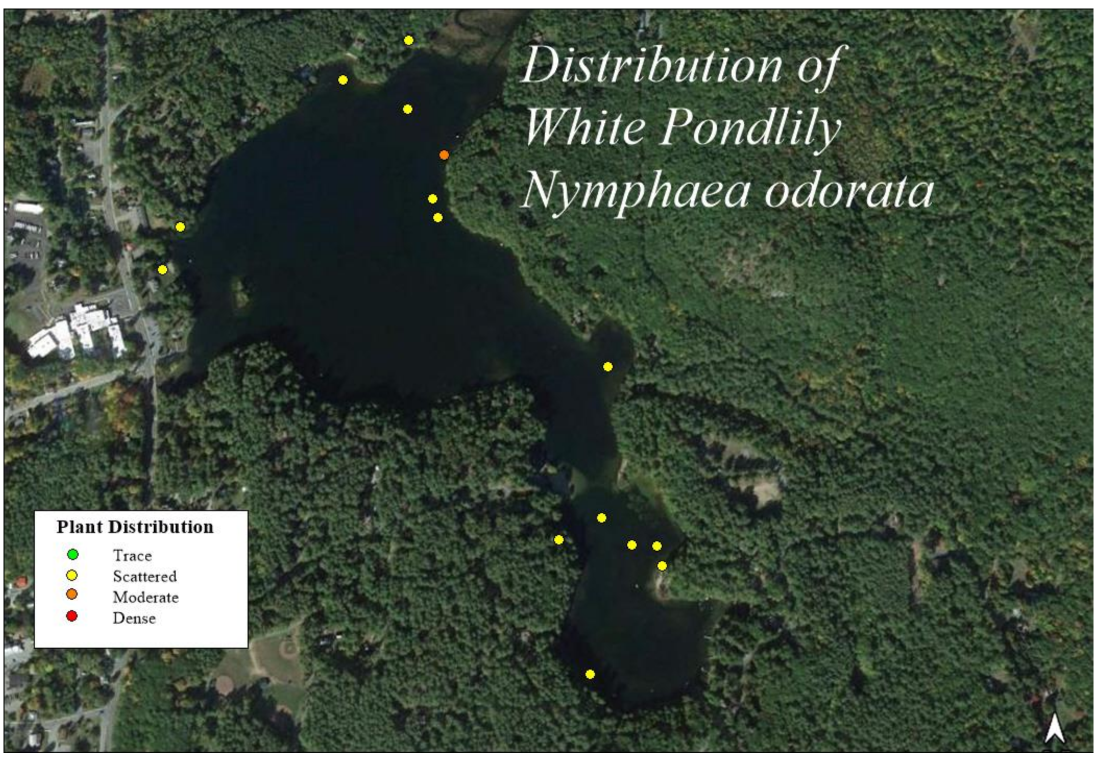

Distribution of
Northern watermilfoil
Myriophyllum sibiricum
Plant Distribution
Trace
Scattered
Moderate
Dense

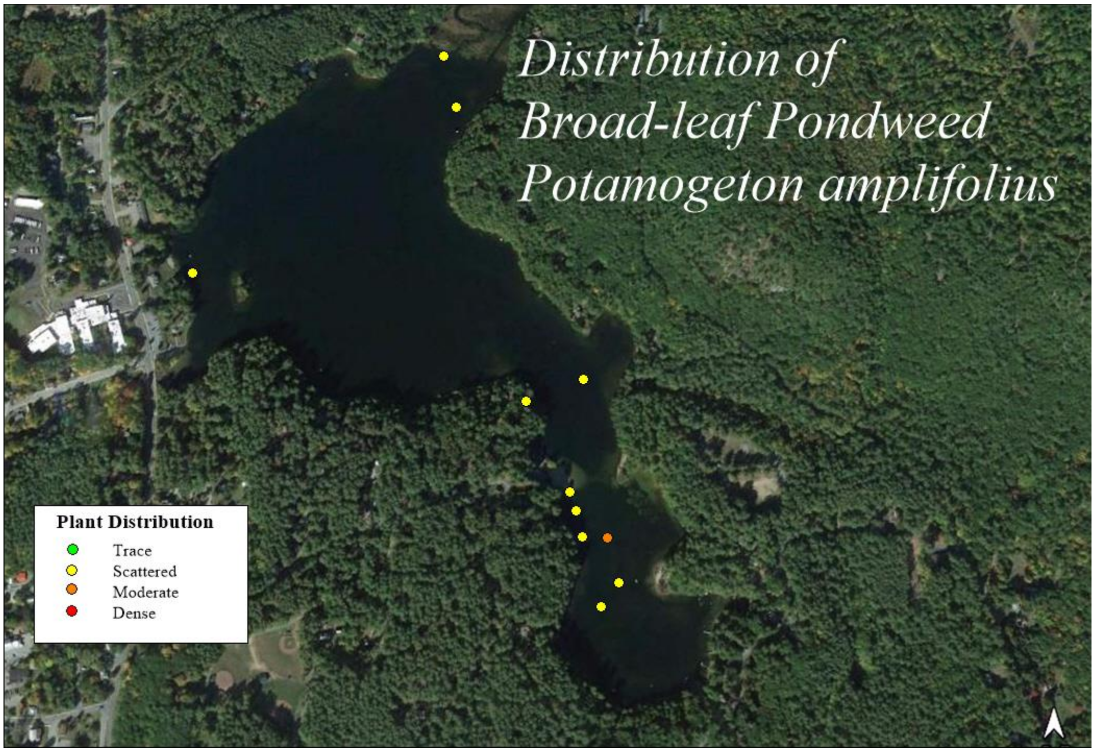

Distribution of
Water marigold
Megalodonta beckii
Plant Distribution
Trace
Scattered
Moderate
Dense

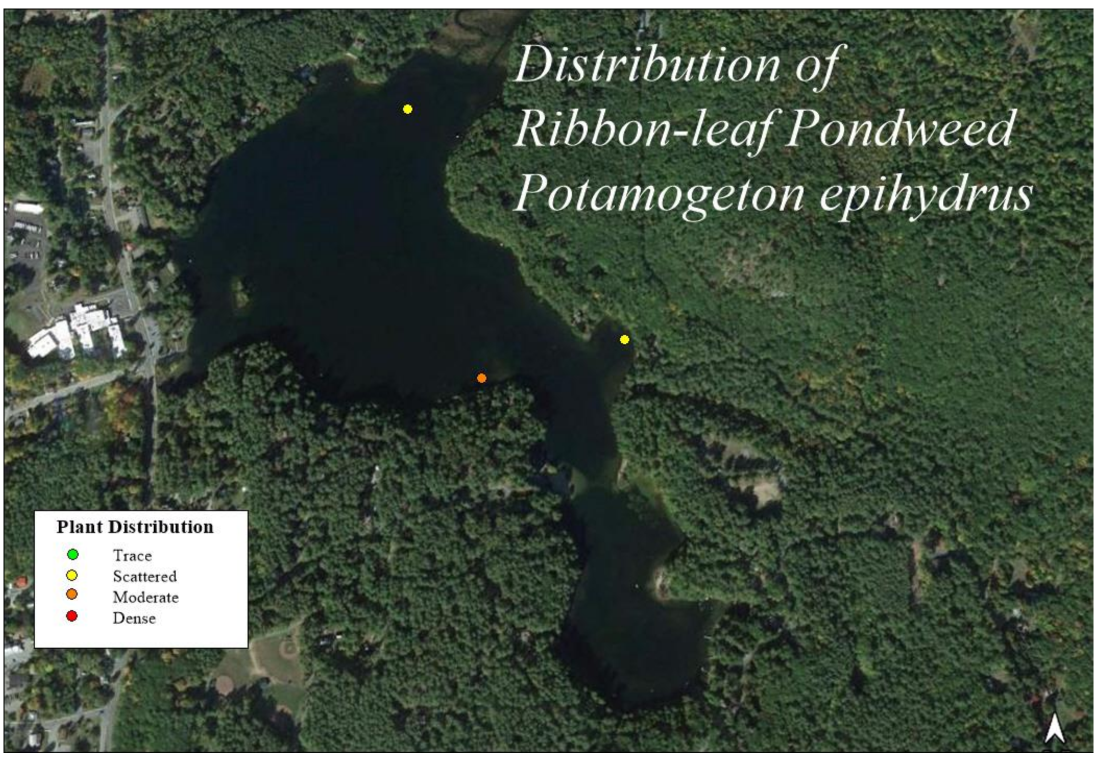

Distribution of
Bushy pondweed
Najas flexilis
Plant Distribution
Trace
Scattered
Moderate
Dense

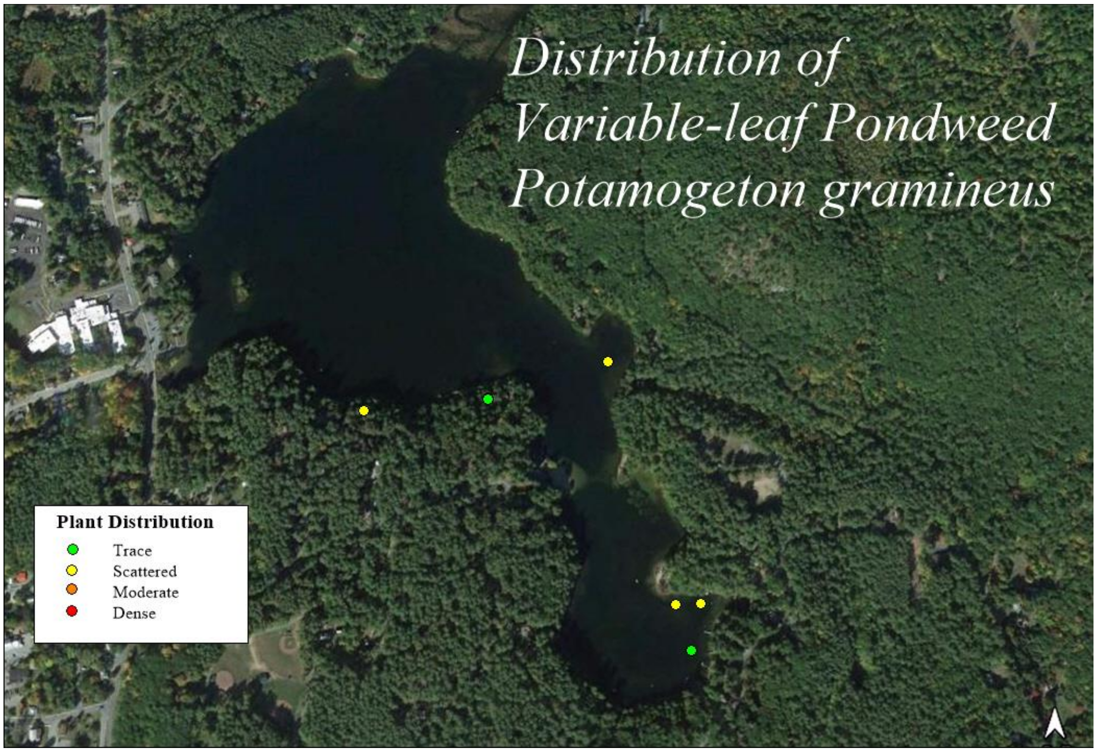

Distribution of
Southern naiad
Najas guadalupensis
Plant Distribution
Trace
Scattered
Moderate
Dense

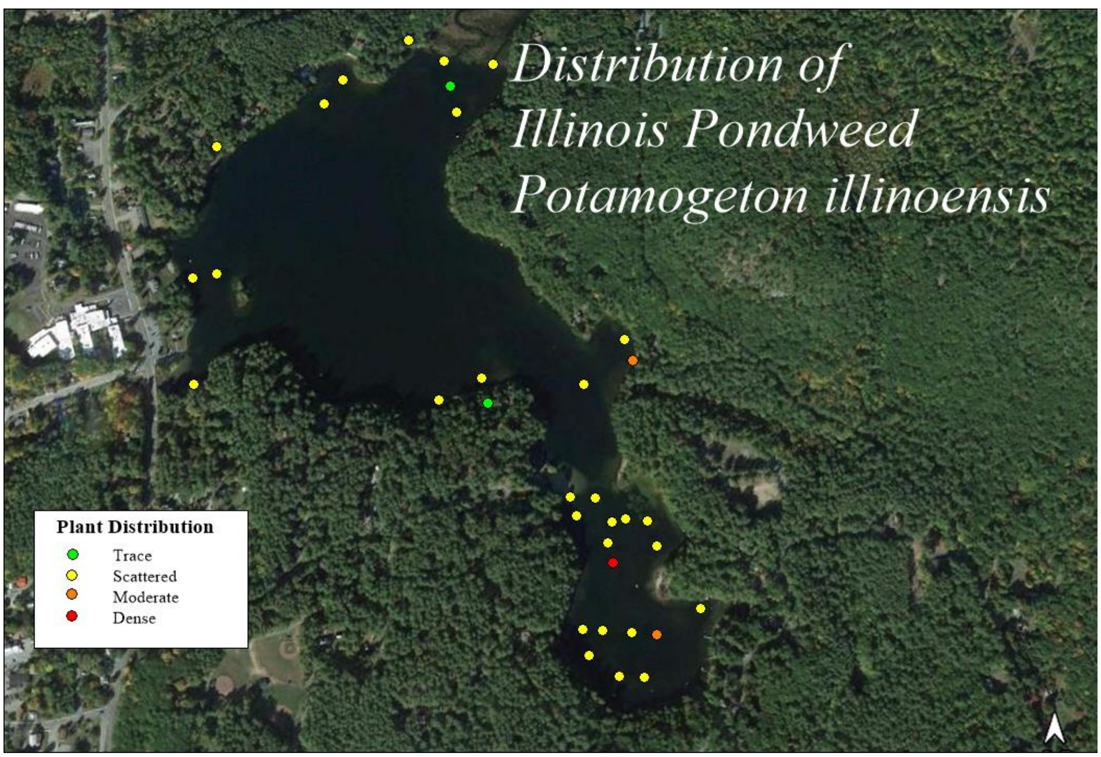

Distribution of
Yellow Pondlily
Nuphar variegata
Plant Distribution
Trace
Scattered
Moderate
Dense

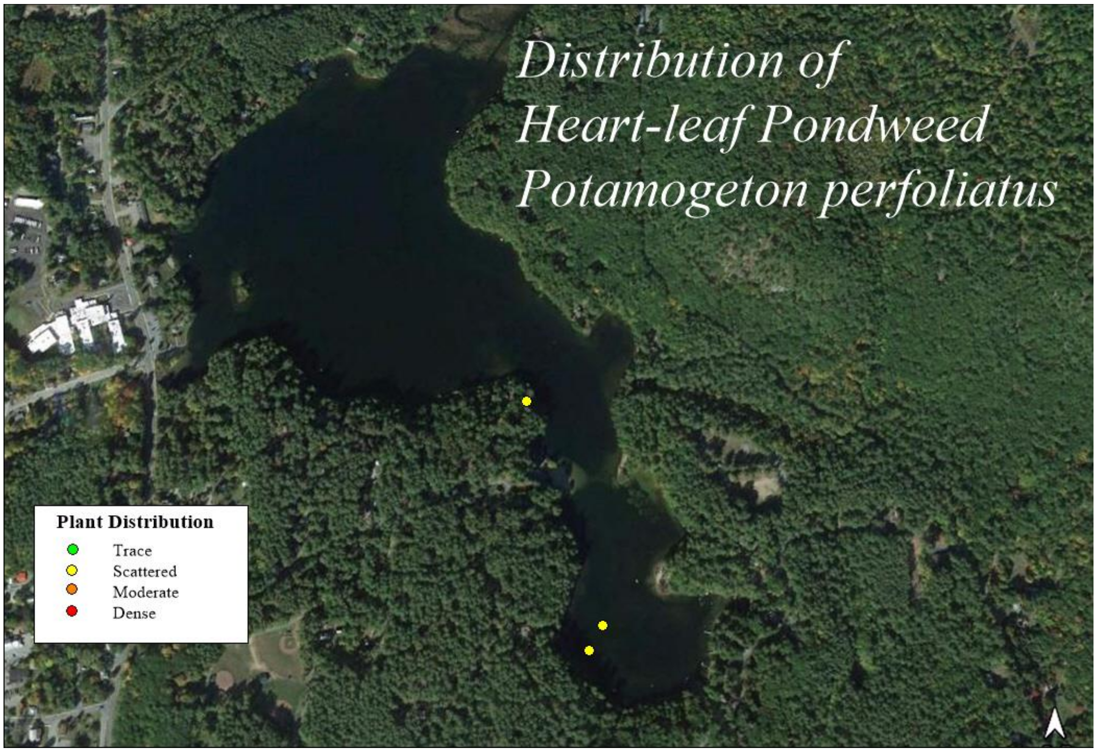

Distribution of
White Pondlily
Nymphaea odorata
Plant Distribution
Trace
Scattered
Moderate
Dense

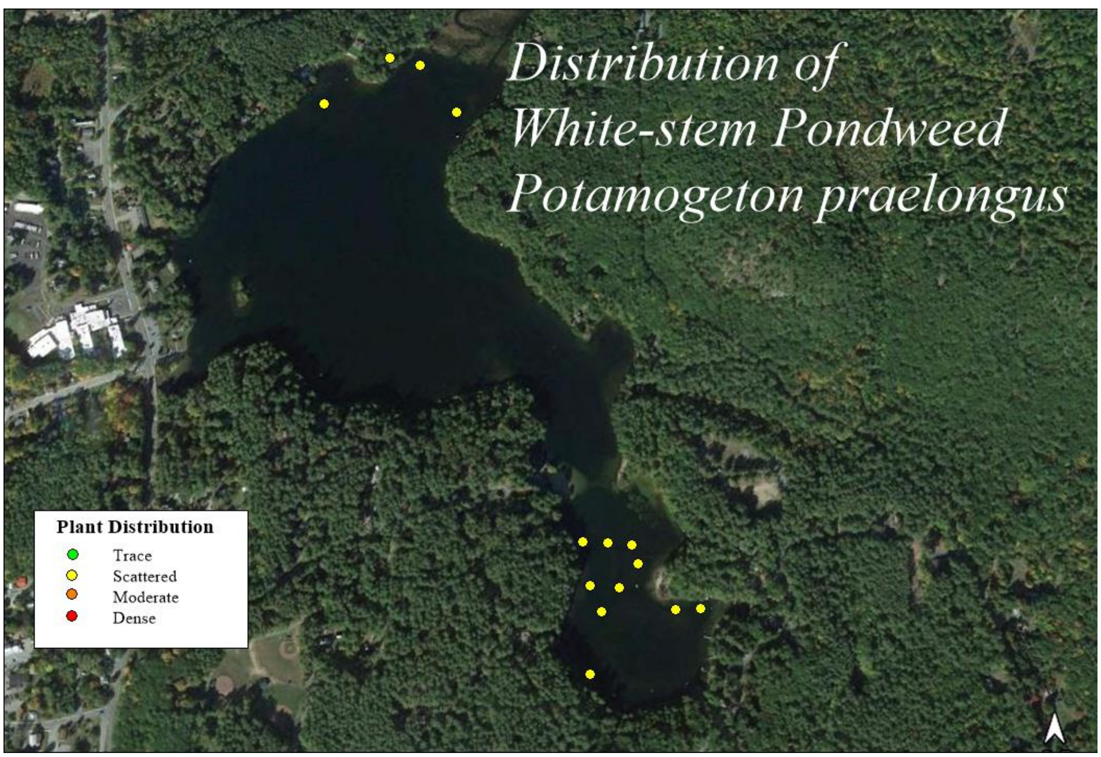

Distribution of
Broad-leaf Pondweed
Potamogeton amplifolius
Plant Distribution
Trace
Scattered
Moderate
Dense


Distribution of
Ribbon-leaf Pondweed
Potamogeton epihydrus
Plant Distribution
Trace
Scattered
Moderate
Dense

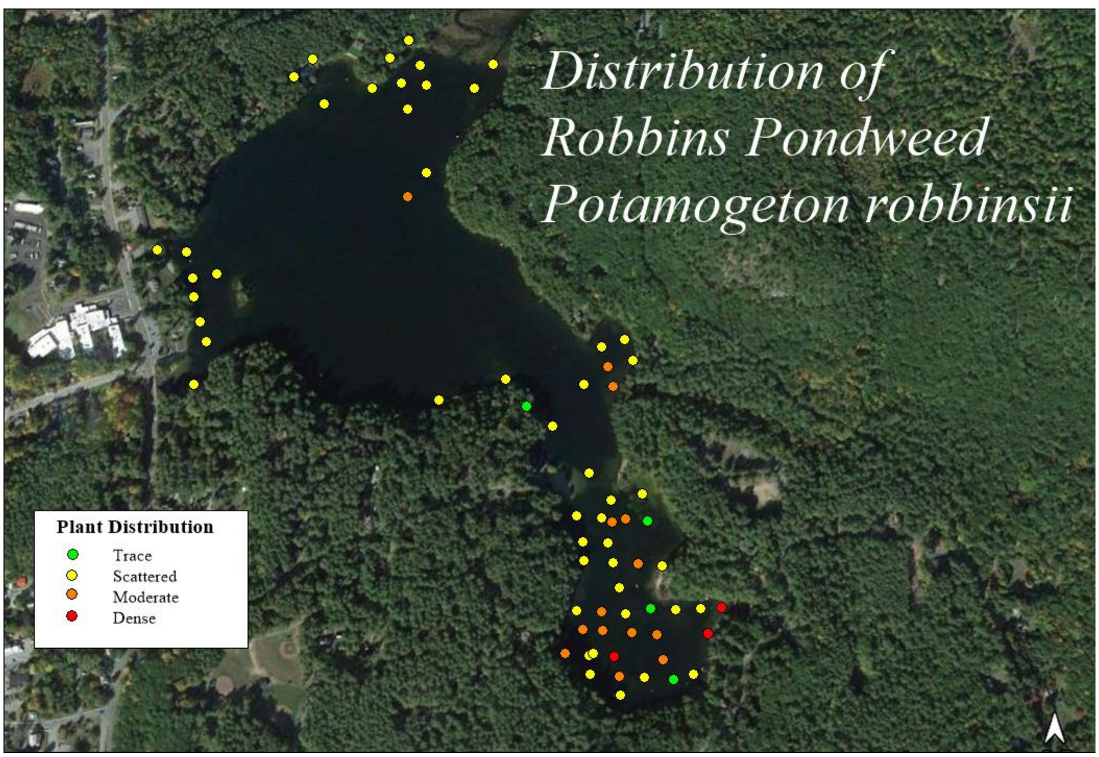

Distribution of
Variable-leaf Pondweed
Potamogeton gramineus
Plant Distribution
Trace
Scattered
Moderate
Dense

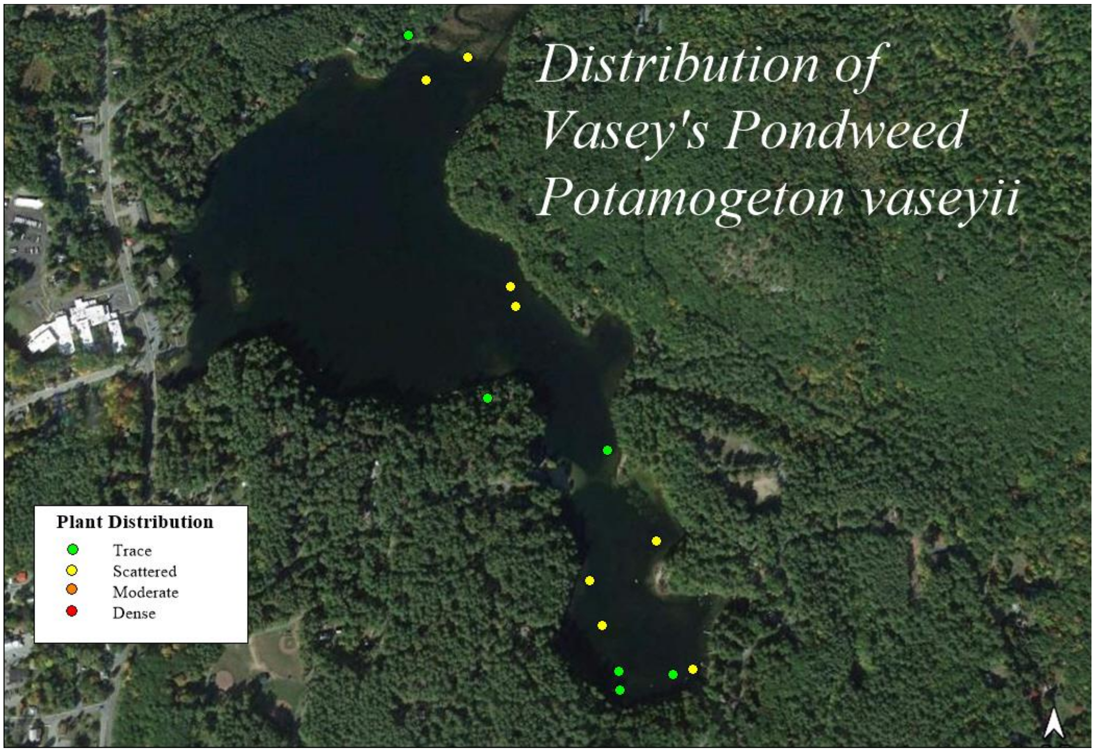

Distribution of
Illinois Pondweed
Potamogeton illinoensis
Plant Distribution
Trace
Scattered
Moderate
Dense

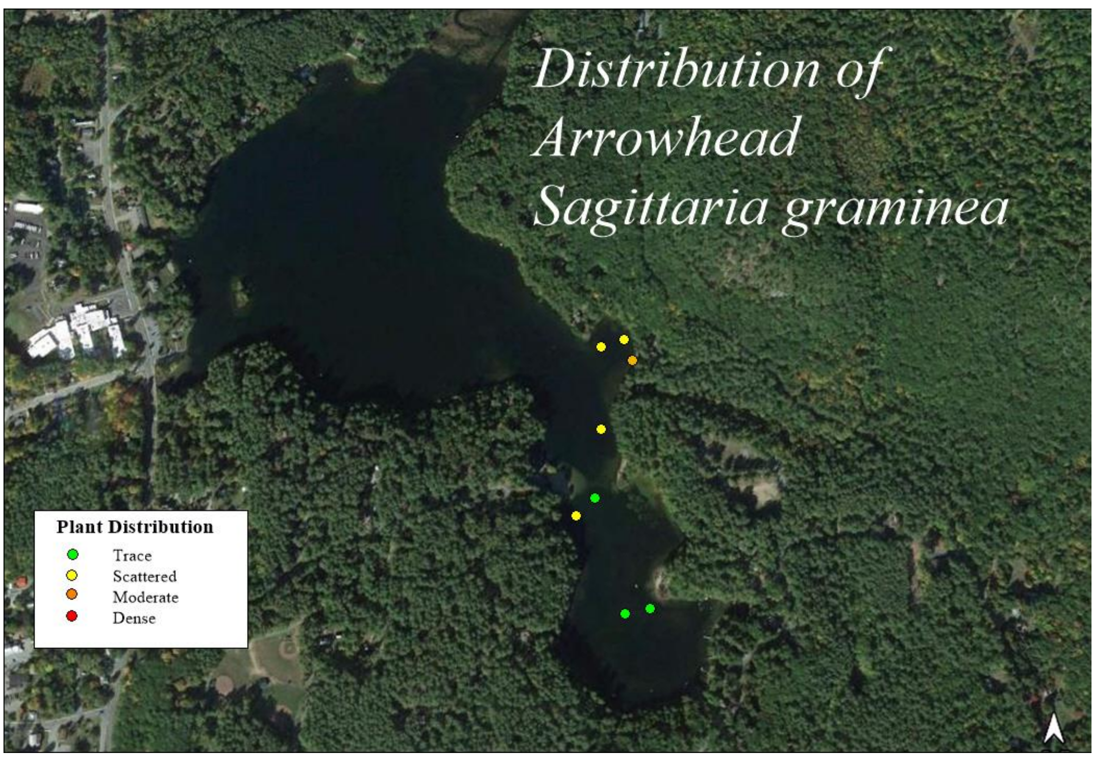

Distribution of
Heart-leaf Pondweed
Potamogeton perfoliatus
Plant Distribution
Trace
Scattered
Moderate
Dense

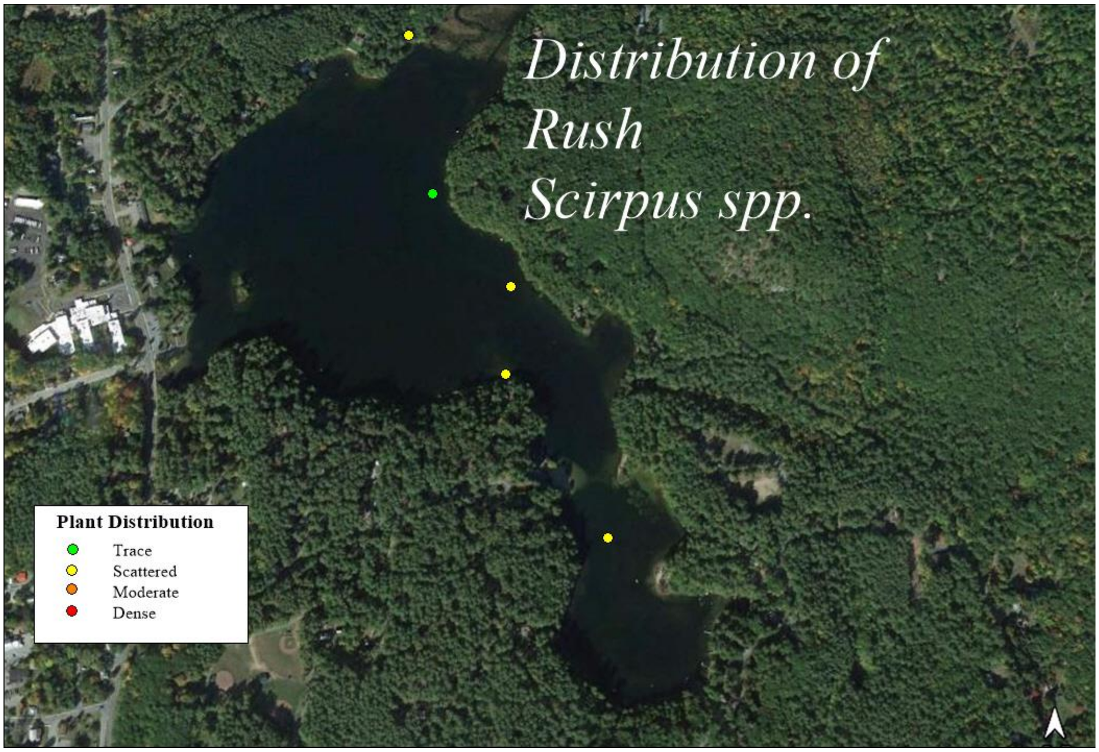

Distribution of
White-stem Pondweed
Potamogeton praelongus
Plant Distribution
Trace
Scattered
Moderate
Dense

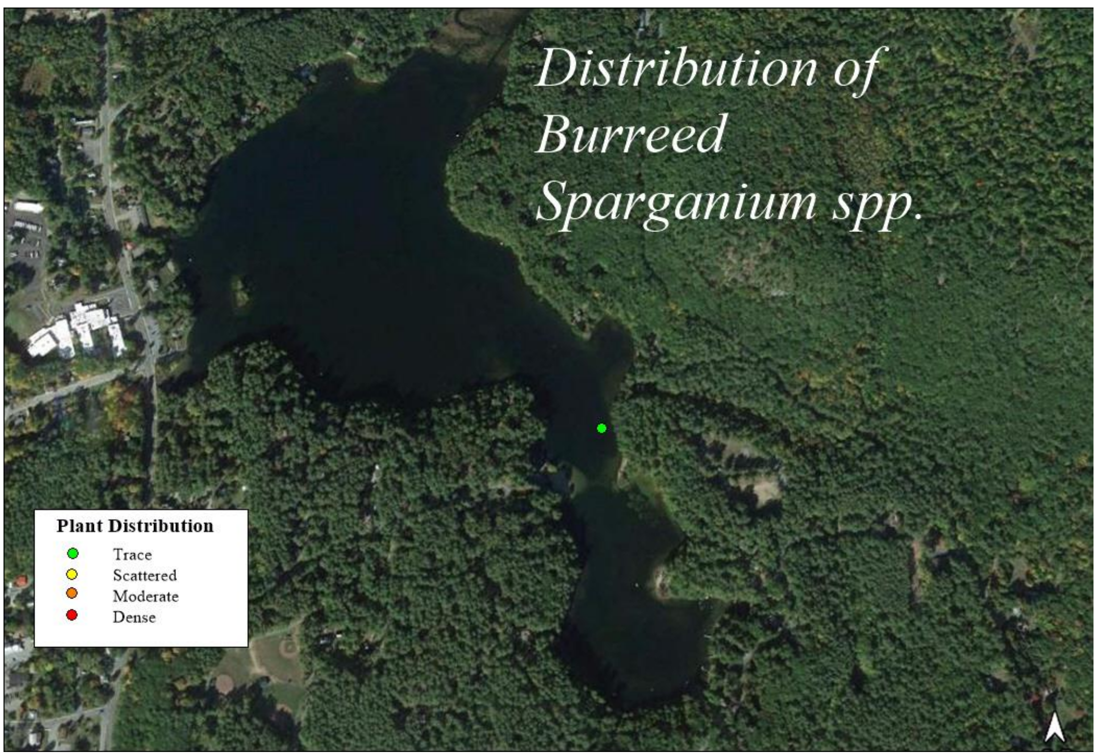

Distribution of

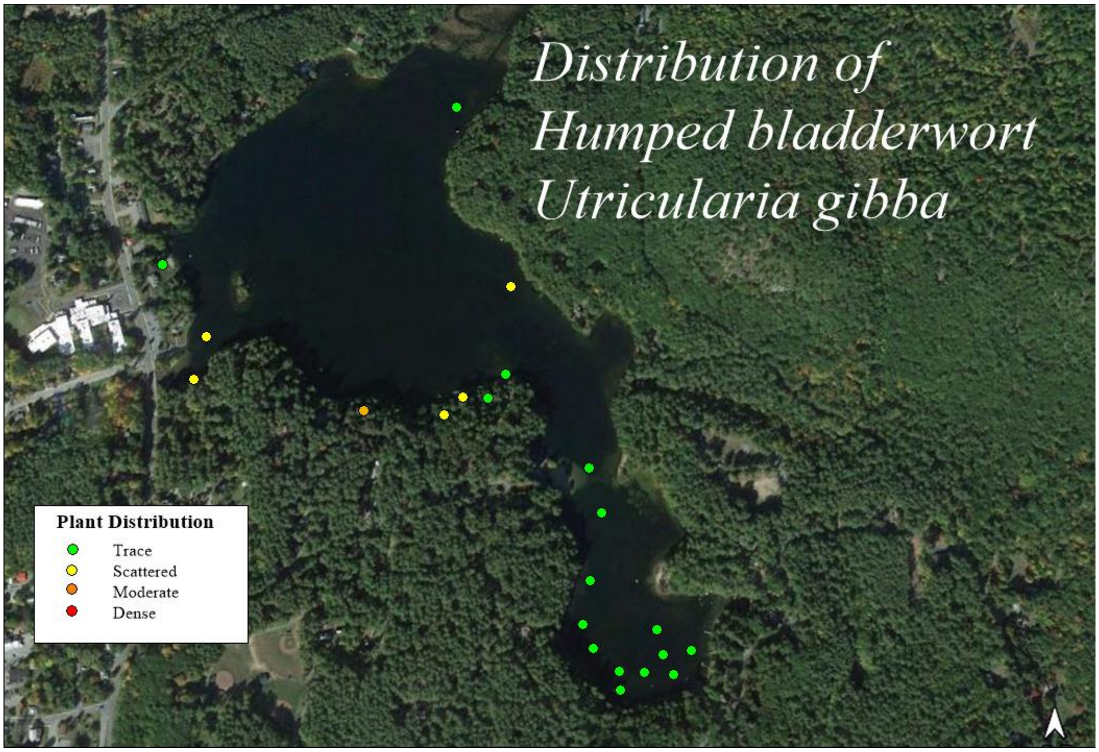

Distribution of
Robbins Pondweed
Potamogeton robbinsii
Plant Distribution
Trace
Scattered
Moderate
Dense

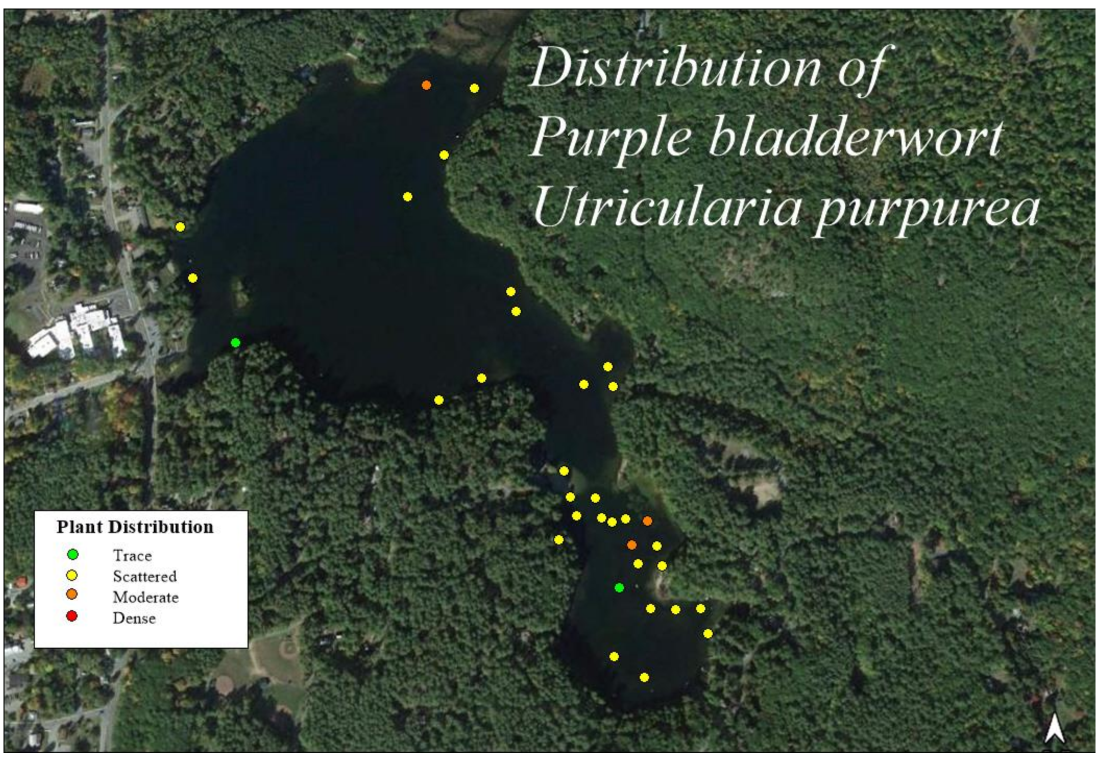

Distribution of
Vasey's Pondweed
Potamogeton vaseyii
Plant Distribution
Trace
Scattered
Moderate
Dense

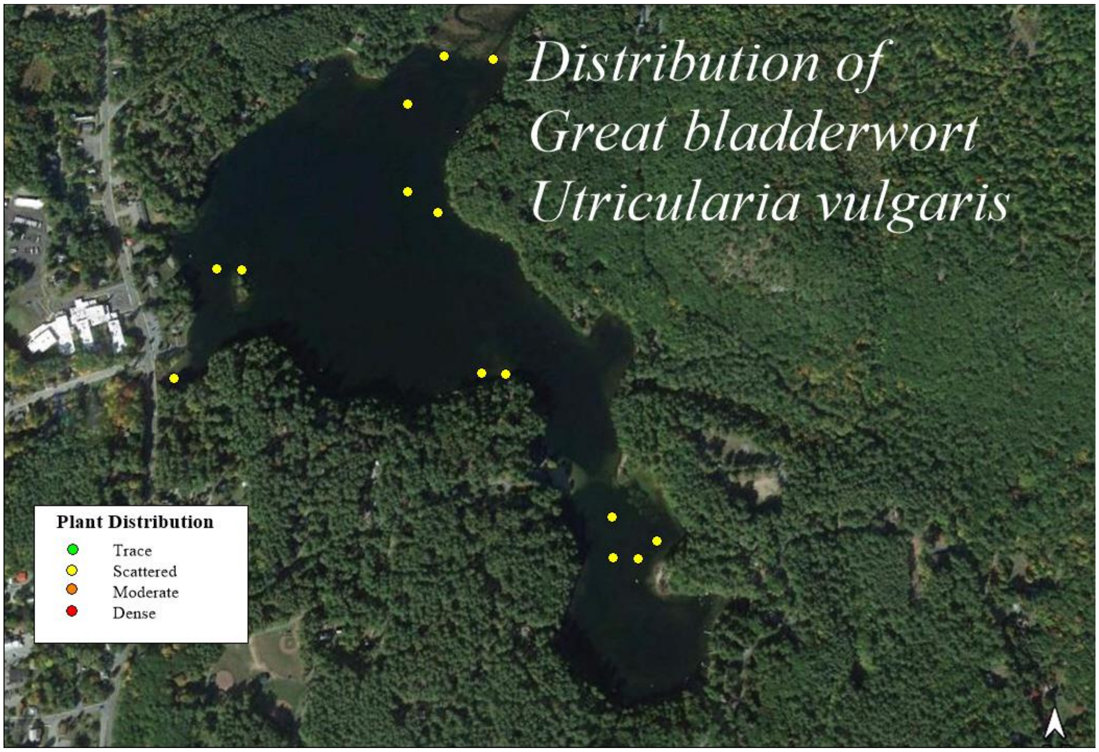

Distribution of
Arrowhead
Sagittaria graminea
Plant Distribution
Trace
Scattered
Moderate
Dense

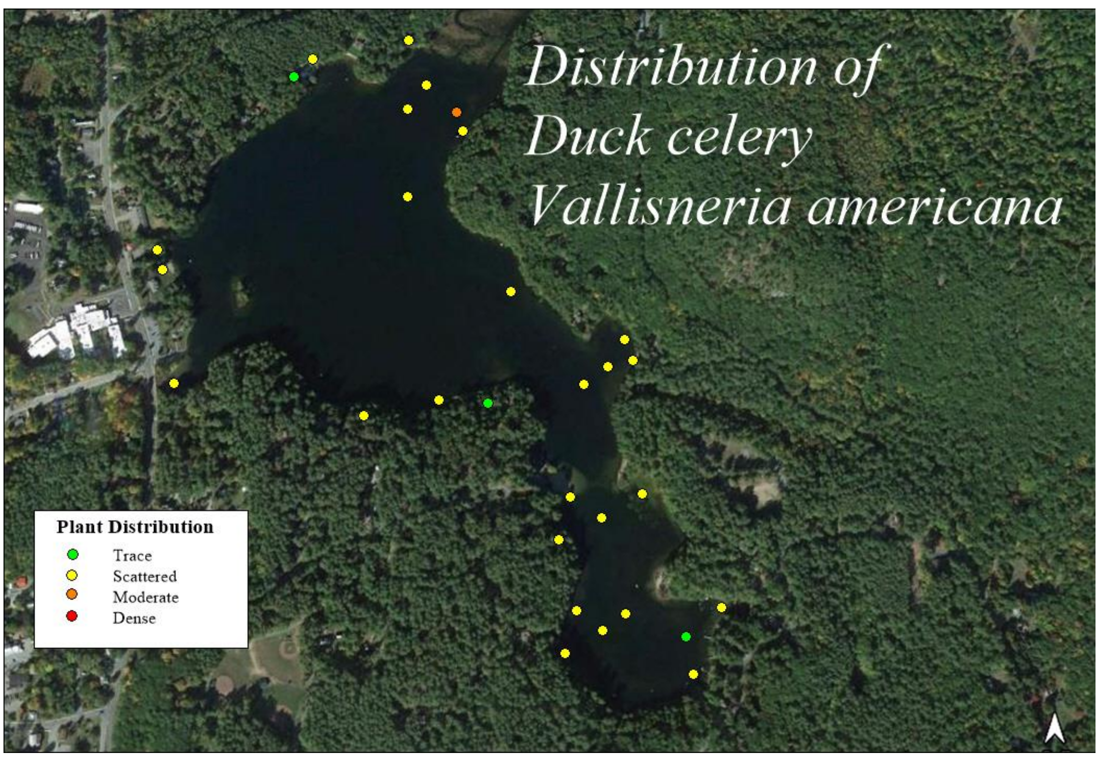

Distribution of
Rush
Scirpus spp.
Plant Distribution
Trace
Scattered
Moderate
Dense


Distribution of
Burreed
Sparganium spp.
Plant Distribution
Trace
Scattered
Moderate
Dense


Distribution of
Humped bladderwort
Utricularia gibba
Plant Distribution
Trace
Scattered
Moderate
Dense


Distribution of
Purple bladderwort
Utricularia purpurea
Plant Distribution
Trace
Scattered
Moderate
Dense


Distribution of
Great bladderwort
Utricularia vulgaris
Plant Distribution
Trace
Scattered
Moderate
Dense


Distribution of
Duck celery
Vallisneria americana
Plant Distribution
Trace
Scattered
Moderate
Dense

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency
RECEIVED
Date: March 10, 2023

COMMERCIAL A E DIVING SERVICES

Serving the Northeast Since 1998

AE Commercial Diving Services
Christopher H. Sheldon, Owner

PO Box 417,
Manchester Center, VT 05255
(802)558-2985

aediving@gmail.com
AECommercialdiving.com

October 18, 2022

ATTN: Jim Niles

Town Councilman

RE: 2022 Watermilfoil Report for Lake Luzerne.

Dear Jim,

We appreciate the Town of Lake Luzerne giving us the opportunity to work on Lake Luzerne for the 2022 season. We hope to continue to be part of your long-term control efforts and look forward to working with you in the future.

Attached you will find our final report for the 2022 season. If you have any questions, please let me know.

Have a good and safe winter. Thank you for your time.
Sincerely,

Chris Sheldon
President & Owner
AE Commercial Diving Services (AECDS)

ATTN: Jim Niles / Town Councilman

RE: 2022 Watermilfoil Report

SYNOPSIS:

Project start date – Phase I – June 13th, 2022
Phase II – September 19th, 2022
Divers – Chris Sheldon, Hannah Sheldon, Matt Blomster, Owen Tompkins, Becky Hines, Dan Dressler, Joseph Agosto, Ian Connors.
Tenders – Owyn Rogers
Number of DASH boats and crews – Phase I – 1/2, Phase II – 1
Number of days spent – Phase I – 14, Phase II – 12

NOTES: The DASH crews worked in many areas around Lake Luzerne. An overview of the lake itself and past harvesting efforts was presented by Jim Niles. This helped us direct the DASH crew(s) to the various sites around the lake and to formulate a plan for the season. The work sites were relatively shallow with varying bottom compositions and the visibility averaged approximately 15 feet. All the Eurasian Water Milfoil (EWM) plants harvested each day were transported back to the milfoil boat dock area and placed in a town dump trailer for disposal. Most of the areas on Lake Luzerne did not have significant growth and were cleaned up quickly during each phase. The project was conducted in two phases to allow for any re-growth from the first phase to be removed during phase 2. We find this method to be very beneficial in the overall reduction of aquatic invasive species (AIS) in a waterbody.

During phase 1 all the buckets were weighed, and the weights recorded. Unfortunately, this didn't happen during phase 2. An average weight was calculated based on Phase 1 and used to determine the total weight removed during Phase 2. See attached chart.

PHASE 1

We started at the town beach and boat launch area and worked our way down the west shoreline heading north. We encountered sporadic EWM growth generally consisting of plants with one or two stems ranging in height from a few inches to 5 feet. The largest and most dense area of EWM growth was in front of one of the motels. This area was challenging due to the hard packed sandy bottom and the presence of a lily pad bed. The EWM plants were dense with multiple stems but were in shallow water and quickly cleaned up.

We then moved into the back bay area between the other town beach and the music school. Jim had informed us that this was an area of concern for the town. We found moderate EWM growth that was consistent throughout the area. It did become more sporadic the further into the bay we worked during Phase 1. Most of Phase 1 was spent in the back bay area.

We also had a crew work the town beach and dam area before the summer season got underway for the town. The amount of activity in this area made it a priority. The area was sporadic with a few areas of small dense beds of EWM. The area is very shallow and required multiple visits due to the loss of visibility underwater.

We were also told of a plateau just outside of the back bay that was about 200 feet from shore that had significant growth and needed to be addressed. We located the plateau and found moderate to dense growth consisting of large plants with multiple stems in a soft, muddy bottom. The area was cleaned up but should be monitored for future growth.

Phase 2

I had the DASH crew go over the areas that were worked during Phase 1 to clean up any re-growth that was present. We started Phase 2 at the town beach, dam, and boat launch area. They found mostly sporadic re-growth in this area and quickly cleaned it up. We then worked our way around the island area and down the shoreline finding mostly sporadic re-growth from Phase 1. We notice some sporadic growth along the southern shoreline heading towards the back bay area. This area was not worked during Phase 1. They worked the shoreline all the way to the back bay area finding mostly single stemmed sporadic growth. With the potential for a lot of boat traffic and houses in the area we felt it was important to clean it up.

We then spent the remainder of the time in the back bay area. The area that was worked during Phase 1 had about 30% re-growth which is what we typically see. We then checked the remaining areas in back bay and found mostly sporadic EWM growth that was quickly removed and disposed of.

Future recommendations

Going forward I would recommend continuing with the two-phase approach. This has proven to be effective and will allow us to continue to remove regrowth during phase 2 each season. I also feel that the progress made this summer will result in less overall EWM in Lake Luzerne next year. This will allow us to maintain the areas worked in 2022 quickly therefore freeing up time to move into other areas of the lake that require attention. Each season I would recommend maintain what was done in the past and move into different problem areas in the lake until we reach the point where the entire lake is in a maintenance situation. Once that happens then the level of effort needed, and the budget required will level off and become more manageable.

FINDINGS:

DATE	HOURS WORKED	LOCATION	BUCKET COUNT	BUCKET WEIGHT
6/13/22	2	Boat launch	0	Brief survey of the lake and set up
6/14/22	6	Boat launch area	3	No weights
6/15/22	8	Boat launch area	5	No weights
6/16/22	8	Shoreline north of boat launch	15	43, 29, 31, 38, 37, 28, 30, 41, 33, 31, 30, 30, 20, 39, 37 **(497 lbs)**
6/17/22	8	Between Island and west shoreline	8	35, 33, 34, 36, 30, 29, 42, 33 **(272 lbs)**
6/21/22	6	Northwest shoreline around the motels	7	41, 31, 46, 33, 36, 36, 40 **(263 lbs)**
6/22/22	8	Back Bay Plateau	12 5	40, 25, 23, 24, 48, 35, 42, 50, 42, 40, 47, 47 32, 24, 29, 26, 32 **(606 lbs)**
6/23/22	8 (2 boats)	Back Bay	16	
6/24/22	8 (2 boats)	Plateau Back Bay Milfoil boat dock	10 7 10	28, 25, 28, 30, 26, 29, 12, 23, 14, 18 23, 18, 19, 19, 20, 16, 17 **(671 lbs)** 33, 27, 30, 36, 23, 34, 24, 28, 27, 44
6/27/22	4	Plateau	3	17, 22, 16 **(55 lbs)**
6/28/22	8 (2 boats)	Plateau Back Bay	7 11	22, 25, 28, 26, 28, 24, 38 **(550 lbs)** 36, 27, 29, 25, 35, 50, 36, 39, 42, 19, 21
6/29/22	8 (2 boats)	Back Bay	12	20, 48, 30, 28, 27, 50, 29, 31, 28, 38, 35, 42 **(406 lbs)**
6/30/22	8 (1.5 boats)	Back Bay	20	20, 29, 26, 32, 48, 60, 59, 24, 50, 62, 24, 28, 26, 32, 25, 20, 26, 30, 35, 18 **(674 lbs)**
7/1/22	8 (1.5 boats)	Back Bay	11	44, 42, 37, 29, 34, 45, 23, 38, 38, 42, 27 **(399 lbs)**
9/19/22	10	Milfoil boat dock area/ beach area	16	No weights.
9/20/21	10	Boat launch	25	No weights
9/21/22	10	Shoreline north of boat launch/island area	6	No weights
9/22/22	10	South of boat launch along the west shoreline	11	No weights

9/26/22	10	Back Bay	4	No weights
9/27/22	10	Back Bay	16	No weights
9/28/22	10	Back Bay	22	No weights
9/29/22	10	Back Bay	25	No weights
10/3/22	10	Back bay	26	No weights
10/4/22	10	Back Bay	24	No weights
10/5/22	10	Back Bay	23	No weights
10/6/22	10	Back bay	55	No weights
TOTALS		PHASE	BUCKETS	WEIGHTS
		Phase 2 Phase 1	203 154	5,785.50 lbs. total. *(Based on an average weight of 28.5 lbs.) 4,393 lbs. total
TOTAL			357	10,178.50 total weight (approx.) 7,140 gallons (1 bucket = 20 gallons approx.) 5.09 tons of biomass removed.

* I took the average weight of the buckets that we had weights for from the first phase (28.5LBS) and multiplied it by the number of buckets without weights to get the total weight for the second phase.

(END)

Adirondack Park Agency
RECEIVED
Date: March 10, 2023

AQUATIC MACROPHYTE SURVEY
SEPTEMBER 14, 2011
LAKE LUZERNE
LAKE LUZERNE, NY

Allied Biological, Inc.
580 Rockport Road, Hackettstown, NJ 07840
ph (908) 850-0303 fax (908) 850-4994

I. Introduction

On September 14, 2011 Allied Biological, Inc. conducted a detailed aquatic macrophyte survey at Lake Luzerne located Adirondack Park in Warren County. This survey is essential in order to determine the aquatic macrophytes that comprise the Lake Luzerne assemblage and their relative abundance and distribution following the 2010 application of triclopyr (Renovate®) in the Southern Cove for the control of Eurasian water milfoil in that location. In addition to assessing the efficacy of the Eurasian water milfoil control, the survey will be used to identify other potential sites in the main basin suitable for herbicide use. Although this survey followed the NYSDEC Tier II guidelines of aquatic macrophyte surveying (one toss per site), similar procedures and sites were utilized to compare data collected during the 2010 survey (Eichler, 2010).

II. Procedures

Before the survey began, a grid was overlain on an aerial map of the lake focusing on the littoral areas. The total number of sample locations is usually based on the total acreage of the lake. As a rule of thumb, one sample location per acre (minimum 50 sample locations) is surveyed. If the lake is over 100 acres in size, the number of sample locations is reduced to about 100. It should also be noted that deeper water areas (total depth greater than 20 feet) are generally not surveyed due to the lack of aquatic macrophyte growth caused by poor light penetration. The sample locations are depicted on a map in the Appendix of this report.

The grid and the boundary map were loaded onto a GPS unit and the survey boat is piloted to the first sample location. On arrival, the GPS coordinates of the sample location were recorded using a Trimble GeoXH 2008 series handheld GPS unit with sub-meter accuracy. The water depth was also measured, using a boat mounted depth finder, a handheld depth gun (HawkEye digital sonar system, or equivalent), or a calibrated metal pole, as appropriate to the conditions. The water depth is recorded on a field log, and is depicted on a map. Any other pertinent field notes regarding the sample location are also recorded on the field log.

Next, a weed anchor attached to a 10 meter-long piece of rope is tossed from a random side of the boat. It is important to toss the weed anchor the full 10 meters (a loop at the end of the rope is attached to the boat to prevent losing the anchor). The weed anchor is slowly retrieved along the bottom, and carefully hoisted into the boat. To determine the overall submersed vegetation amount, the weed mass is assigned one of five densities, based on semi-quantitative metrics developed by Cornell University (Lord, et al, 2005). These densities are: **No Plants** (empty anchor), **Trace** (one or two stems per anchor, or the amount that can be held between two fingers), **Sparse** (three to 10 stems, but lightly covering the anchor, or about a handful), **Medium** (more than 10 stems, and covering all the tines of the anchor), or **Dense** (entire anchor full of stems, and one has trouble getting the mass into the boat). See the Appendix of this report for pictures of these representative densities. These densities are abbreviated in the field notes as 0, T, S, M, and D. Next the submersed weed mass is sorted by species (or Genus, if the species can’t be confirmed in the field) and one of the five densities (as described above) is assigned to each species. Finally, overall floating macrophyte density within a 10 meter diameter of the survey boat is assigned a density, as well as an estimated density for each separate species observed. This data is recorded in the field notes. This procedure is then repeated for the remaining sample points.

A sample of each different macrophyte is collected and placed in a bottle or Ziploc-type bag with a letter or number code (A, B, 1, 2, etc.). If possible, these samples included both submersed and floating leaves (if any), seeds, and flowers (if present), to facilitate identification. These bottles were placed in a cooler stocked with blue-ice packs or ice, and returned to Allied Biological's lab for positive identification and photographing. Regionally appropriate taxonomic keys (see the list in section VII) were used to identify the aquatic macrophytes to the lowest practical taxa.

The weed anchor used for aquatic macrophyte surveys has a specific design. It is constructed with two 13.5 inch wide metal garden rakes attached back to back with several hose clamps. The wooden handles are removed and a 10 meter-long nylon rope is attached to the rake heads.

III. Summary of Major Findings

The following is a summary of major findings for the September 2011 Aquatic Macrophyte Survey performed at Lake Luzerne by Allied Biological.

- During the September 2011 full basin aquatic macrophyte survey at Lake Luzerne, 38 different aquatic macrophytes were collected at 95 sample locations. An additional five emergent species and one submersed species were observed, but not collected on any weed anchor tosses.
- Lake Luzerne has excellent aquatic macrophyte diversity (typical for an Adirondack lake), including five different species of water milfoil, 10 different species of pondweeds, and four different species of bladderworts.
- Three exotic invasive species were collected during the survey: Eurasian water milfoil (the target of an herbicide application in the Southern cove), curly-leaf pondweed, and southern naiad.
- Eurasian water milfoil was collected at 24% (n=23) of the sites surveyed in 2011. However, only 17% of these sites supported nuisance growth. In the Southern treatment cove, Eurasian water milfoil was only collected at one site (trace density), and observed near another site.
- In 2011, three new aquatic macrophytes were observed for the first time (or at least since 1998 surveys were conducted). These included low water milfoil, floating-leaf pondweed and small duckweed. Southern naiad was also confirmed in 2011, and had not been documented at Lake Luzerne since 1998.
- Four aquatic macrophytes collected in 2011 were on the New York State Natural Heritage Watch or Active Inventory List as Rare or Threatened. These include little water milfoil, water marigold, lake quillwort, and small bladderwort.

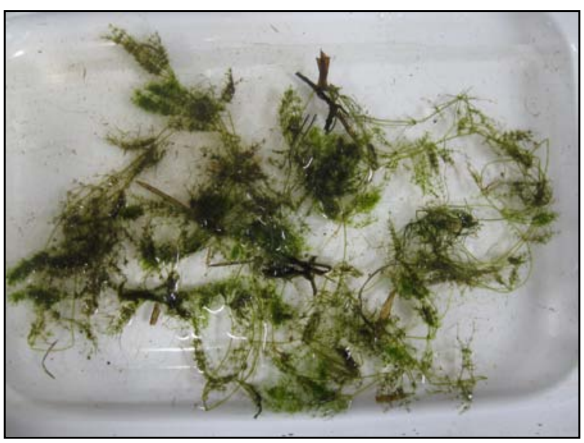
IV. Macrophyte Summary

The following aquatic macrophytes were collected and/or observed at Lake Luzerne on September 14, 2011. The respective macrophyte percent abundance data are summarized on Table #1 in the Appendix. Table #2 is a summary of all the data collected at each sample site. Table #3 is a summary of the historical macrophyte occurrence at Lake Luzerne since 1998 (derived from Eichler, 2010). In addition, the distribution of each individual macrophyte is depicted on separate maps located in the Appendix of this report. Below is a short description of each macrophyte and a picture, arranged in order of dominance with submersed macrophytes first and then floating macrophytes. Unless otherwise noted, all pictures of macrophytes represent the actual plants collected or observed at Lake Luzerne, either taken in the field, or from samples returned to Allied Biological's laboratory.

Robbins Pondweed (*Potamogeton robbinsii*. Common Name: Fern pondweed. **Native**.): Robbins pondweed has robust stems that emerge from spreading rhizomes. The leaves are strongly ranked creating a fern-like appearance most clearly seen while still submerged. Its distinct closely-spaced fern-like leaves give it a unique appearance among the pondweeds of our region. Each leaf is firm and linear, with a base that wraps around the stem. The leaves tend to be dark green to brown. At the stem it has ear-like lobes fused with a fibrous stipule. No floating leaves are produced. Although it rarely produces fruit, whorled stalks of fruits are occasionally produced. Robbins pondweed thrives in deeper water (sometimes exceeding depths 5.0 meters), and under some circumstances, it can over winter green. Robbins pondweed creates suitable invertebrate habitat, and cover for lie-in-wait predaceous fish, such as pickerel and pike.

Large Purple Bladderwort (*Utricularia purpurea*: Common Name: Purple bladderwort, large purple bladderwort. **Native.**): Large purple bladderwort has free-floating stems that can reach lengths up to one meter long. Its branches are filament-like, and arranged in whorls even spaced out along the stem. The whorls tend to curl at the growing tip. It differs from other native bladderworts by its purple snap-dragon-like flowers (produced in late summer) and the location of the bladders. All bladders are located at the tip of a branch only. It prefers soft, low pH water, but its distribution in a lake is dependent on wind and water currents. It produces overwintering buds, or can reproduce via fragmentation. This latter form of reproduction can attribute to nuisance growth, interfering with recreational uses. Mats of large purple bladderwort provide habitat for a myriad of aquatic invertebrates, and forage opportunities for fish.

Wild Celery (*Vallisneria americana*. Common Names: Wild celery, water celery, eel-grass, tape-grass. **Native**.): Wild celery has long flowing ribbon-like leaves that have a basal arrangement from a creeping rhizome. The leaves can be up to two meters long, have a cellophane-like texture, with a prominent center stripe and finely serrated edges. The leaves are mostly submersed, although they can reach the surface allowing the tips to trail. Male and female flowers are produced on separate plants, but reproduction is usually via over wintering rhizomes and tubers. Wild celery usually inhabits hard substrate bottoms in shallow to deep quiet waters and streams. It can tolerate a wide variety of water chemistries and is somewhat turbidity tolerant. Wild celery is the premiere food source for waterfowl, which greedily consume all parts of the plant. Canvasback ducks (*Aythya valisneria*) enjoy a strong relationship with wild celery, going so far as to alter their migration routes based on wild celery abundance. Extensive beds of wild celery are considered excellent shade, habitat and feeding opportunities for fish as well.



Water Moss (*Fontinalis* sp. Common Name: water moss. **Native**.): Water mosses are submerged mosses that are attached to rocks, trees, logs, and other hard substrates by false rootlets located at the base of their stems. It prefers cooler waters and low pH water, in general, although individual species can vary. It can grow in quiet lakes and ponds, or attached to rocks in quick moving streams. The stems are dark-green to brown, and about one foot long. The leaves share a similar color as the stems, and are usually ovate with fine-toothed margins. Water moss is particularly sensitive to copper. Water moss is highly utilized by aquatic invertebrates, and as a breeding site for small fish. Due to its short growth pattern, water moss rarely reaches nuisance levels.

Muskgrass (*Chara* sp. Common Names: muskgrass, stonewort, Chara. **Native**.): Muskgrass is actually a multi-branched algae that appears as a higher plant. Since its structure and life history is similar to higher plants, it's often included in aquatic macrophyte surveys. It is simple in structure and has rhizoids instead of true roots. The branches of muskgrass have ridges that are often encrusted with calcium carbonate, granting the entire plant a "crusty" feel and appearance. The side branches develop in whorls that look like the spokes in a wheel. It typically is only a few centimeters tall, although it can reach lengths up to one meter under ideal conditions. Muskgrass reproduces vegetatively via rhizoids, as well as sexually. Female reproductive parts are pear-shaped oogonium, visible without magnification. The oogonium is capped with five cells (while those of stonewort are capped with 10 cells). Muskgrass is easily identified by a pungent, skunky odor. It prefers softer sediments, and can often be found in deeper water than other plants. As such, it's considered an early pioneer, the first species to colonize a disturbed lakebed.

Northern Water Milfoil (*Myriophyllum sibiricum; =M. exalbescens*) Common Names: Northern water milfoil, spiked water milfoil. **Native.**): Northern water milfoil has light colored stems, usually sparingly branched and erect when in the water column. Thread-like leaves occur, usually in five to 12 pairs, on a short stalk. The lower leaflet pairs tend to be longer granting the appearance of the Christmas tree. Fruit are produced on flower spikes with whorls of red-tinted flowers, although reproduction via seed is usually limited. The fruit are four-parted with a smooth to roughened surface. It overwinters via hardy rootstalks and the production of winter buds. Northern water milfoil prefers soft sediments in shallow zones to about four meters deep. It prefers clear water, and thus is sensitive to reduced water clarity, often declining in water bodies becoming more eutrophic. The leaves and fruit of Northern water milfoil are readily consumed by waterfowl, while the feather-like leaflets provide excellent invertebrate habitat. Beds of Northern water milfoil provide suitable shade, shelter and grazing opportunities for fish. Northern water milfoil was likely quite common in areas of the Northeast, but has since declined due to increasing eutrophic conditions and the aggressive nature of the invasive Eurasian water milfoil.

Eurasian Water Milfoil (*Myriophyllum spicatum*. Common Names: Asian water milfoil. **Aggressive, Exotic, Invasive**.): Eurasian water milfoil has long (two to four meters long) spaghetti-like stems that grow from submerged rhizomes. The stems often branch repeatedly at the water's surface creating a canopy that can shade out other vegetation, and obstruct recreation and boat navigation. Low light conditions and high surface water temperatures promote canopy formation. The leaves are arranged in whorls of four to five, often spread out along the stem one to three centimeters apart. The leaves are divided like a feather, resembling the bones on a fish spine, typically with 14 to 20 pairs. Eurasian water milfoil is an exotic, originating in Europe and Asia, but its range now includes most of the United States. It's ability to grow in cool water and at low light conditions gives it an early season advantage over other native submersed plants. It can grow in water up to 15 feet deep, and prefers fine-textured inorganic sediments. In addition to reproducing via fruit production, it can also reproduce via fragmentation. It does not produce winter buds, and can persist under the ice as an evergreen plant. Waterfowl graze on Eurasian water milfoil, and its vegetation provides substandard habitat for invertebrates. However, studies have determined mixed beds of native pondweeds and wild celery can support more abundant and diverse invertebrate populations.

Bass Weed (*Potamogeton amplifolius*. Common Names: Large-leaf pondweed, bass weed, musky weed. **Native.**): Bass weed has robust stems that originate from black-scaled rhizomes. The submersed leaves of bass weed are among the broadest in the region. The submersed leaves are translucent, gracefully arched and slightly folded, attached to stems via short (one to six cm) stalks, and possess many (25-37) veins. Floating leaves are opaque and oval-shaped, adorned with numerous veins, and are attached to long stalks (8-30 cm). Stipules are large, free and taper to a sharp point. Flowers, and later in the season fruit, are densely packed onto a spike. Bass weed prefers soft sediments in water one to four meters deep. This plant is sensitive to increased turbidity and also has difficulty recovering from top-cutting, from such devices as boat propellers and aquatic plant harvesters. As its name implies, the broad leaves of this submersed plant provides abundant shade, shelter and foraging opportunities for fish. The abundance of nutlets produced per plant makes it an ideal waterfowl food source.

Little Water Milfoil (*Myriophyllum alterniflorum*. Common names: Little water milfoil, little milfoil, slender milfoil, alternate-flowered milfoil. **Native.**): Little water milfoil is the smallest, most delicate milfoil that occurs in our region, having submersed leaves typically less than 1.0 cm long. The stems are often highly branched, with whorls of three to five leaves evenly spaced along the slender stems. The leaves occur in three to seven thread-like pairs and are typically cupped upward, toward the end of the stem. Sometimes, both stems and leaves have a distinct reddish tint. Tiny flowers are produced in an alternating pattern along a bract that pokes above the water's surface. These bracts are entire, or slightly serrated, often the same length or slightly larger than the flowers produced. Little milfoil produces overwintering buds late in the season. Little water milfoil prefers clear, non-flowing water, and often occurs intermixed with other milfoil and native species. The diminutive branches of little milfoil are host to a myriad of invertebrates, but produce limited habitat for fish larger than newly hatched fry.

Ribbon-leaf Pondweed (*Potamogeton epihydrus*: Common Name: ribbon-leaf pondweed). **Native.)**: Ribbon-leaf pondweed has slightly flattened stems and two types of leaves. The submersed leaves are alternate on the stem, lack a leaf stalk, and are long tape-like in shape. Each leaf, which can reach lengths up to 2.0 meters long, has a prominent stripe of pale green hollow cells flanking the midvein, and five to 13 other veins. Stipules are not fused to the leaf. Floating leaves are egg or ellipse-shaped, and supported by a leaf stalk about as long as the leaf itself. Fruiting stalks are located at the top of the stem and packed with flattened disk-shaped fruits. It is typically found growing in low alkalinity environments, and in a variety of substrates. Seeds are highly sought after by all manner of waterfowl. The whole plant is consumed by muskrat, deer, beaver and moose, while invertebrates utilize underwater structures for habitat.

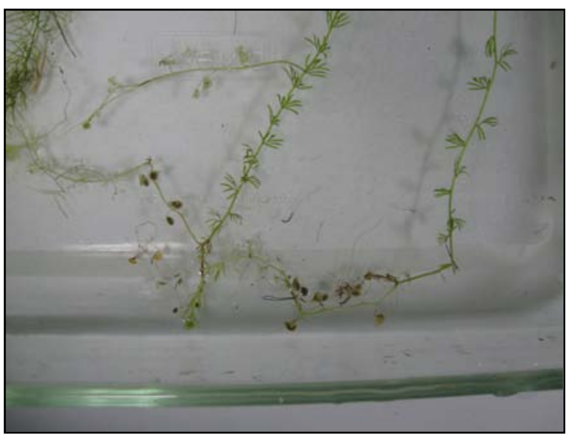
Vasey's Pondweed (*Potamogeton vaseyi*. Common Names: Water thread pondweed, Vasey's pondweed. **Native.**): Vasey's pondweed has fine hair-like leaves that range from 2.0 to 6.0 cm long and 0.2 to 1.0 mm wide originating from delicate stems. It is similar to other varieties of fine-leaved pondweeds (such as *P. diversifolius*). However, the stipules are completely free from the leaves, and submersed leaves do not have lacunar bands. Vasey's pondweed produces tiny floating leaves which are ellipse-shaped (8.0 to 15.0 mm long), and have slender hollow cells (lacunar) between the cells. The seeds are rounded with a slight keel, and an obvious hook-like protrusion at one end. It often produces winter buds on the side branches. Vasey's pondweed prefers quite waters with soft sediment bottoms less than 2.0 meters deep. Seeds are consumed by waterfowl and mammals alike, and the submersed leaves may be colonized by invertebrates, and foraged upon by fish.

Small Pondweed (*Potamogeton pusillus*. Common Name: Small pondweed. **Native**.): Small pondweed has slender stems and a slight rhizome that branches repeatedly near the ends. Only submersed leaves are produced, and these are linear, attaching directly to the stem of the plant. The leaves have three veins and the mid-vein is usually bordered by several rows of lacunar (hollow) cells. There is usually a pair of raised glands at the base of the leaf attachment (called nodal glands). Membranous stipules are wrapped around the stem in early growth, but as the plant ages, these tend to break down, becoming shredded in appearance and free. Flowers and fruits are produced in one to four spaced whorls on a slender stalk. The fruit is plump with a smooth back and a short hooked beak. Small pondweed can tolerate turbid environments and inhabits shallow zones to a depth of three meters. Small pondweed is grazed upon by waterfowl, muskrat, deer, beaver, and even moose. Locally, it can be a very important link in the ecological balance of a lake system. It also provides suitable grazing opportunities and cover for numerous fish.

Common waterweed (*Elodea canadensis*: Common Names: Elodea, common waterweed. **Native.**): Common waterweed has slender stems that can reach a meter or more in length, and a shallow root system. The stem is adorned with lance-like leaves that are attached directly to the stalk that tend to congregate near the stem tip. The leaves occur in whorls of three (or occasionally two). The leaves are populated by a variety of aquatic invertebrates. Male and female flowers occur on separate plants, but it can also reproduce via stem fragmentation. Common waterweed overwinters as an evergreen plant, and primarily reproduces via fragmentation. Its resistance to disease and tolerance of low-light conditions grant it a competitive advantage. Although common waterweed is considered a desirable native plant, it can reach nuisance levels, creating dense mats that can obstruct fish movement, and the operation of boat motors.

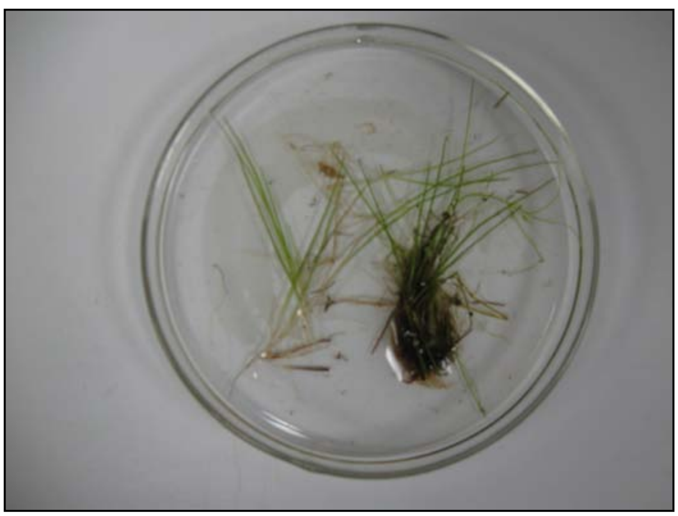
Variable Pondweed (*Potamogeton gramineus*. Common Names: Variable pondweed, grass-leaved pondweed. **Native**.): Variable pondweed has branching stems that arise from a sprawling rhizome. Submersed lance-like alternate leaves have three to seven veins, lack a stalk, and slightly taper where they attach to the stem. Submersed leaves are often translucent, and leaf margins tend to be smooth, although under magnification reveal tiny serrations. Floating leaves are shaped like an ellipse, with 11 to 19 veins, and are attached to the stem via a stalk usually longer than the blade. The appearance of variable pondweed depends on its habitat, substrate type and nutrient availability. It can be compact with "bushy" clusters of short leaves, or single, longer "rangy" leaves. This variability, along with its tendency to hybridize with other pondweeds makes it difficult to identify. It prefers hard sediments, and usually inhabits water less than one meter deep. It can occur in deeper water, and is often associated with beds of muskgrass, naiads and wild celery. Waterfowl graze on its tubers and fruits, and its dense underwater foliage provides suitable macro invertebrate and fish habitat.

Common Bladderwort (*Utricularia vulgaris = U. macrorhiza*: Common Names: Common bladderwort, great bladderwort. **Native.**): Common bladderwort is a free-floating plant that can reach two to three meters in length. Since they are free-floating, they can grow in areas with very loose sediment, and their distribution in a lake can vary based on water movement or prevailing winds. Leaf arrangement is alternate, but may appear in pairs, or even in whorls. Along its stem are finely divided leaf-like branches adorned with minute spines, forked three to seven times. Scattered about the edges of divided leaves are numerous bladders, used to capture prey ranging from the size of unicellular protozoans (such as *Euglena*), to mosquito larvae. Prey is slowly digested inside the bladders by enzymes. Bladders tend to turn brown or black on more mature plants. Common bladderwort produces small yellow snap-dragon-like flowers that protrude above the water. Each stem can be adorned with four to 20 such flowers. Reproduction is primarily by stem fragmentation and over wintering via winter buds. Stems of common bladderwort provide food and cover for fish.



Northern bladderwort (*Utricularia intermedia*. Common names: Flat-leaf bladderwort, intermediate bladderwort, northern bladderwort. **Native.**): Northern bladderwort stems are typically short, less than 0.5 meters long. The leaves are alternately arranged in a tight radiating pattern, similar to a whorl. The finely divided leaves are flattened, serrated, and typically fork one to three times. Bladders only occur on separate leafless stems (often under the sediment), a distinct characteristic of this bladderwort. Flowers are bright yellow, each being five-patterned and two-lipped (similar to a snap dragon flower), and typically occur in clusters of two to four emerging out of the water adorned along stalks. Small, flattened turions are produced at the tips of the stems late in the season. Northern bladderwort prefers bogs, fens, and mucky lakes, often intermixed with other bladderworts and plants. It can also be found creeping along exposed mudflats, along lake and pond margins, and adorning sediment "hummocks" exposed due to nuisance water lily growth. It provides adequate shade, foraging, and cover opportunities, and fine invertebrate habitat.

Small Bladderwort (*Utricularia minor*. Common Names: Small bladderwort, lesser bladderwort. **Native.**): Small bladderwort is a free floating aquatic perennial herb. The stems can are both free floating and creeping usually no more than 75 cm long. The delicate stem is densely lined with fine leaves (usually less than 1.0 cm) in an alternate arrangement. The leaves fork three to seven times, and are adorned with scattered bladders. The bladders are used to capture prey, such as protozoa, zooplankton, and even small insect larvae. The leaves are linear, flat, and bristle-tipped. Small yellow snap dragon-like flowers are produced, with the lower lip twice as long as the upper lip. Since it is free floating, and it derives nutrients from captured prey, it can inhabit low nutrient waters. It prefers soft, quiet waters, and is not limited to substrate type, water clarity, or water depth, due to its lack of roots, but it is at the mercy of wind or water currents. Small bladderwort provides limited grazing and habitat to other aquatic biota.



Spikerush (*Eleocharis* sp.: Common Names: Hairgrass, spikerush. **Native.**): The stems of spike rush are usually slender and short (up to 12 cm long), but certain species can have stems that are about one meter long. The stems emerge in tufts from fine spreading rhizomes. Sometimes the stems are topped with a spikelet of a tight spiral and flowers and eventually nutlets. The nutlets widely vary in surface patterns, and this characteristic is needed for identification to species level. There is also a sterile form of at least one genus that is completely submerged and usually found away from the shoreline. Spikerush prefers firmer substrates, and can tolerate turbid conditions usually in depths up to 2.0 meters deep. The leaves provide suitable food for waterfowl, and excellent habitat and shelter for aquatic invertebrates.

Illinois Pondweed (*Potamogeton illinoensis*. Common Name: Illinois pondweed. **Native**.): Illinois pondweed has stout stems up to two meters long that emerge from thick rhizomes. The submerged leaves are lance-shaped with a needle-like point, attached directly to the stem or on a short stalk, typically in an alternate pattern. These leaves can be up to 20 cm long, and typically have nine to 19 veins. The stipules are free, quite large (4 to 10 cm long) and have two prominent ridges called keels. Sometimes ellipse-shaped floating leaves are produced on a thick stalk usually shorter than the blade. Flower and fruit are arranged in a tight cylindrical spike on a stalk thicker than the stem. The fruit have three low dorsal ridges and a short beak. It tends to grow in shallow water up to depths of three meters, and prefers water with high clarity and moderate to high pH. Illinois pondweed fruit is valuable as waterfowl food, and the large leaves create suitable shade and cover for many fish and invertebrates.

Slender Naiad (*Najas flexilis*: Common Names: water nymph, northern water nymph, slender naiad, bushy pondweed. **Native**.): Slender naiad has fine-branched stems that can taper to lengths of one meter, originating from delicate rootstalks. Plant shape can vary based on environmental conditions; from compact and bushy, to long and trailing slender stems, depending on growing conditions. The leaves are short (1-4 cm long) and taper to a point with very fine serrations (actually minute spines) that are often only visible under a microscope. The leaves broaden gently where they meet the stem. It is a prolific seed producer, generating seeds with faint pits longer than wide. It is found in a variety of habitats, and can colonize sandy or gravelly substrates. Slender naiad typically does not reach nuisance density, due to its low-growing structure in all but the shallowest of waters. It is a true annual, and dies off in the fall, relying on seed dispersal to return the next year. Stems, seeds and leaves are important food sources for waterfowl, marsh birds, and even muskrats.

White-stem Pondweed (*Potamogeton praelongus*: Common Name: White-stem pondweed. **Native.**): White-stem pondweed has zigzag stems that can extend two to three meters in length, and emerge from a stout rust-spotted rhizome. The alternate submersed leaves are lance to oval shaped (quite long, up to 30 cm) and “clasp” around one third to one half of the stem’s diameter. The leaves typically possess three to five strong veins and many (11 to 35) weaker veins. The tip of the leaf is shaped like a boat. No floating leaves are produced. Although similar in appearance to clasping-leaf pondweed, the zigzag stems and attachment to the stem are distinguishing characteristics. Flowers and plump fruit are produced on a cylindrical spike. The fruit have a sharp dorsal ridge, unlike that of clasping-leaf pondweed. White-stem pondweed prefers clear lakes and soft sediment types. It can’t tolerate turbid conditions (often the first plant to die off), and serves as a suitable water quality indicator. The fruit produced by white-stem pondweed is valuable to grazing waterfowl, and portions of the plant are consumed by muskrat, beaver, deer and moose. White-stem pondweed provides valuable food for grazing fish, and excellent habitat for classic lie-in-wait predators such as pickerel and muskellunge.

Dwarf Water Milfoil (*Myriophyllum tenellum*. Common Name: Leafless water milfoil, dwarf water milfoil. **Native.**): Dwarf water milfoil, which does not look anything like other milfoil species, has stiff, slender un-branched stems ranging from 2 cm to 15 cm in height. The alternate leaves are reduced to scales or “bumps”. If the tips rise out of the water, they are capable of producing pale flowers and nut-like fruits. The toothpick-like stems arise from rhizomes in a chain. Dwarf milfoil is often small and overlooked, preferring sandy bottoms in quiet waters up to four meters deep. Dwarf water milfoil provides suitable spawning habitat for pan fish and adequate shelter for small invertebrates. The rhizome networks also help stabilize bottom sediments.

Quillwort (*Isoetes* sp. Common Name: Quillwort. **Native.**): Quillwort leaves grow from a fleshly, lobed underground stem adorned with forked roots. The leaves are arranged in a rosette, radiating from the base of the plant. At the base is a sack containing megaspores and microspores. The former can be used to identify the plant to species with under 100X magnification. Each leaf has a central vein and four longitudinal air chambers visible in cross-section. Quillwort usually inhabits quiet waters of lakes, ponds or streams, ranging from a few centimeters deep to one to three meters deep. Most species of quillwort prefer low nutrient soft water habitats. Quillworts overwinter via spores, or sometimes as evergreen plants. Quillwort can provide limited habitat opportunities in low nutrient sites, often bereft of excessive vegetative growth.

Clasping-leaf Pondweed (*Potamogeton richardsonii*. Common Name: Clasping-leaf pondweed. **Native**.): Clasping-leaf pondweed has sinuous stems that originate from a spreading rhizome. Submersed leaves are oval to lance shaped with 13-21 veins, some more prominent than others. The submersed leaves are wavy in appearance, and tend to be longer than other “clasping-leaf” pondweeds in the region (ranging from three to 12 cm long). The base of each leaf is heart-shaped and “clasps” the stem, wrapping one half to three quarters around it. Stipules are fibrous, but as the season progresses, these disintegrate into a white beard of fibers at the node. No floating leaves are produced. Fruiting stalks are produced, packed with olive-green plump fruit adorned with a prominent beak. Clasping-leaf pondweed can tolerate a wide-variety of sediment types and depths up to four meters deep. Clasping-leaf pondweed can tolerate disturbance and is often found growing with disturbance insensitive species such as coontail and small pondweed. The fruit produced are locally important to waterfowl, and the stems and leaves are grazed on by muskrat, deer and beaver. The leaves and stems are usually packed with aquatic invertebrates and these submersed beds also provide suitable cover and forage opportunities for juvenile fish.

Water Marigold (*Bidens beckii*, =*Megalodonta beckii*. Common Name: Water marigold. **Native**.): Submersed leaves are situated in delicate stems that appear to be a whorl of six leaves. Actually, the widely branched leaves are opposite-arranged bundles of three leaves dividing at the stem junction. Stems are typically not branched, and can reach lengths of two meters. Water marigold usually only develops submersed leafy structures. If it does rise out of the water, its emerged leaves have toothy margins attached directly to the stem. Although it rarely does, it can produce a distinct daisy-like yellow flower on a sturdy stalk. Water marigold prefers soft sediment and clear water, up to three meters deep. It is a classic indicator species, and is often one of the first submersed plants to decline in abundance and distribution when water quality declines. Since it usually doesn't produce flowers, it over winters via rhizomes. The submersed portions of this plant provide shade, shelter and foraging opportunities for fish. When flower structures emerge, it attracts terrestrial flying insects. In New York, water marigold appears on the Natural Heritage Program Watch List (Young and Weldy, 2006). Water marigold is considered Threatened, with a State Rank of S3 (rare, usually 21 to 35 extant sites).

Pipewort (*Eriocaulon aquaticum*. Common Names: Pipewort. **Native.**): Pipewort has translucent green leaves, 2 to 10 cm long, that form a compact basal rosette appearing like a sea urchin. The individual leaves taper from the base to the tip, and have three to nine veins, bearing a checkered appearance due to many fine crossing veins. Pipewort has pale un-branched roots that appear segmented, a distinguishing characteristic. Each rosette typically produces a single flower stalk that can range from a few centimeters to several meters in length, depending on the depth of the water. The flower head is round with many small flowers packed in a tight formation. Pipewort prefers sandy substrates and soft water with excellent clarity. Reproduction can be from overwintering roots, or insect pollination of flower tips. Pipewort creates suitable habitat for invertebrates and amphibians, and is occasionally graze on by waterfowl.

Stonewort (*Nitella* sp. Common Names: stonewort, nitella. **Native**.): Stonewort is actually a multi-branched algae that appears as a higher plant. Although it's not considered a higher plant, stonewort is usually included in aquatic macrophyte surveys, since it occupies a similar ecological role. It lacks conductive tissue and roots, using simple anchoring structures called rhizoids. Stem lengths can reach 0.5 meters, and leaves are arranged in whorls. Although similar in appearance to muskgrass, stonewort has smooth stems and branches usually bright green to translucent, and lacks the distinct musky odor. Another distinguishing characteristic is the number of cap cells on the oogonia: stonewort has ten cap cells (while muskgrass has five cap cells). Nitella inhabits soft sediments in the deeper water of lakes, and can be found as deep as 10 meters. Fish and waterfowl graze on stonewort.

Low Water Milfoil (*Myriophyllum humile*) Common Name: Lowly water milfoil. **Native.**): Low water milfoil is a submersed perennial with delicate stems usually less than one meter long. From these stems are mainly alternate short stalks, with five to 13 pairs of capillary-divided leaves. The stems and leafs can be distinctly tinted red. The minute fruit are round-backed and smooth, a distinguishing characteristic of this milfoil. Flowers are produced in axils of submersed leaves and no winter buds are produced. Low water milfoil inhabits shallow ponds and streams, preferring muddy banks after water recedes. The entire low water milfoil plant is considered a low grade duck food, but beds of low water milfoil provide cover and suitable habitat for small fish and aquatic invertebrates.

Curly-leaf Pondweed (*Potamogeton crispus*. Common Name: curly-leaf pondweed. **Aggressive, Invasive, Exotic.**): Curly-leaf pondweed is native to Europe, but was introduced to North America in the mid-1800's. This invader is very common in the northeast, and its range now includes most of the USA. Curly-leaf pondweed has spaghetti-like stems that often reach the surface by mid-June (up to four meters long). Its submersed leaves are oblong, and attached directly to the stem in an alternate pattern. The margins of the leaves are wavy and finely serrated, hence its name. No floating leaves are produced. Stipules are fused to the base of the stem, but disintegrate early in the season. Curly-leaf pondweed can tolerate turbid water conditions better than most other macrophytes, giving it a competitive advantage over most desirable native plants. In late summer, curly-leaf pondweed enters its summer dormancy stage. It naturally dies off (often creating a sudden loss of habitat and releasing nutrients into the water to fuel algae growth) and produces vegetative buds called turions. These turions germinate when the water gets cooler in the autumn and give way to a winter growth form that allows it to thrive under ice and snow cover, providing habitat for fish and invertebrates.

Southern Naiad (*Najas guadalupensis*. Common Names: Southern water nymph, bushy naiad, bushy pondweed. **Invasive.**): Southern naiad is native to the southern states of the United States, but is often classified as invasive in the Northeast. It shares many common characteristics with other native naiads, including leaves that may be opposite, whorled, or arranged in "sprays" along the delicate stems. These stems tend to be much longer than native naiads, possibly over one meter or more. The leaf tip is blunt, and the leaf base has a slight shoulder. Leaf edges are serrated, but require magnification to detect. Seeds are dull, and adorned with 20 to 40 rows of angled pits. Flowers occur at the base of the leaves, but are so small, they usually require magnification to detect. Reproduction is typically by prolific seed production.

Water bulrush (*Scirpus subterminalis*; = *Schoenoplectus subterminalis*). Common names: water bulrush, bulrush. **Native.**): Water bulrush is a truly aquatic bulrush, with only the tips of fertile stems poking above the water's surface, if any. The slender, limp stems originate from a delicate rhizome, typically less than 2.0 mm diameter. The hair-like stems can reach lengths up to 1.0 meter, and occur in flowing or still-water environments. The leaves are sheathed at the base, and become crescent-shaped above the sheath. This basal sheathing is a distinct characteristic that sets water bulrush apart from spikerush species. The leaves have one to five length-wise veins and scattered cross-veins. The leaves are often covered with a fine coating of algae in nutrient-poor environments. Researchers believe the bulrush plants are a phosphorus source for the algae. When nutlets are produced, they are three-angled with a slender beak. Water bulrush prefers shallow water, but can become established in depths exceeding 1.0 meter. Water bulrush stands produce grass-like meadows which provide suitable habitat for invertebrates and juvenile fish.

Lake Quillwort (*Isoetes lacustris*, = *I. macrospora*. Common Name: Quillwort. **Native.**): Lake quillwort leaves grow from a fleshly, lobed underground stem adorned with forked roots. The dark green to blue-green, often firm, leaves (five to 10.0 cm long) are arranged in a rosette, radiating from the base of the plant. Each leaf has a central vein and four longitudinal air chambers visible in cross-section. The leaves taper from the base to a pointed tip and often curve back toward the sediment. Spores form

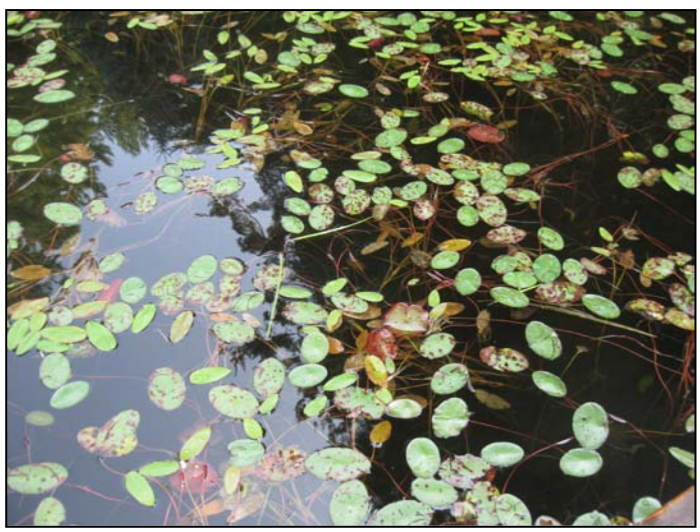
inside sacks located on the spoon-like bases of the leaves. Lake quillwort has pale unspotted spore sacks, and the examining the megaspores (under 100X magnification) reveals a convoluted network of ridges (lacking spines) on their surface. Lake quillwort usually inhabits quiet waters ranging from a few centimeters deep to one to three meters deep. Most species of quillwort prefer low-nutrient, soft water habitats. Quillwort foliage is sometimes consumed by waterfowl.

Spiral-fruited Pondweed (*Potamogeton spirillus*. Common Name: Spiral-fruited pondweed, snail-seed pondweed. **Native.**): Spiral-fruited pondweed has slender stems that originate from a delicate, spreading rhizome. The stems tend to be compact and have numerous branches. Submersed leaves are linear with a curved appearance, having one to three veins. Floating leaves are delicate, ellipse-shaped and range from seven to 35 mm long and two to 13 mm wide, with five to 13 veins. Stipules are fused to the leaf blade for more than half of their length. Nut-like fruits are produced on stalks of varies lengths. Shorter stalks tend to be on lower axils with fruit arranged in a compact head, while longer stalks tend to appear on upper axils, with fruit arranged in a cylindrical head. The fruit itself is a flatten disc with a sharply-toothed margin. Its smooth sides appear like a tightly coiled embryo, a distinguishing characteristic. Spiral-fruited pondweed prefers shallow water with sandy substrate, but can inhabit a wide range of bottom substrates. It serves as an important bottom stabilizer and cover for fish fry and invertebrates.

Floating-leaf Pondweed (*Potamogeton natans*: Common Name: Floating-leaf pondweed. **Native.**): Floating-leaf pondweed has stems that emerge from a red-spotted rhizome. Submersed leaves are stalk like, with no obvious leaf blade and three to five veins. Floating leaves are heart-shaped at their base and appears like someone pinched the stalk and bent it, which allows the leaf blade and stalk to form a right angle for floating leaves. The pinched region is usually lighter in color than the rest of the stalk. Floating leaves are alternate with smooth margins and 17 to 37 veins. Stipules are fibrous and free on both leaf types. New stems develop in spring from buds located on the rhizome. Flowering occurs in early summer and fruit are produced by mid-growing season. The fruit are oval to egg-shaped and have deep wrinkles on the sides, a dorsal ridge and short beak. In the fall, the upper portion of the stem dies back. Floating-leaf pondweed can tolerate a variety of sediment types and water chemistries, and prefers to grow in water up to 2.5 meters deep. This plant is considered good fish habitat because it provides shade and foraging opportunities. The seeds are consumed by waterfowl, while mammals graze on all plant structures.

White Water Lily (*Nymphaea odorata.* Common Name: white water lily, fragrant water lily. **Native.**): White water lily leaf stalks emerge directly from a submerged fleshy rhizome. White water lilies have round floating leaves that can reach 30 cm in diameter. The floating leaves have a narrow notch (or sinus), and a green to purple underside. The white flowers are prominent and showy (seven to 20 cm) and arise from stalks from the rhizome. Flowering occurs during the summer, and the flowers open during the day, and close during the night. White water lilies are very common and typically inhabit quiet water less than two meters deep, such as ponds, shallow lakes and slow-moving streams. They inhabit a variety of sediment types, and can reach nuisance density under ideal circumstances. Nuisance density white lilies shade other macrophyte growth, compound sediment accumulations, and obstruct boat movement. The leaves offer shade and protection for fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes even deer. There is quite a bit of debate among aquatic macrophyte taxonomists regarding the placement of fragrant white water lily and tuberous white lily (*N. tuberosa*).

Watershield (*Brasenia schreberi*. Common Names: common water shield, water target. **Native.**): Watershield is a floating-leaf aquatic plant similar to water lilies, although the floating leaves are usually smaller. Its stem and leaves are elastic, and are attached to a rooted rhizome that acts as an anchor and source of stored nutrients. The leaf stalks are attached to the middle of the leaf, creating a bull's eye effect, hence its name water target. The oval leaves have faint veins that radiate from the center of the leaf. The leaves are green on the upper surface, and purple underneath. Maroon to purple flowers peak above the water's surface on short, stout stalks. Watershield is usually coated with a clear gelatinous slime on the stem and underside of the leaves. Watershield prefers soft-water lakes and ponds in soft sediments containing decomposing organic matter. The whole plant is consumed by waterfowl, and the floating leaves provide shade and cover for fish.



Spatterdock (*Nuphar vareigata*. Common Name: Yellow pond lily, bullhead pond lily, spatterdock. **Native.**): Spatterdock leaf stalks emerge directly from a robust submerged fleshy rhizome often adorned with scars from previous flower stalks. Spatterdock has large (up to 25 cm) heart-shaped leaves with a prominent notch and two lower lobes. The leaf stalk sports a winged margin, setting it apart from another yellow pond lily, *N. advena*. Flowering occurs in the summer and, the flowers open during the day and close at night. Flowers are bulbous in shape with yellow sepals often tinted red at the base. Spatterdock typically inhabits quiet water less than two meters deep, such as ponds, shallow lakes and slow-moving streams. Occasionally, the leaves are held erect, above the surface of the water. The leaves offer shade and protection for fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes even deer.

Small Duckweed (*Lemna minor.* Common Names: Small duckweed, water lentil, lesser duckweed. **Native.**): Small duckweed is a free floating plant, with round to oval-shaped leaf bodies typically referred to as fronds. The fronds are small (typically less than 0.5 cm in diameter), and it can occur in large densities that can create a dense mat on the water's surface. Each frond contains three faint nerves, a single root (a characteristic used to distinguish it from other duckweeds), and no stem. Although it can produce flowers, it usually reproduces via budding at a tremendous rate. Its population can double in three to five days. Since it is free floating, it drifts with the wind or water current, and is often found intermixed with other duckweeds. Since it's not attached to the sediment, it derives nutrients directly from the water, and is often associated with eutrophic conditions. It over-winters by producing turions late in the season. Small duckweed is extremely nutritious and can provide up to 90% of the dietary needs for waterfowl. It's also consumed by muskrat, beaver and fish, and dense mats of duckweed can actually inhibit mosquito breeding.

V. Discussion of the Aquatic Macrophyte Survey

In the Appendix of this report are a total of 43 maps. Thirty-eight of these maps represent the distribution of aquatic macrophytes according to species at each sample location. Four maps depict sample location distribution, water depth distribution, total floating aquatic vegetation distribution, and total submersed aquatic vegetation distribution for Lake Luzerne in September 2011. The final map depicts sample location richness.

A total of 95 sample locations were surveyed for aquatic macrophytes at Lake Luzerne in September 2011. The sample sites were selected based on previous surveys conducted (Eichler, 2010). The survey focused on the littoral zone of the lake. Water depth at the surveyed sites ranged from 2.5 feet to 26.0 feet. Since the open water areas of the lake were not surveyed, average depth was not calculated with these water depth measurements.

Thirty-eight submersed aquatic macrophytes were collected or observed during the September 2011 survey at Lake Luzerne. Five additional emergent species and one additional submersed species was observed, typically along shoreline margins, but were not collected on any individual weed anchor tosses. See below for additional information on these macrophytes. Three invasive species were observed: Eurasian water milfoil, curly-leaf pondweed, and southern naiad, although the latter is open for debate on its status among plant taxonomists. The remainder of the observed macrophytes are considered desirable native species, although a few of these could reach nuisance densities, negatively impacting lake uses. Four macrophytes of special concern were collected and/or observed. Little water milfoil is on the New York State Natural Heritage Active Inventory List with Threatened Status and a State Rank of S2 (imperiled with 6 to 20 sites). The following three macrophytes are on the New York State Natural Heritage Watch List and carry a State Rank of S3 (rare in New York State with 21 to 35 sites): water marigold (Threatened), lake quillwort (Rare), and small bladderwort (Threatened) (Young and Weldy, 2006).

Submersed macrophytes were collected at 89 (or 94%) of the sites surveyed in 2011. At 22 (or 25%) of the sites surveyed, trace density submersed macrophytes were collected. At 39 (or 44%) of the sites sparse density macrophytes were collected, while another 22 sites (or 25%) had medium density macrophytes. The remaining six sites (or 7%) had dense submersed macrophytes. Submersed macrophytes at medium or dense density (typically considered nuisance density) occurred at 32% of the sites surveyed in 2011. The heaviest density of submersed plants occurred in the Northeast cove (near the freshwater marsh) with four of the dense sites and another medium site being located here. To the west of the island, along most of the West shoreline (near the park and to the north) medium density sites were common, with nine occurring here. The Southern cove (the 2010 herbicide treatment area) supported sparse to medium dense macrophytes throughout, with a single dense site located along the East shore as well.

An additional map provided in this report depicts Richness (number of different species) per sample location. Sample richness included both floating and submersed macrophytes, but only what was collected on actual weed anchor tosses. Sample richness ranged from zero (no aquatic macrophytes) to 13 different macrophytes. Nearly all of the sites that lacked aquatic macrophytes were deep water sites (exceeding 12.5 feet). Sample richness in the Southern cove ranged from one to 12, with most sites containing an excess of six different species. The Northeast cove support diverse aquatic macrophyte growth with at least nine different species at six of the eight sites located there.

The following discussions of individual macrophytes are presented by submersed macrophytes in observed highest abundance to least abundance, followed by floating macrophytes, presented in similar fashion.

Two submersed macrophytes occurred at the most frequency: Robbins pondweed and purple bladderwort. Robbins pondweed was the first dominant submersed macrophyte collected/observed during the 2011 survey. It occurred at 60 (or 63%) of the sites surveyed. Nearly half of these sites (29, or 48%) were considered trace density. Another 24 sites (or 40%) were considered sparse density. The final seven sites (or 12%) were medium density. Robbins pondweed was found throughout much of the entire lake basin. It occurred at all but two sites in the Southern treatment cove, typically at trace or sparse density. Robbins pondweed was also commonly found along the West shoreline, behind the island. Three of the medium dense sites were located here. The remaining medium sites occurred in the Northwest cove (two sites), the Northeast cove (one site), and the Southern treatment cove (one site). Robbins pondweed was largely absent along the East shoreline, and the Southeast shoreline. The 2011 Robbins pondweed abundance and distribution displays about a 12% increase when compared to the 2010 data collected.

Purple bladderwort (also called large purple bladderwort) was the second most dominant submersed macrophyte that we collected. It also occurred at 60 (or 63%) of the total sites surveyed. At 35 (or 58%) of the sites surveyed the density was trace. At 23 (or 38%) of the sites the density was considered sparse. One site of medium density and one site of dense purple bladderwort (each representing 2%) were collected. Purple bladderwort occurred throughout much of the entire basin. Since bladderworts are not typically rooted to the substrate, water depth doesn’t impact its distribution. In the Southern treatment cove, purple bladderwort occurred at most sites, typically at sparse density. The exception was the west shore of this cove, which was nearly devoid of purple bladderwort. The single dense site occurred in the Southern treatment cove, situated in a small cove isolated along the east shore. The medium site was located off the main basin, in the Northeast cove. Purple bladderwort abundance has more than doubled since 2010, when it occurred at 29.6% of the sites surveyed. The greatest increase in occurrence was in the main basin of the lake, especially along the West shoreline.

Wild celery is a highly desirable native submersed macrophyte that provides numerous ecological benefits to a lake system, while rarely becoming a nuisance. Wild celery occurred at 49, or just over half (52%) of the sites surveyed at Lake Luzerne. Most sites supported trace growth (37, or 76%). The remaining 12 sites (or 24%) were considered sparse density. Wild celery was scattered through the entire lake basin, but seemed to prefer shoreline sites. Nearly all of the shoreline sites in the Southern treatment cove had wild celery, typically at trace (n=9) or sparse (n=7) density. Open water sites in this cove generally lacked wild celery. Three additional sparse sites were located behind the island, while the last two occurred in the Northeast cove. Wild celery abundance doubled from 2010 to 2011.

Watermoss was collected at 29 (or 31%) of the sites surveyed in 2011. Most sites were considered trace density (22, or 76%), but six sites (or 21%) were considered sparse density. One medium site (representing 3%) was also collected. Watermoss was most commonly found in the Southern treatment cove. In this cove, 17 of the 25 sites (or 68%) supported watermoss growth, typically in trace density. However, five sparse sites and the medium site were located in this cove. Overall watermoss abundance increased significantly from 2010 (4.6%) to 2011 (31%). This increase can be attributed to the increase in the Southern treatment cove (0% in 2010 as compared to 68% in 2011). Since watermoss is a low grower, it stands to reason that the near eradication of Eurasian water milfoil in this cove opened up the water column for watermoss colonization. Allied Biological has observed a similar trend with other invasive species control programs and the increase of watermoss in subsequent years from treatment.

Muskgrass (*Chara* sp.) is actually a macroscopic algae, but since it occupies a similar ecological niche as higher plants, it’s typically included in aquatic macrophyte surveys. Muskgrass was collected at 25 (or 26%) of the sites surveyed in 2011. All 25 of these sites were considered trace density. Over half of the sites (n=13) that supported muskgrass growth occurred in the Southern treatment cove. Although overall muskgrass abundance decreased from 2010 (40.1%), the percent abundance in the treatment cove was very similar (44.7% in 2010 as compared to 52% on 2011). One must also consider that the 2010 report combined muskgrass and stonewort (*Nitella* sp, another macroscopic algae) under one entry. As an early colonizing species, the muskgrass abundance data collected both years is consistent with an herbicide treatment program. In the main basin, muskgrass was confined to scattered shoreline sites.

Five water milfoils (*Myriophyllum* species) were collected at Lake Luzerne. One invasive water milfoil (Eurasian water milfoil) was collected, but the remaining four species are all considered desirable natives. Little water milfoil carries a Threatened status in New York State. Northern water milfoil and Eurasian water milfoil shared the same percent occurrence at 24% of the total sites surveyed.

Northern water milfoil was collected at 23 (or 24%) of the sites surveyed at Lake Luzerne. It occurred at a wide range of densities, although most (17, or 74%) were considered trace density. Four sites of Northern water milfoil were considered sparse density. One site (4%) was considered medium, and one site was considered dense density. Northern water milfoil was scattered about the main basin, but was less common in the Southern treatment cove (occurring at only four sites here). Northern water milfoil was often found intermixed with other water milfoil species. The heaviest density of Northern water milfoil occurred in the Northeast cove, with six sites located here, including the only dense and medium sites, along with one of the sparse sites. Other single sparse sites occurred along the Northwest shoreline, in the Southern treatment cove, and in the small Southeastern cove. Northern water milfoil is often crowded out by Eurasian water milfoil. Therefore, it was encouraging to see its overall abundance in 2011 (24%) higher than in 2010 (9.2%).

Eurasian water milfoil, an aggressive exotic invasive submersed macrophyte, was the target species of the 2010 Renovate® application in the Southern cove. Eurasian water milfoil occurred at 23 (or 24%) of the sites surveyed in 2011. It occurred at a wide range of densities from trace to medium. At 13 (or 57%) of the sites, the density was considered trace, while another six (or 26%) of the sites were sparse density. The remaining four sites (or 17%) were considered medium density. This data is nearly identical to data collected in 2010, when Eurasian water milfoil was collected at 24.3% of the sites surveyed. But of greater concern is the abundance and distribution of Eurasian water milfoil in the Southern treatment cove. In 2010, it was virtually non-existent in the cove with scattered growth found at one (or 2.6%) of the sites here. In 2011, it was also located at one trace site accounting for 4% of the total sites in the cove. Therefore, desirable effects of the 2010 application persisted throughout the entire 2011 season, which is encouraging. In the rest of the main basin, Eurasian water milfoil was prominent in two locations. These were the entire shoreline/cove behind the island, with 12 sites, including four medium sites. The other area was the Northern shoreline, which supported an additional five sites of growth. The former location would be a suitable future location for a contained herbicide application, provided the logistics for curtain deployment could be solved. During the survey, scattered Eurasian water milfoil rooted plants were located at additional sites, but were not collected on weed anchors. These included sites L13 (two stems, in the Southern treatment cove), L30, L33 (both located along the East shoreline), L53, and L57 (both located along the North shoreline).

Bass weed is a highly desirable native pondweed that provides excellent fish habitat. Bass weed was collected at 21 (or 22%) of the sites surveyed in 2011 at Lake Luzerne. It had an even distribution of abundance. It occurred at six sites (or 29%) at trace density and eight (or 38%) sites at sparse density. At six more sites, it occurred at medium density, and the final site (5%) was considered dense. The dense site of bass weed was located in the Northeast cove. Behind the island, along the West shoreline seven sites of bass weed were collected, three at medium density and four at sparse density. In the Southern treatment cove, bass weed occurred at six sites, but three of these were medium density in the open water. In 2010, only one scattered bass weed site was located in the Southern treatment cove. Overall in 2010, bassweed was only collected at 1.3% of the sites surveyed.

Little water milfoil was collected at 20 (or 21%) of the sites surveyed in 2011. Most sites supported trace growth (18, or 90%) but two sparse sites were also collected. Three of the little water milfoil sites occurred in the Southern treatment cove, including one of the sparse sites. The other sparse site occurred along the southwest shoreline. For the most part, little water milfoil was scattered about the main basin. Four trace sites occurred in the Northeast cove, another four trace sites were located behind the island along the West shoreline. In 2010, little water milfoil was only collected at one site (0.7%) situated along the West shoreline. The little water milfoil samples collected in 2011 lacked seeds or flowers. Identification was based on size and leaf structures only.

Ribbon-leaf pondweed was collected at 19 (or 20%) of the total sites surveyed in 2011. Most sites were considered trace density (16 sites, or 84%) as it appeared this pondweed was already dying back for the season. Three additional sites (or 16%) represented sparse growth, usually with floating leaves still at the surface. Ribbon-leaf pondweed was scattered about the entire basin of Lake Luzerne. Three sites occurred in the Southern treatment cove, including one sparse site. Three sites occurred in the small Southeast cove located along the East shoreline. Three more trace sites occurred along the East shoreline, and four sites occurred in the Northeast cove. Ribbon-leaf pondweed was largely absent from the West shoreline (and behind the island). In 2010, ribbon-leaf pondweed was collected at only 2.0% of the sites surveyed. Many of the ribbon-leaf plants still bore seeds, which were used in conjunction with floating leaves to confirm the identity of this pondweed.

Vasey's pondweed occurred at 18 (or 19%) of the sites surveyed. All but two sites (16, or 89%) were considered trace density. The last two sites (11%) were considered sparse density. Vasey's pondweed was most common in the southern half of the lake (including the Southern treatment cove). Eleven sites (but only one of the sparse sites) were located in the Southern treatment cove. In 2010, Vasey's pondweed occurred at 10.5% of the sites surveyed, so a significant increase was observed. This included a significant increase in the Southern treatment cove, but a decrease in the untreated areas of the basin. Vasey's pondweed is a fine-leaved pondweed that can be difficult to identify without seeds or floating leaves (and both structures were lacking). The samples collected in 2011 lacked nodal glands, and leaf structure and stipule characteristics (plus historical records) were used to identify this pondweed.

Small pondweed was collected at 16 (or 17%) of the sites surveyed. At 14 sites (or 88%) the density of small pondweed was trace. One of the final two sites (6%) was sparse density, while the other was medium density. Small pondweed was scattered about the main basin and the Southern treatment cove (eights in each). The medium site occurred along the southern shoreline in the main basin. The sparse site was situated in the open water of the Southern treatment cove. Three trace sites were located along the Northern shoreline in the main basin. In 2010, small pondweed was collected at 10.5% of the sites surveyed, but most were located outside of the Southern treatment cove. Small pondweed is another fine-leaved pondweed that can be difficult to identify without seeds. Although the Lake Luzerne samples lacked seeds, the presence of nodal glands (and historical documentation of this pondweed) were used to finalize identification.

Common waterweed was collected at 14 (or 15%) of the sites surveyed. Twelve of these sites (or 86%) were trace density, while the remaining two sites (14%) were at sparse density. Common waterweed was scattered about the basin, with three sites (and one sparse) in the Southern treatment cove, five trace sites near/behind the island, two sites along the Northern shoreline (including the other sparse site) and two trace sites in the Northeast cove. In 2010, common waterweed occurred at a very similar abundance (15.8%) and distribution pattern.

Variable pondweed occurred at 14 (or 15%) of the sites surveyed in 2011. At 11 of the sites (or 79%) the density was considered trace, while at the remaining three sites (21%) the density was considered sparse. Despite its limited abundance, variable pondweed was scattered about the basin. Six sites (including one sparse site) were located in the Southern treatment cove. The other two sparse sites were located along the Southern shoreline in the main basin. Three more sites occurred along the East shoreline. In 2010, variable pondweed was collected at two sites, representing 1.3% percent abundance. Both of these were outside of the Southern treatment cove, so the six sites observed here in 2011 is encouraging. Variable pondweed has a variable appearance based on growing conditions. The samples collected in 2011 lacked seeds, but identification was confirmed through the examination of leaf margins, stipules and counting veins.

The remaining three bladderwort species all occurred at 11 (or 12%) of the sites surveyed. However, each enjoyed a different distribution around the lake. Common bladderwort is the largest of these three, with stems that can exceed 1.0 meter long. Most of the common bladderwort sites (10, or 91%) were considered trace density. The final site was considered sparse. Common bladderwort did not occur in the Southern treatment cove. In the main basin, it preferred the Northern shoreline and the Northeast cove, including the one sparse site located in this latter area. In 2010, common bladderwort abundance was similar at 15.8% of the sites surveyed. However, its distribution varied considerably, as it was collected at nine sites in the Southern treatment cove in 2010.

Northern bladderwort was also collected at 11 sites. Again, most of these were at trace density (nine, or 82%), while the remaining two sites (18%) were at sparse density. Northern bladderwort was scattered throughout the Lake Luzerne basin, but only two sites were located in the Southern treatment cove. Five sites (including both sparse sites) were situated in the Northeast cove. Single trace sites occurred along the North shoreline, the West and East shorelines, and in the interior of the Southeast cove in the main basin. In 2010, Northern bladderwort was not collected or observed at any of the sites surveyed. Historical reports indicate the presence of Northern bladderwort in 1998, 2004 and as recent as 2009.

Small bladderwort was also collected at 11 sites. All sites were considered trace density, likely due to the diminutive structure of the stems. Two sites were located at the mouth of the Southern treatment cove, with another two sites in the main basin near the entrance to the Southern treatment cove. The other sites occurred along the West shoreline with three near the island, another two along the North shoreline, and the last along the South shoreline. In 2010, small bladderwort occurred at 15.8% of the sites surveyed, with eight sites in the Southern treatment cove. It occurred evenly distributed throughout the main basin as well.

Spikerush (*Eleocharis* sp.) was collected at 10 (or 11%) of the sites surveyed in 2011. All 11 sites were considered trace density. Spikerush distribution was truly scattered about the Lake Luzerne basin. Three sites occurred in the Southern treatment cove. Two sites occurred along the East shoreline, while two more sites occurred along the Northwest shoreline. One site was situated behind the island (at the mouth of the outlet cove), and the last two sites were along the South site in the main basin. Spikerush samples were diminutive, and could not be identified to species due to a lack of reproductive structures. In 2010 (and 1998, 2004 and 2009, for that matter), needle spikerush (*E. acicularis*) was documented to occur in Lake Luzerne, so it's likely the spikerush collected in 2011 was indeed that particular species.

Illinois pondweed was collected at nine (or 9%) of the sites surveyed at Lake Luzerne. It occurred at eight sites (or 89%) at trace density, with the final site being considered sparse density. Illinois pondweed occurred at four sites in the Southern treatment cove, including the single sparse site. The trace sites were located near the shoreline, but the sparse site was located in the open water. In the main basin, three sites occurred in the northern part of the basin, while the last two sites were located off the West shoreline, with one near the island. In 2010, Illinois pondweed occurred at 15.8% of the sites surveyed, scattered throughout the entire lake basin. Illinois pondweed can be confused with bass weed, and no seeds adorned any of the samples collected at Lake Luzerne. The specimens were identified via leaf, stem, and vein structures.

The first of two naiads collected in 2011, slender naiad is very common throughout much of New York. Slender naiad was collected at eight (or 8%) of the sites surveyed in 2011. At seven of these sites (or 88%), slender naiad was considered trace density. The remaining site (12%) was considered sparse density. It should be noted that slender naiad is a low growing, compact macrophyte, which could explain its restricted abundance. Slender naiad was most common in the southern reach of the basin, with five sites occurring in the Southern treatment cove, including the sparse site. Two more sites were located at the mouth of the Southern treatment cove, and the final site was located along the South shoreline. In 2010, slender naiad occurred at 7.9% of the sites surveyed. Although common in the Southern treatment cove in 2010, the heaviest density occurred in the small cove located along the Northern shoreline. In 2011, it was absent from this area (and in the northern part of the basin in general). The identity of this naiad was confirmed by the presence of seeds.

White-stem pondweed was collected at eight (or 8%) of the sites surveyed at Lake Luzerne. Seven of the sites (or 88%) were considered trace density, while the last site (12%) was considered sparse. White-stem pondweed typically occurred in the Southern treatment cove, where six of the eight sites occurred. All sites here occurred in the open water, including the single sparse site. The remaining two sites where located in the Northeast cove. This abundance and distribution is similar to data collected in 2010, when white-stem pondweed occurred at 7.2% of the sites, and in similar locations of the basin. No seeds were present on any samples, so identification was concluded via examination of clasping-leaf characteristics, stem structure, and stipules.

Dwarf water milfoil (also known as leafless milfoil) is a diminutive macrophyte often overlooked during vegetation surveys. It prefers shallow, sandy substrates, and does not appear to be closely related to other members of the *Myriophyllum* genus. Yet, dwarf water milfoil has been observed at Lake Luzerne since 1998, and in 2011 it was once again collected. Dwarf water milfoil occurred at eight (or 8%) of the sites surveyed in this year. Six sites (74%) were trace density, while two sites (25%) were considered sparse density. Dwarf water milfoil was scattered about the main basin, but not in the Southern treatment cove, and always at shoreline sites. One site was located at the beach at the mouth of the

Southern treatment cove, and another along the Southern shoreline. Sparse sites were located along the West shoreline, and the North shoreline, and one site was even located along the eastern side of the island. A single trace site was situated on the East shoreline. In 2010, dwarf water milfoil only occurred at 2.6% of the sites, with one of those sites being dense growth located in the Southern treatment cove.

Historically, two species of quillworts have been collected at Lake Luzerne: Lake Quillwort (*Isoetes lacustris*) and Spiny-spored quillwort (*I. echinospora*). In order to identify a quillwort to species, microscopic examination of intact megaspores is necessary. Quillworts were collected at eight total sites and voucher specimens from each site were returned to the laboratory for microscopic examination. However, only one sample (see lake quillwort, below) had intact megaspores suitable for identification. Many samples were only damaged stems. The remaining samples were all classified simply as quillwort (*Isoetes* sp.). Quillwort occurred at seven (7%) of the sites surveyed. Six of these sites were trace density, while the final site was sparse density. Quillwort occurred at one location in the Southern treatment cove, and another site at the mouth to this cove. Two sites were located along the South shoreline, with single trace sites off the park shoreline (behind the island) and along the East shoreline. The sparse site was located off the Eastern side of the island. In 2010, both species of quillworts accounted for 2.7% of the sites surveyed.

Clasping-leaf pondweed occurred at seven (or 7%) of the sites surveyed. At six of these sites, the density was considered trace, while the last site was sparse density. Often, clasping-leaf pondweed was observed near the surface at these locations. Five trace sites were located in the open water sites of the Southern treatment cove. Another trace site was located in the interior of the outlet cove, and the sparse site was located in the Northeast cove. In 2010, clasping-leaf pondweed was not collected at any sites. Leaf structures and the “clasp” at the leaf base were used to confirm identification, since no seeds were found on any samples collected.

Water marigold, a Threatened aquatic macrophyte in New York State, was collected at seven (or 7%) of the sites surveyed at Lake Luzerne. It had a fairly even distribution of trace (three, or 43%) and sparse (four, or 57%) density. Water marigold occurred in isolated beds throughout much of the main basin, but was absent from the Southern treatment cove. In 2010, it did not occur in the Southern treatment cove either. Trace sites were located in the outlet cove, along the North shore, and in the Northeast cove. Sparse sites were located at the mouth of the Southern treatment cove, along the South shore, along the West shore, and in the Northeast cove. In 2010, water marigold occurred at 2.0% of the total sites surveyed.

Pipewort was collected at four (or 4%) of the sites. At all sites, this delicate rosette species was collected at trace density. Two of the sites occurred along the East shoreline, while the other two sites were located along the South shoreline. On several other instances (sites L13, L15, and L91) the distinctive pipewort flower stalks were observed poking above the water’s surface, but no pipewort was collected during the weed anchor toss. In 2010, pipewort occurred at 0.7% of the sites surveyed, represented by a single site along the West shoreline.

Stonewort (*Nitella* sp.) is another macroscopic algae (see discussion on muskgrass, above). It occurred at four (or 4%) of the sites surveyed. Three of these sites (75%) were trace density, while the last site was sparse density. The sparse site was located in the open water at the mouth of the Southern treatment cove. The remaining trace sites were located on the East shore, in the Northeast cove, and off the Northwest shoreline, respectively. Since the 2010 survey combined both macro-algae into one entry, it's difficult to compare the results to the 2011 survey.

Low water milfoil was collected at two (or 2%) of the sites surveyed in 2011. Both sites were considered to be trace density, and included just a few broken stems. Both sites occurred along the South shoreline, adjacent to one another. In 2010, low water milfoil was not collected at Lake Luzerne. Actually, it does not appear on any of the historical records dating back to 1998. There was some question to its identification, since it lacked reproductive structures (seeds). But as can be seen in the picture, it clearly had a scattered radiating leaf arrangement, as opposed to strict whorls, which is typical of other native water milfoils. It could have been Farwell's water milfoil (*M. farwellii*), an uncommon member of the water milfoil genus, but the lack of seeds prevented this determination. More vegetative material from Lake Luzerne is needed to qualify this identification

Curly-leaf pondweed was the second invasive submersed aquatic macrophyte collected during the 2011 survey. It was collected at two (or 2%) of the sites surveyed. One site was at trace density, while the second site was considered sparse. Both sites were located in the Northeast cove, adjacent to each other. In 2010, curly-leaf pondweed was only found at one site (or 0.7%). Curly-leaf pondweed is an early season grower that experiences a natural die-off in late June. If the survey were to be conducted earlier in the year, it's likely that an increase in curly-leaf pondweed abundance and distribution would be observed.

Southern naiad was the second naiad species present at Lake Luzerne, and the final invasive species collected in 2011. It occurred at two (or 2%) of the sites surveyed, both at trace density. Southern naiad occurred at two sites located along the East shoreline. In 2010, southern naiad was not observed or collected at any sites. However, historical records indicate it was collected in 1998 (but not during surveys in 2004 or 2009). The identity of this macrophyte was confirmed by the presence of numerous seeds on samples returned to ABI's laboratory for microscopic examination.

Water bulrush (*Scirpus subterminalis*) occurred at two (or 2%) of the sites surveyed. Half of these sites were considered trace density, while the other was sparse density. Both were located along the South shoreline, with the trace site being located near the mouth of the Southern treatment cove. Water bulrush was not collected previously at Lake Luzerne. However, in 2010, a rush (*Scirpus* sp.) was collected at one site, so it's possible it was water bulrush.

Lake quillwort was collected at one trace site, located along the West shoreline. See the discussion above for additional information on other quillworts collected in 2011. This was the only specimen that intact megaspores could be used to determine the species. In 2010, lake quillwort was also collected at one site. However, this site was a bit to the north of the 2011 site, and it supported dense growth.

Spiral-fruited pondweed was collected at one trace site in 2011. This site was located along the West shoreline, behind the island. The specimen collected had abundant seeds, so identification of this fine-leaved pondweed was confirmed. In 2010, spiral-fruited pondweed did not occur at Lake Luzerne, but historical records indicate its presence in 2004 and back to 1998.

Floating-leaf pondweed was located at a single sparse site situated along the East shoreline of the Northeast cove. It was intermixed with other floating leaf macrophytes such as white water lily and watershield. Floating-leaf pondweed did not occur during the 2010 survey, nor at any of the surveys conducted in 2009, 2004, or 1998. This could be the first documentation of this macrophyte at Lake Luzerne, although a more extensive literature search would need to be completed before this conclusion could be made.

Four additional floating leaf macrophytes rounded out the aquatic macrophyte assemblage at Lake Luzerne. Floating macrophyte densities are largely based on observations and not solely what is collected on the weed anchor. Floating macrophytes occurred at 38 (or 40%) of the sites surveyed in 2011. At 23 (or 61%) of these sites the density was estimated at trace. At 14 (or 37%) of the sites, the density was considered sparse, and at one site (3%) the density was medium. Floating macrophytes occurred throughout much of the Southern treatment cove and the main basin, in sites along the shore. The highest concentration of floating macrophytes occurred in the Northeast cove, with three sparse sites and the medium site being located here. Floating macrophytes were mostly lacking along the South shoreline, and a stretch of the North shoreline in the main basin.

White water lily was the dominant floating macrophyte observed in 2011 at Lake Luzerne. It occurred at 30 (or 32%) of the sites surveyed. Typically, it occurred at trace density (20, or 67%), but nine (or 30%) of the sites supported sparse density. The final site was considered medium density. White water lily occurred throughout much of the entire lake basin. In the Southern treatment cove, over 50% of the sites had white lilies, with six of the 14 sites being sparse density. With the exception of two sparse sites and a medium site in the Northeast cove, most of the remaining sites in the main basin were isolated trace patches of white water lily. In 2010, white water lilies occurred at 4.6% of the sites surveyed.

Watershield was considered fairly common throughout Lake Luzerne in 2011. It occurred at 17 (or 18%) of the sites surveyed. At 13 of these sites (or 76%) the density was estimated at trace density, while at four sites (or 24%) the density was sparse. Watershield was absent from the Southern treatment cove. In the main basin, watershield occurred in four locations. In the Southeastern cove, three sites (one sparse) of watershield occurred. Along the Northern stretch of the East shoreline, watershield occurred at five consecutive sites (one also being sparse). In the small North cove, four watershield sites, including two sparse sites, were located. And finally, four trace sites were observed on the West side of the lake, one on the West shore, two flanking the island, and the last in the outlet cove. In 2010, watershield was collected at 7.2% of the sites surveyed.

Spatterdock (also called yellow pond lily) was observed at three (or 3%) of the sites surveyed in 2011. All three sites were considered trace density and were scattered about the entire basin. One occurred in the Southern treatment cove, one along the East shoreline, and the last in the Northeast cove. In 2010, spatterdock was collected at 1.3% of the sites surveyed.

Small duckweed is a tiny floating leaf macrophyte. At Lake Luzerne, it was observed at two (or 2%) of the sites surveyed in 2011. One of these sites was considered trace density while the other was sparse density. Both of these sites were located in the Northeast cove, intermixed with other macrophytes at the surface. Small duckweed was not observed in 2010, and does not appear in the historical observations from 1998 through 2009. Although it's possible this is the first documentation of small duckweed at Lake Luzerne, an extensive literature search would be needed to confirm this. It's also likely that small duckweed has just been overlooked in recent years, due to its low abundance and diminutive size.

VI. Additional Aquatic Macrophytes Observed

Several additional aquatic macrophytes, mostly emergent species that occurred along the lake margins, were also observed during the survey, but not collected on any weed anchor tosses. During the survey, notes on these observations were recorded, but not actual densities.

Pickerelweed (*Pontedaria cordata*) is a very common emergent macrophyte in the Northeast with vibrant blue-purple flowers. It was quite common at Lake Luzerne, in small patches along the shorelines throughout most of the basin. It occurred near the following eight sites: L7, L12, L22, L46, L53, L70, L72, and L94. In 2010, pickerelweed was collected at 0.7% of the sites surveyed.

Sedges (*Carex* sp.) also commonly occur in Northeast lakes along margins. Lake Luzerne was no exception with five scattered occurrences. It occurred near sites L22, L33, L46, L72, and L94. In 2010, sedges were not observed.

Burreed (*Sparganium* sp.) has also been observed at Lake Luzerne. In 2011, burreed was observed at two sites in the Northeast cove, near sites L47, and L48. Additional burreed was observed further into the cove, in the interior of the freshwater marsh. In 2010, burreed was collected at 2.0% of the sites surveyed.

Arrowhead (*Sagittaria* sp.) is also a common Northeast emergent species. In 2011, a single patch of arrowhead was observed near site L28. In 2010, grassy arrowhead (*S. graminea*) occurred at 0.7% of the sites surveyed.

Cattails (*Typha* sp.) are tall (often exceeding 1.0 meters) emergent macrophytes that can occur in dense stands with extensive rhizome systems. If not actively managed, cattails can become a nuisance and crowd out other desirable native emergent species. A single stand of cattails was observed along the shoreline near site L7. According to historical data, cattails (*T. latifolia*) have occurred at Lake Luzerne since 1998.

The final observed aquatic macrophyte was a submersed species, heart pondweed (*Potamogeton perfoliatus*, sometimes commonly called perfoliate pondweed). Heart pondweed is similar to clasping-leaf pondweed, but it has distinctly shorter, rounder submersed leaves. A single patch of heart pondweed was observed near site L3. A specimen was not collected, as it was early in the survey, and it was assumed to be collected at a later site. But it was not observed or collected again. In 2010, heart pondweed occurred at 1.3% of the sites surveyed. It was also collected during the 2004 survey.

VII. References

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Appendix

Lake Luzerne
Aquatic Vegetation Survey
September 14, 2011

Sample Point	Water Depth (ft)	Latitude (WGS84)	Longitude (WGS84)	Richness	Total Submersed Vegetation	Total Floating Vegetation	Bass Weed	Clasping-leaf Pondweed	Common Bladderwort	Common Waterweed	Curly-leaf Pondweed	Dwarf Water Milfoil	Eurasian Water Milfoil	Floating-leaf Pondweed	Illinois Pondweed	Lake Quillwort	Little Water Milfoil	Low Water Milfoil	Muskgrass	Northern Bladderwort	NorthernWater Milfoil	Pipewort	Purple Bladderwort	Quillwort species	Ribbon-leaf Pondweed	Robbin's Pondweed	Slender Naiad	Small Bladderwort	Small Duckweed	Small Pondweed	Southern Naiad	Spatterdock	Spikerush	Spiral-fruited Pondweed	Stonewort	Tape-grass	Variable Pondweed	Vasey's Pondweed	Water Marigold	Water Bulrush	Watermoss	Watershield	White-stem Pondweed	White Water Lily
1	5.5	43.317182°	-73.82897°	8	S	T													T				T			S	T			T						T					S			T
2	6.5	43.317182°	-73.828285°	6	S										T								S			T							T			S					T			
3	4.0	43.317668°	-73.827679°	6	S	T																	T			S				T						T					T			T
4	7.5	43.317655°	-73.828226°	9	M		S	T											T				S			S										T	T				T		S	
5	12	43.317643°	-73.828759°	1	S																					S																		
6	7.5	43.317629°	-73.829328°	8	S			T											T				S			S				T						T					T		T	
7	4.5	43.317622°	-73.829966°	12	S	S				T									T					T	T	T	T			T			T			S		T			T			S
8	3.5	43.318031°	-73.830109°	11	S	T									T				T		T				T	T				T		T				T		T			S			T
9	6.0	43.318072°	-73.8296°	7	S														T				S			S				S			T					T			T			
10	6.5	43.318046°	-73.829084°	7	M		M	T											T				S			S											T						T	
11	8.5	43.318099°	-73.828482°	2	M																					M											T							
12	4	43.318122°	-73.827616°	7	S	S				S													T			T										S		T			T			S
13	2.5	43.31832°	-73.827018°	8	M	S											S			T	S		T		S	T											S							S
14	5	43.318549°	-73.828686°	11	S			T									T		T	T	T		T			T										T	T				T		T	
15	5	43.318535°	-73.829749°	6	S	T													T											T						S		T			S			T
16	3.0	43.318967°	-73.829684°	4	S	T																														T		S			S			T
17	5.5	43.31905°	-73.828979°	5	M		S	T							S								S			S																		
18	5	43.319109°	-73.828271°	6	S	T																	S			T										S		T			T			T
19	4.0	43.319646°	-73.827992°	5	S	S	T																S			T										S								S
20	5.0	43.319613°	-73.828543°	7	S	T													T				S			S	S									T					T			T
21	6.0	43.319571°	-73.829325°	7	M		M												T				S			S		T									T						T	
22	4.0	43.319514°	-73.82991°	9	S	S				T									T		T					T	T									T		T			T			S
23	3.0	43.319866°	-73.829883°	8	M	T							T						T							T	T									S		T			M			T
24	6.0	43.319881°	-73.829259°	8	M		M																S			S		T		T								T			T		T	
25	3.5	43.320027°	-73.828496°	6	D	S									T		T						D			S												T						S
26	3.0	43.320231°	-73.829044°	1	T																					T																		
27	4.0	43.32023°	-73.829782°	6	T							T							T				T			T		T													T			
28	8.5	43.320656°	-73.830297°	12	S	T				T			T				T		T		T		S	T	T	T	T											T						T
29	17.0	43.32071°	-73.829671°	2	S																									T					S									
30	9.5	43.320709°	-73.828987°	8	M		T												T		T					S	T									T			S		T			
31	6.5	43.321231°	-73.82907°	9	S	T											T		T				T			T		T										T			S	T		T
32	6.0	43.321933°	-73.828607°	6	S														T				T		S	T										T		S						
33	3.5	43.3224°	-73.828973°	9	S	S	T													T	S		T		T	T										T						T		S
34	3.0	43.321966°	-73.829397°	8	S	S			T														T		T	S												T			T	S		T
35	8.0	43.322384°	-73.829679°	1	T																T																							
36	7.0	43.322787°	-73.830196°	5	T																	T	T								T		T			T								
37	7.5	43.323181°	-73.830641°	0																																								

Lake Luzerne
Aquatic Vegetation Survey
September 14, 2011

Sample Point	Water Depth (ft)	Latitude (WGS84)	Longitude (WGS84)	Richness	Total Submersed Vegetation	Total Floating Vegetation	Bass Weed	Clasping-leaf Pondweed	Common Bladderwort	Common Waterweed	Curly-leaf Pondweed	Dwarf Water Milfoil	Eurasian Water Milfoil	Floating-leaf Pondweed	Illinois Pondweed	Lake Quillwort	Little Water Milfoil	Low Water Milfoil	Muskgrass	Northern Bladderwort	NorthernWater Milfoil	Pipewort	Purple Bladderwort	Quillwort species	Ribbon-leaf Pondweed	Robbin's Pondweed	Slender Naiad	Small Bladderwort	Small Duckweed	Small Pondweed	Southern Naiad	Spatterdock	Spikerush	Spiral-fruited Pondweed	Stonewort	Tape-grass	Variable Pondweed	Vasey's Pondweed	Water Marigold	Water Bulrush	Watermoss	Watershield	White-stem Pondweed	White Water Lily
38	7.0	43.323561°	-73.830799°	1	T																				T																			
39	10.0	43.323849°	-73.831337°	3	T	T																			T							T												T
40	12.5	43.324161°	-73.831854°	7	S																	T	S		T						T				T	T	T							
41	4.5	43.32469°	-73.832189°	3	T	T																		T									T									T		
42	10.5	43.325279°	-73.832094°	6	T	T			T			T								T			T														T					T		
43	7.0	43.325803°	-73.831747°	5	S	T													T				T													T					S	T		
44	3.5	43.32618°	-73.831391°	11	D	S	S										T			T	D		T		T	T			S							T			T			T		T
45	5.5	43.32648°	-73.830872°	13	M	S			T	T				S			T		T	T	T		S		S											T	T					S		T
46	5.5	43.326905°	-73.831335°	10	S	T				T					T		T			T					T				T			T			T	S								
47	3.0	43.327066°	-73.832099°	9	D		S	S	T											S	S		S			M										S							T	
48	3.0	43.327142°	-73.832686°	11	D	M	T		T		S									S	M		M			S										T			S			T		M
49	3.0	43.326756°	-73.832256°	11	S	S			S		T		T		T		T				T				T	S				T													T	S
50	14.5	43.3264°	-73.831731°	0																																								
51	9.5	43.326917°	-73.833064°	7	D		D		T										T		T		S			T											T							
52	5.5	43.326582°	-73.83361°	9	S	S						S	T				T		T				T		T											T						T		S
53	3.5	43.326833°	-73.834223°	6	T	T			T			T											T													T						T		T
54	4.5	43.326511°	-73.834249°	8	S	S				S			T		T										T					T						T						S		T
55	3.5	43.326811°	-73.834667°	5	M	S	T						S													M				T												S		
56	5.5	43.326465°	-73.835004°	10	M				T	T			S				T				T		S			M		T								T			T					
57	7.5	43.326127°	-73.835427°	4	S												T				S		S			T																		
58	12.0	43.325873°	-73.835249°	18	T																														T									
59	8.0	43.325962°	-73.835736°	6	S								T						T	T	T		T			T				T						T								
60	10.0	43.325647°	-73.836249°	3	T				T														T			T		T					T								T			
61	12.0	43.325267°	-73.836734°	5	T																		T		T	T																		
62	11.0	43.324856°	-73.837065°	3	T	T											T						T			T							T									T		
63	6.0	43.324488°	-73.83727°	3	T	T							T		T																													T
64	6.0	43.323943°	-73.837722°	6	M								M													S													S					
65	7.0	43.323505°	-73.837678°	7	S							S	T			T	T						T													T								
66	5.0	43.323151°	-73.837439°	7	M	T				T			M										T			M		T								T								T
67	3.5	43.322759°	-73.837324°	6	M		S						S										T			S								T		T								
68	2.5	43.32239°	-73.837241°	10	S					T			T										T	T		S							T			T	T	T	T					
69	5.0	43.322108°	-73.837251°	0																																								
70	4.0	43.321548°	-73.837586°	4	M		M	T															T			S																		
71	2.5	43.321677°	-73.837187°	4	M	T							T								T					M																T		
72	6.0	43.322099°	-73.836595°	6	S					T			T								T		T			S										S								
73	7.0	43.322558°	-73.836661°	10	M		M			T			S		T		T						S			S		T		T						S								
74	6.0	43.32285°	-73.836797°	3	T	T																	T			T																T		

Lake Luzerne
Aquatic Vegetation Survey
September 14, 2011

Sample Point	Water Depth (ft)	Latitude (WGS84)	Longitude (WGS84)	Richness	Total Submersed Vegetation	Total Floating Vegetation	Bass Weed	Clasping-leaf Pondweed	Common Bladderwort	Common Waterweed	Curly-leaf Pondweed	Dwarf Water Milfoil	Eurasian Water Milfoil	Floating-leaf Pondweed	Illinois Pondweed	Lake Quillwort	Little Water Milfoil	Low Water Milfoil	Muskgrass	Northern Bladderwort	NorthernWater Milfoil	Pipewort	Purple Bladderwort	Quillwort species	Ribbon-leaf Pondweed	Robbin's Pondweed	Slender Naiad	Small Bladderwort	Small Duckweed	Small Pondweed	Southern Naiad	Spatterdock	Spikerush	Spiral-fruited Pondweed	Stonewort	Tape-grass	Variable Pondweed	Vasey's Pondweed	Water Marigold	Water Bulrush	Watermoss	Watershield	White-stem Pondweed	White Water Lily
75	8.5	43.323146°	-73.836887°	7	D		M			T			M				T						T			M										S								
76	9.5	43.32352°	-73.837064°	4	M		S						M				T									T																		
77	9.0	43.323744°	-73.837229°	4	M		S						S										T			S																		
78	4.0	43.323976°	-73.837383°	5	M		S						S								T					S										T								
79	16.0	43.324345°	-73.837031°	1	T																																				T			
80	21.0	43.324077°	-73.836824°	1	T																							T																
81	26.0	43.323757°	-73.836593°	0																																								
82	11.0	43.323374°	-73.836375°	2	S																		S													T								
83	6.0	43.322972°	-73.836126°	9	S	T						T											T	S				T								T	T				T	T		T
84	20.0	43.322659°	-73.835893°	0																																								
85	17.0	43.32228°	-73.835839°	3	T							T	T				T																											
86	12.0	43.322052°	-73.83538°	5	T																		T	T		T										T		T						
87	12.5	43.321656°	-73.834988°	0																																								
88	14.5	43.321312°	-73.834363°	9	T				T									T	T				T			T	T	T		T						T								
89	11.5	43.321429°	-73.833643°	7	S													T			T		T		T											T	S		S					
90	11.0	43.321234°	-73.832875°	7	T	T							T								T	T			T								T			T								T
91	8.0	43.321421°	-73.83228°	3	S																		S																	S	T			
92	8.0	43.32158°	-73.831556°	5	T					T												T	T	T																	T			
93	5.0	43.321679°	-73.830927°	7	M							T							T				T							M						T	S				T			
94	10.5	43.321489°	-73.830429°	8	S		T										S				T		S			T							T			T					T			
95	8.0	43.321061°	-73.830239°	7	S												T			T			S			T										T		T		T				

Lake Luzerne
Aquatic Macrophyte Distribution
September 14, 2011

Table #2

Aquatic Macrophyte	Total Abundance		Trace Abundance		Sparse Abundance		Medium Abundance		Dense Abundance	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	**95**	**100%**								
Total Floating Vegetation	38	40%	23	61%	14	37%	1	3%	0	0%
White Water Lily	30	32%	20	67%	9	30%	1	3%	0	0%
Watershield	17	18%	13	76%	4	24%	0	0%	0	0%
Spatterdock	3	3%	3	100%	0	0%	0	0%	0	0%
Small Duckweed	2	2%	1	50%	1	50%	0	0%	0	0%
Total Submersed Vegetation	89	94%	22	25%	39	44%	22	25%	6	7%
Robbin's Pondweed	60	63%	29	48%	24	40%	7	12%	0	0%
Purple Bladderwort	60	63%	35	58%	23	38%	1	2%	1	2%
Tape-grass	49	52%	37	76%	12	24%	0	0%	0	0%
Watermoss	29	31%	22	76%	6	21%	1	3%	0	0%
Muskgrass	25	26%	25	100%	0	0%	0	0%	0	0%
NorthernWater Milfoil	23	24%	17	74%	4	17%	1	4%	1	4%
Eurasian Water Milfoil	23	24%	13	57%	6	26%	4	17%	0	0%
Bass Weed	21	22%	6	29%	8	38%	6	29%	1	5%
LittleWater Milfoil	20	21%	18	90%	2	10%	0	0%	0	0%
Ribbon-leaf Pondweed	19	20%	16	84%	3	16%	0	0%	0	0%
Vasey's Pondweed	18	19%	16	89%	2	11%	0	0%	0	0%
Small Pondweed	16	17%	14	88%	1	6%	1	6%	0	0%
Common Waterweed	14	15%	12	86%	2	14%	0	0%	0	0%
Variable Pondweed	14	15%	11	79%	3	21%	0	0%	0	0%
Common Bladderwort	11	12%	10	91%	1	9%	0	0%	0	0%
Northern Bladderwort	11	12%	9	82%	2	18%	0	0%	0	0%
Small Bladderwort	11	12%	11	100%	0	0%	0	0%	0	0%
Spikerush	10	11%	10	100%	0	0%	0	0%	0	0%
Illinois Pondweed	9	9%	8	89%	1	11%	0	0%	0	0%
Slender Naiad	8	8%	7	88%	1	13%	0	0%	0	0%
White-stem Pondweed	8	8%	7	88%	1	13%	0	0%	0	0%
Dwarf Water Milfoil	8	8%	6	75%	2	25%	0	0%	0	0%
Quillwort species	7	7%	6	86%	1	14%	0	0%	0	0%
Clasping-leaf Pondweed	7	7%	6	86%	1	14%	0	0%	0	0%
Water Marigold	7	7%	3	43%	4	57%	0	0%	0	0%

Lake Luzerne
Aquatic Macrophyte Distribution
September 14, 2011

Table #2 cont'd

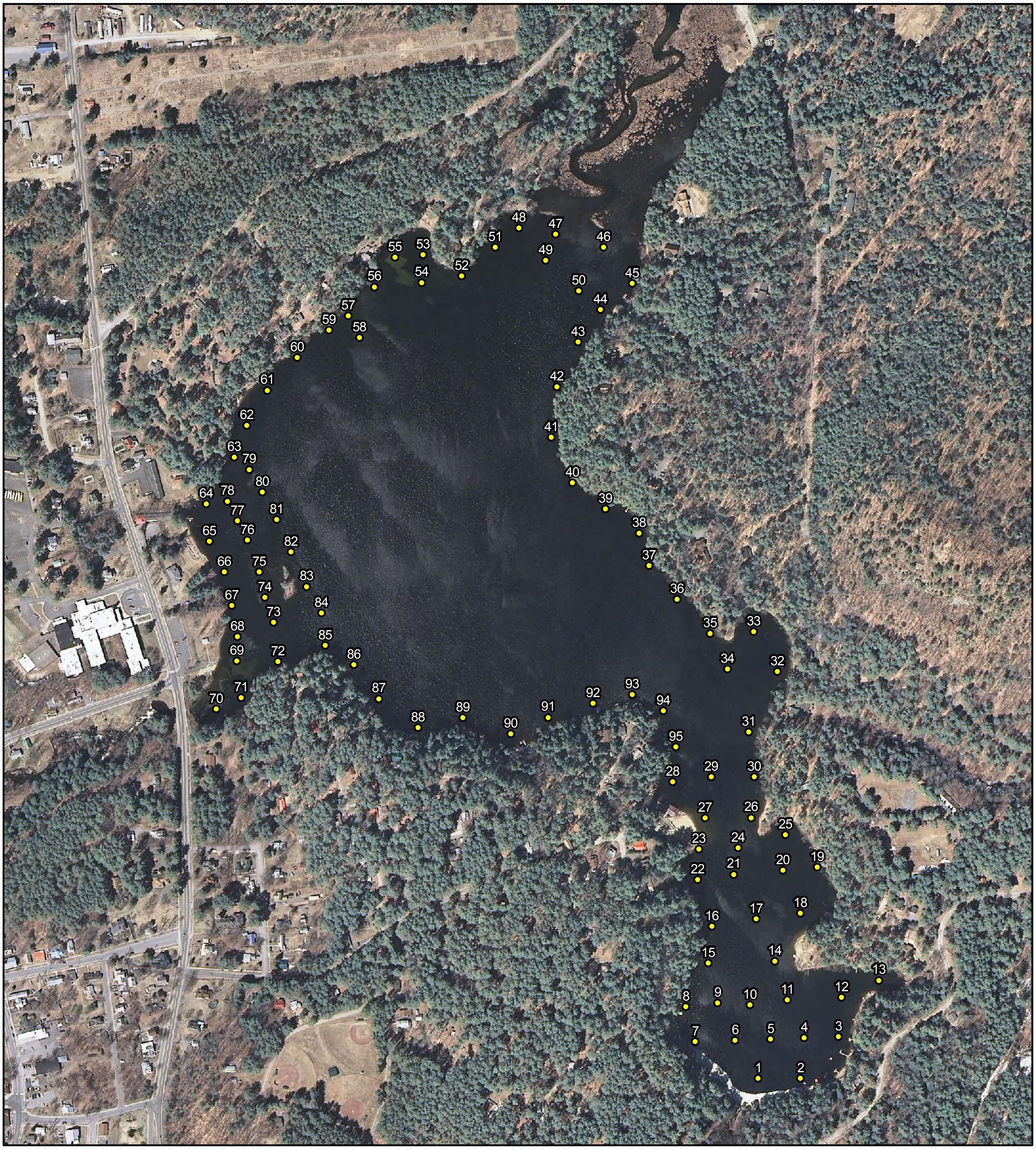
Aquatic Macrophyte	**Total Abundance**		**Trace Abundance**		**Sparse Abundance**		**Medium Abundance**		**Dense Abundance**	
	Sites	**%**	**Sites**	**%**	**Sites**	**%**	**Sites**	**%**	**Sites**	**%**
Total Submersed Vegetation										
Pipewort	4	4%	4	100%	0	0%	0	0%	0	0%
Stonewort	4	4%	3	75%	1	25%	0	0%	0	0%
Low Water Milfoil	2	2%	2	100%	0	0%	0	0%	0	0%
Curly-leaf Pondweed	2	2%	1	50%	1	50%	0	0%	0	0%
Southern Naiad	2	2%	2	100%	0	0%	0	0%	0	0%
Water Bulrush	2	2%	1	50%	1	50%	0	0%	0	0%
Lake Quillwort	1	1%	1	100%	0	0%	0	0%	0	0%
Spiral-fruited Pondweed	1	1%	1	100%	0	0%	0	0%	0	0%
Floating-leaf Pondweed	1	1%	0	0%	1	100%	0	0%	0	0%

Table 3. Historical Aquatic Plant List for Lake Luzerne

Scientific Name	Common Name	Type	2011	2010	2009	2004	1998
Bidens beckii	Water Marigold	Submersed	X	X	X	X	X
Brasenia schreberi	Watershield	Floating-leaf	X	X	X	X	X
Chara sp.	Muskgrass	Macro-algae	X	X	X	X	
Elatine minima	Little Elatine	Submersed			X	X	
Eleocharis acicularis	Needle Spikerush	Submersed		X	X	X	X
Eleocharis sp.	Spikerush	Submersed	X				
Elodea canadensis	Common Waterweed	Submersed	X	X	X	X	X
Eriocaulon aquaticum	Pipewort	Submersed	X	X	X	X	
Fontinalis sp.	Watermoss	Submersed	X	X	X	X	
Isoetes echinospora	Spiny-spored Quillwort	Submersed		X	X	X	X
Isoetes lacustris	Lake Quillwort	Submersed	X	X		X	X
Isoetes sp.	Quillwort	Submersed	X				
Lemna minor	Small Duckweed	Floating-leaf	X				
Myriophyllum alterniflorum	Little Milfoil	Submersed	X	X		X	X
Myriophyllum humile	Low Water Milfoil	Submersed	X				
Myriophyllum sibiricum	Northern Water Milfoil	Submersed	X	X	X	X	X
Myriophyllum spicatum	Eurasian Water Milfoil	Submersed	X	X	X	X	X
Myriophyllum tenellum	Dwarf Water Milfoil	Submersed	X	X	X	X	X
Najas flexilis	Slender Naiad	Submersed	X	X	X	X	X
Najas guadalupensis	Southern Naiad	Submersed	X				X
Nitella sp.	Stonewort	Macro-algae	X	X	X	X	
Nuphar variegata	Spatterdock	Floating-leaf	X	X	X	X	X
Nymphaea odorata	White Water Lily	Floating-leaf	X	X	X	X	X
Pontederia cordata	Pickerelweed	Emergent	X[1]	X	X	X	X
Potamogeton amplifolius	Bass Weed	Submersed	X	X	X	X	X
Potamogeton crispus	Curly-leaf Pondweed	Submersed	X	X		X	
Potamogeton epihydrus	Ribbon-leaf Pondweed	Submersed	X	X	X	X	X
Potamogeton gramineus	Variable-leaf Pondweed	Submersed	X	X	X	X	X
Potamogeton illinoensis	Illinois Pondweed	Submersed	X	X	X	X	
Potamogeton natans	Floating-leaf Pondweed	Floating-leaf	X				
Potamogeton perfoliatus	Heart Pondweed	Submersed	X[1]	X		X	
Potamogeton praelongus	White-stem Pondweed	Submersed	X	X	X	X	X
Potamogeton pusillus	Small Pondweed	Submersed	X	X	X	X	X
Potamogeton richardsonii	Clasping-leaf Pondweed	Submersed	X		X	X	X
Potamogeton robbinsii	Robbins Pondweed	Submersed	X	X	X	X	X
Potamogeton spirillus	Spiral-fruited Pondweed	Submersed	X			X	X
Potamogeton vaseyii	Vasey's Pondweed	Submersed	X	X	X	X	X
Potamogeton zosteriformis	Flat-stem Pondweed	Submersed		X		X	X
Sagittaria graminea	Grassy Arrowhead	Emergent	X[1]	X	X	X	X
Scirpus subterminalis	Water Bulrush	Submersed	X				
Scripus sp.	Rush	Emergent		X			
Sparganium sp.	Burreed	Submersed	X[1]	X	X	X	X
Typha latifolia	Cattail	Emergent	X[1]	X	X	X	X
Utricularia intermedia	Northern Bladderwort	Submersed	X	X	X	X	
Utricularia minor	Small Bladderwort	Submersed	X	X	X	X	
Utricularia purpurea	Large Purple Bladderwort	Submersed	X	X	X	X	
Utricularia vulgaris	Common Bladderwort	Submersed	X	X	X	X	X
Vallisneria americana	Wild Celery	Submersed	X	X	X	X	X
Richness (# of species)			**43**	**38**	**34**	**40**	**30**

Notes
2011 Data from Allied Biological (2011)
1998-2010 Data from Eichler (2010)
Red indicates an invasive species
1. Macrophyte Observed, but not collected on anchor

Sample Location Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



Allied Biological

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Northern NY Office: 984 County Highway 53, Maryland, NY 12116

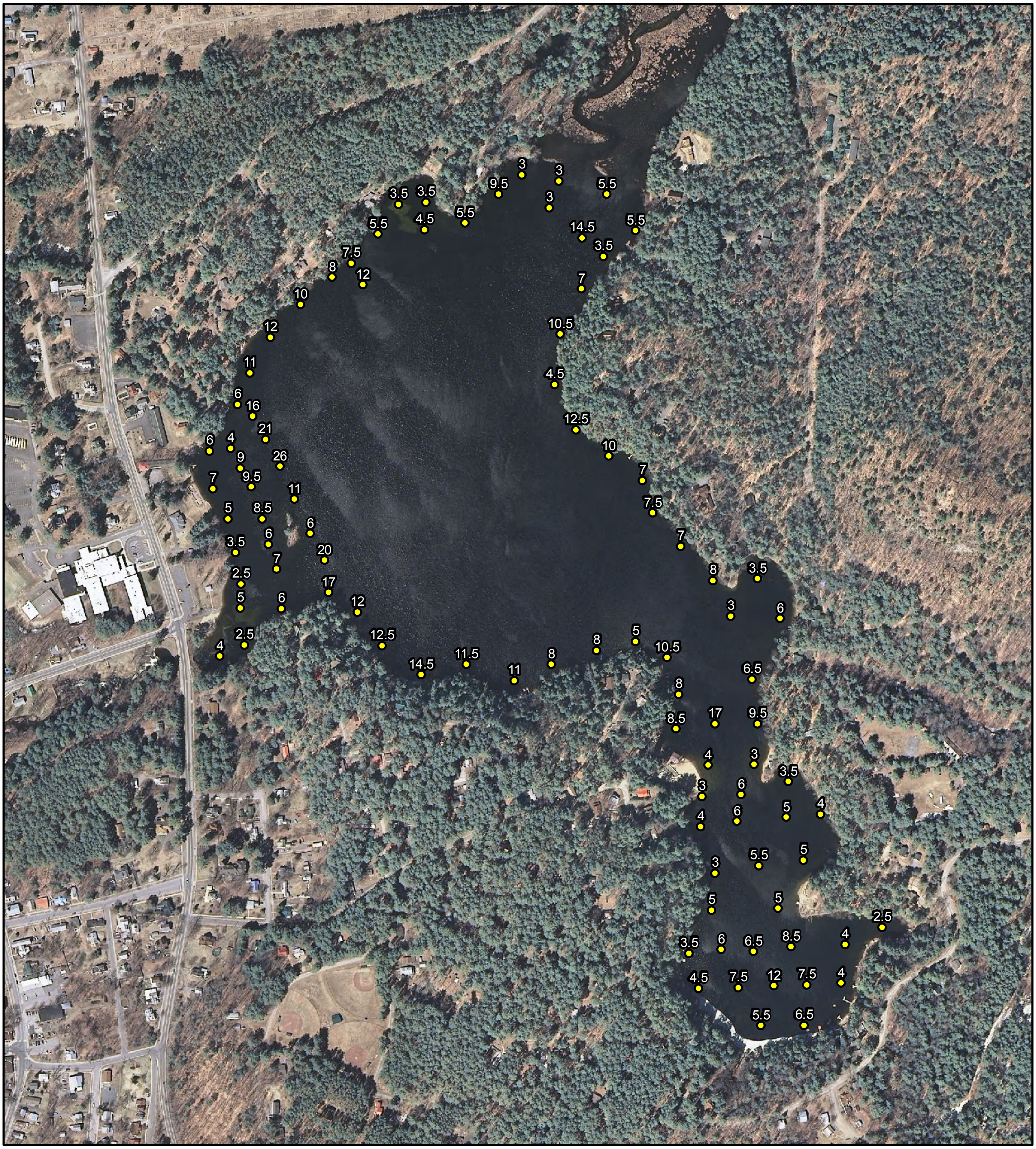
1-800-245-2932 www.alliedbiological.com

Sample Location

N

0 220 440 880 Feet

Water Depth Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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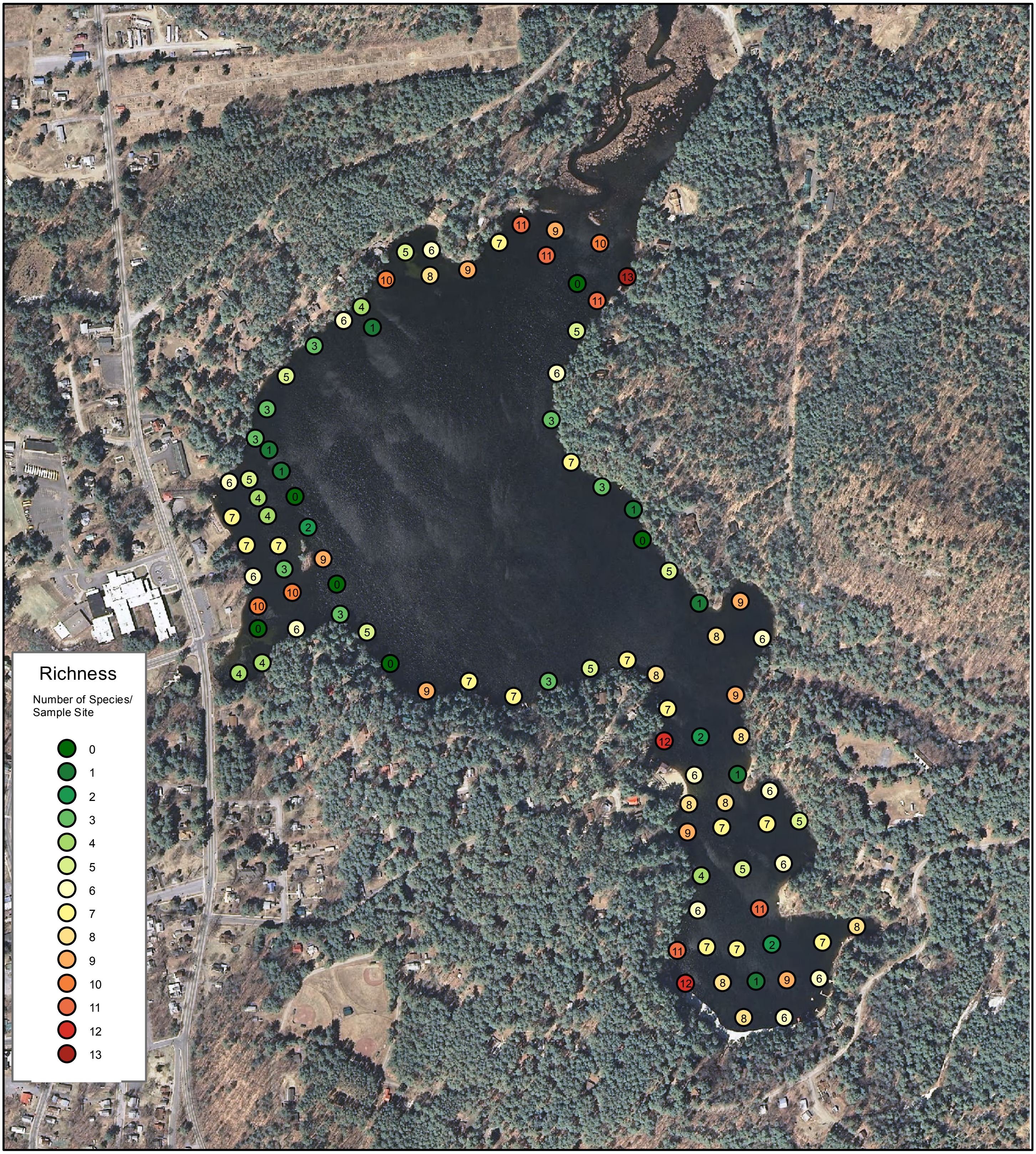
Water Depth in Feet

0 220 440 880 Feet

Aquatic Vegetation Sample Site Richness
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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0 215 430 860 Feet

Total Submersed Vegetation Distribution
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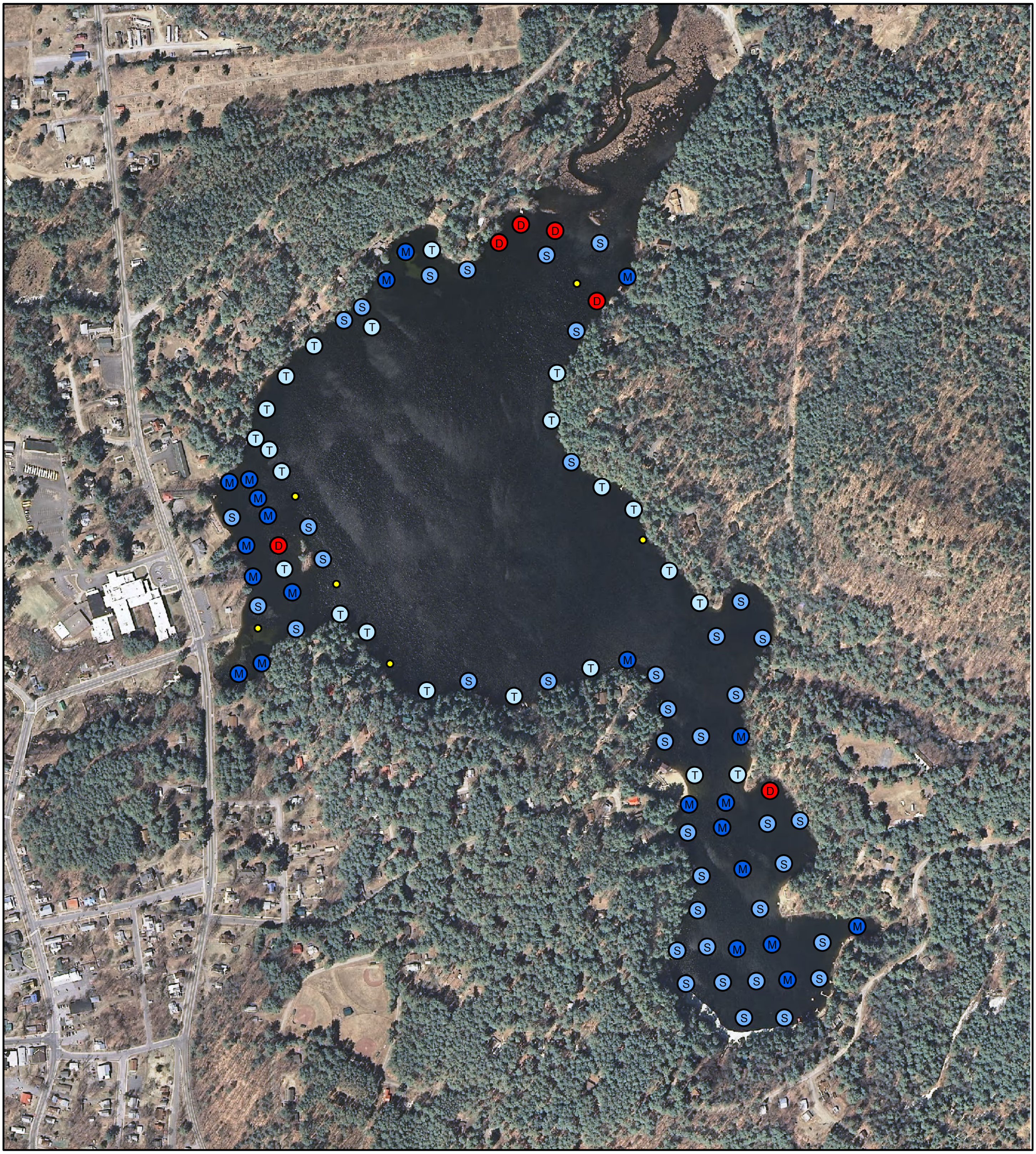
September 14, 2011



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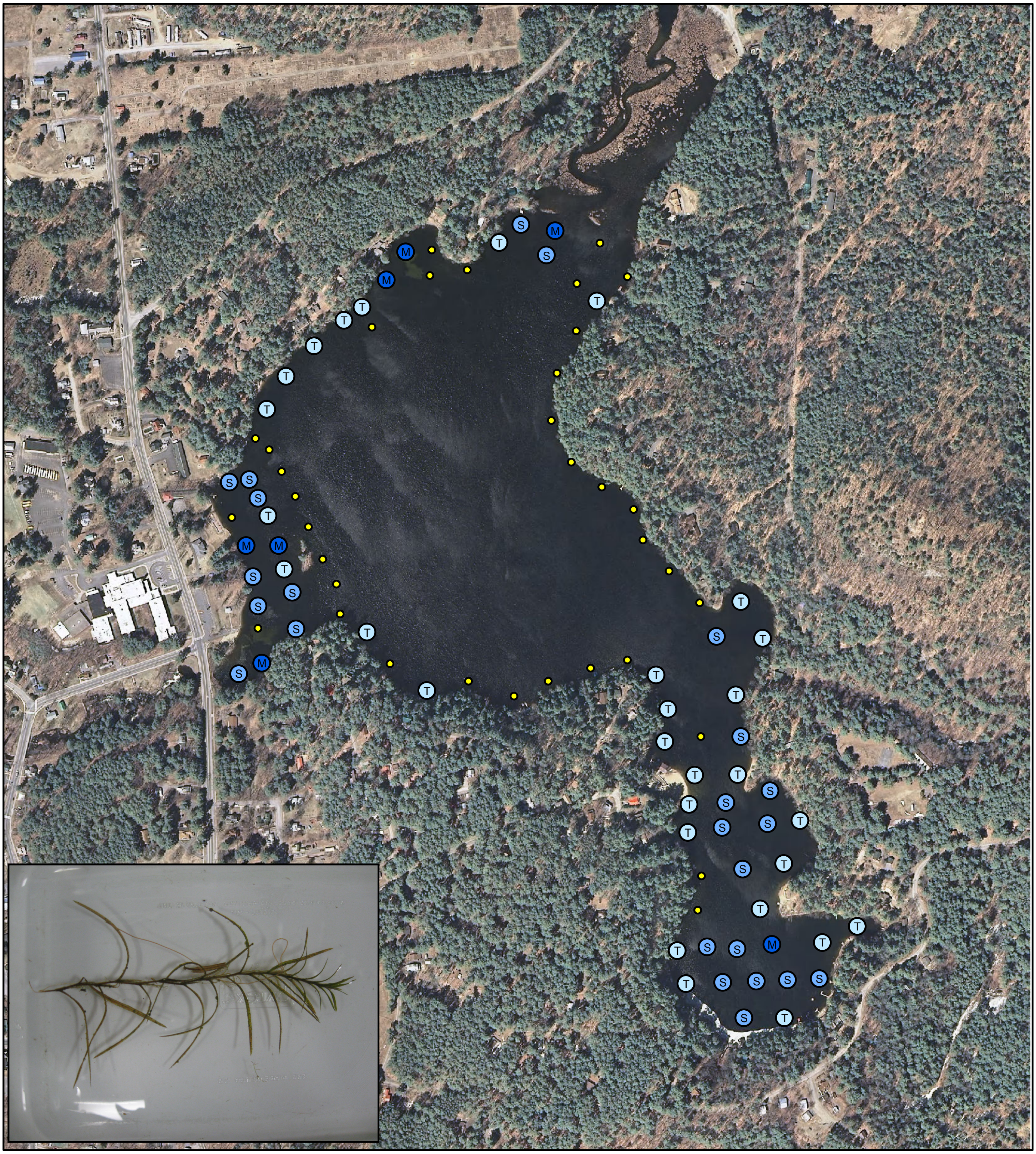
LEGEND

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

N

0 220 440 880
Feet

Robbin's Pondweed (*Potamogeton robbinsii*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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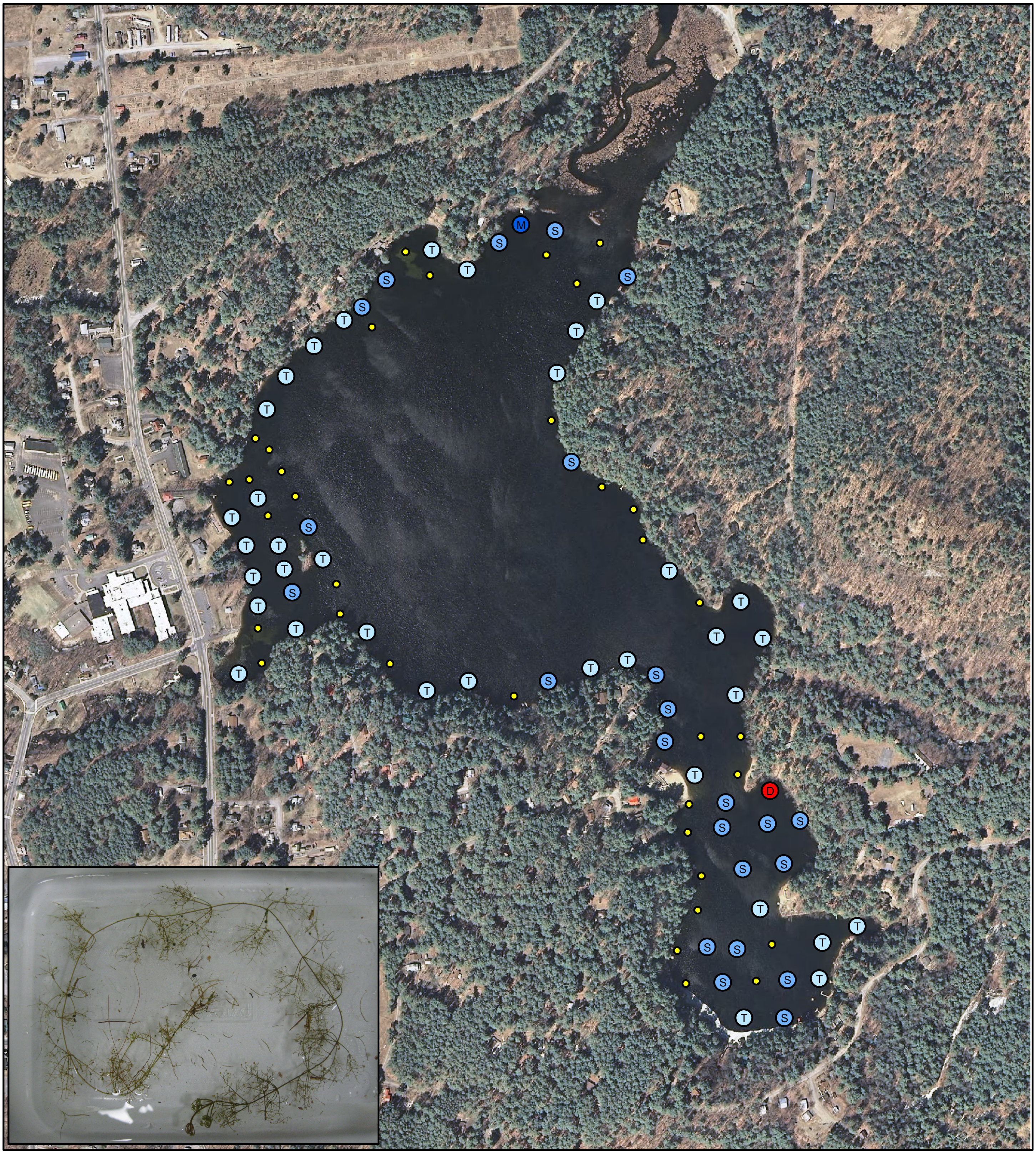
N

0 220 440 880 Feet

Purple Bladderwort (*Utricularia purpurea*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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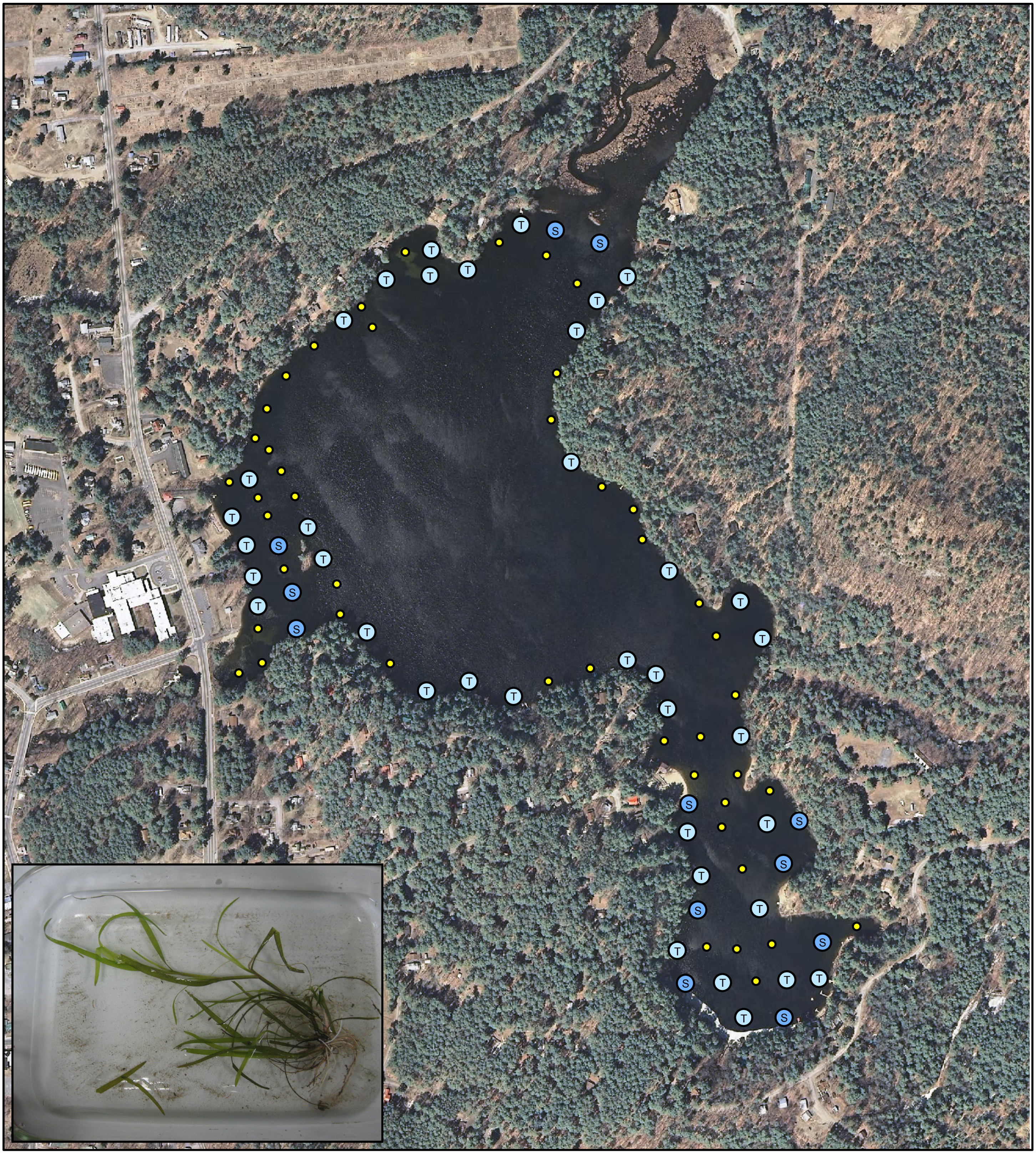
N

0 220 440 880
Feet

Wild Celery (*Vallisneria americana*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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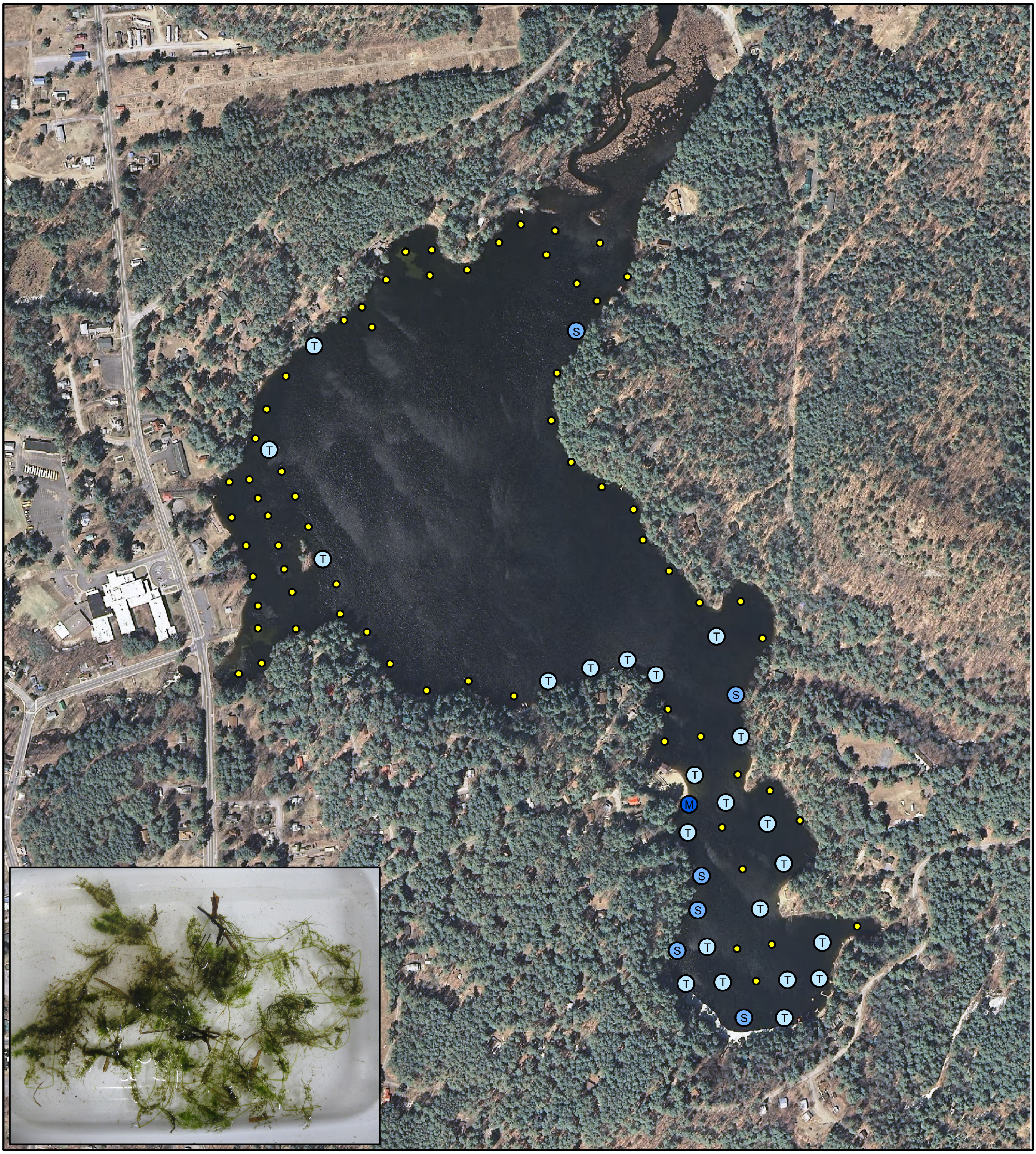
- D = Dense Plants

N

0 215 430 860 Feet

Watermoss (*Fontinalis* sp.) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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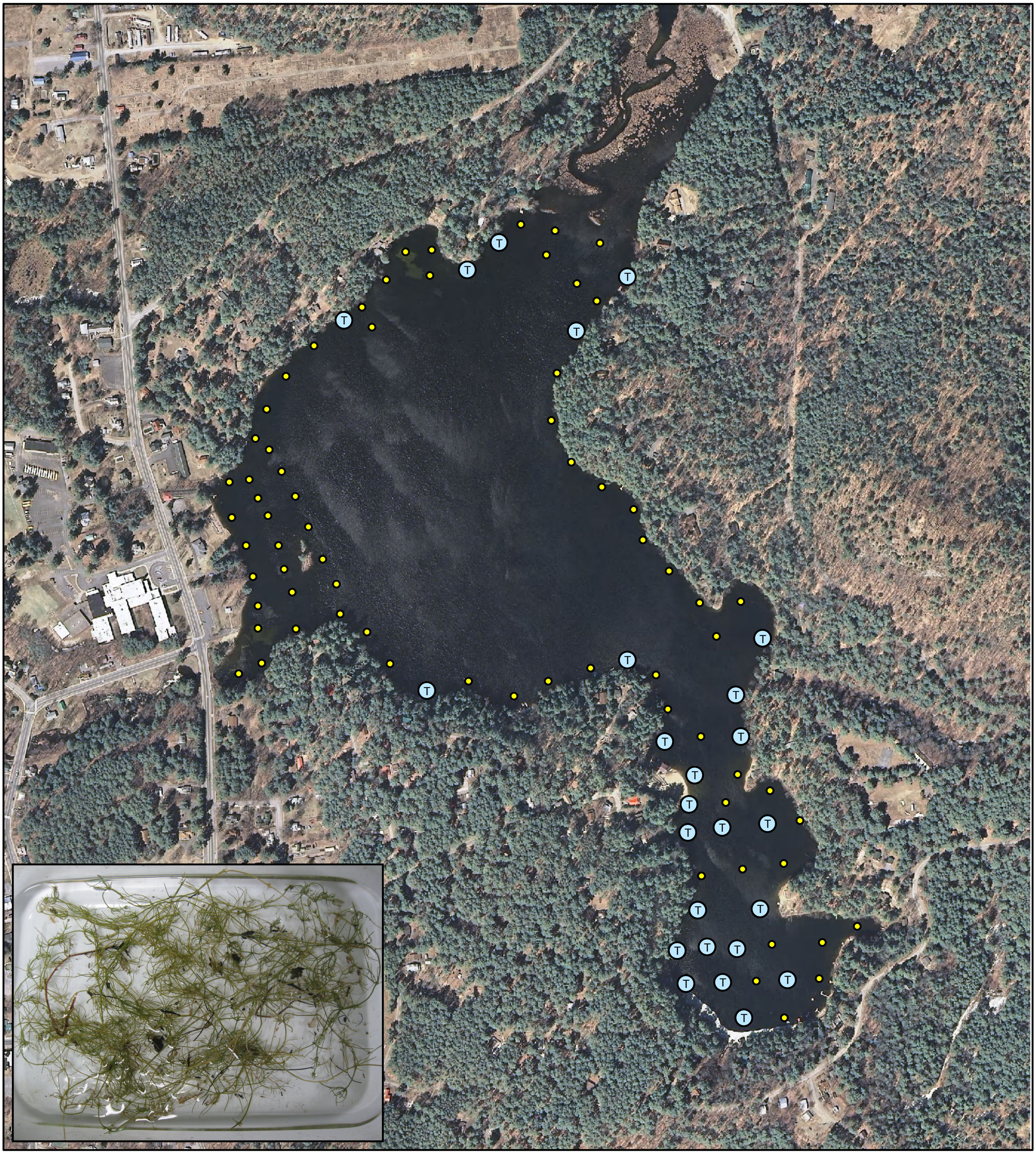
- D = Dense Plants

0 220 440 880
Feet

Muskgrass (*Chara* sp.) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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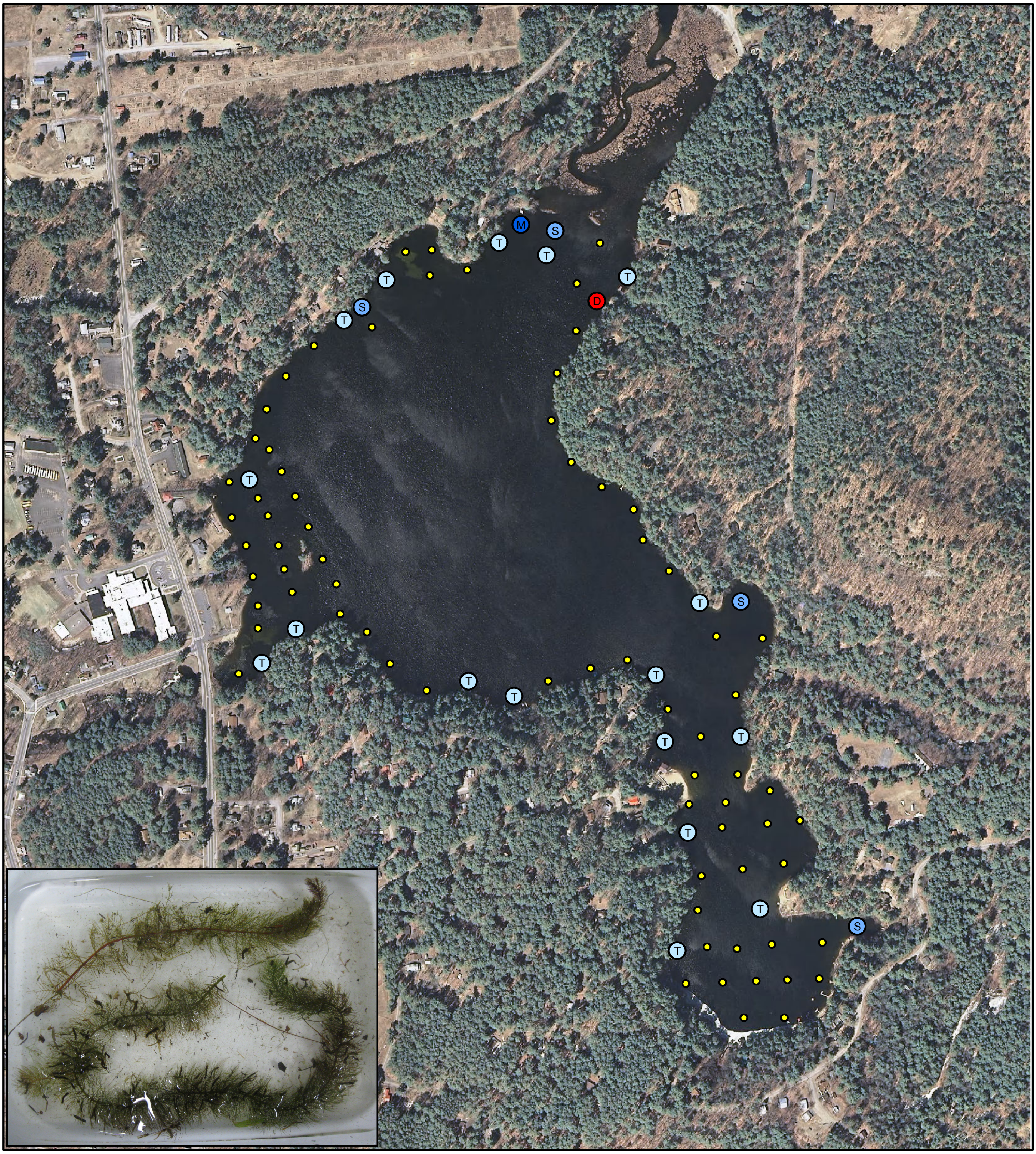
N

0 220 440 880 Feet

Northern Water Milfoil (*Myriophyllum sibiricum*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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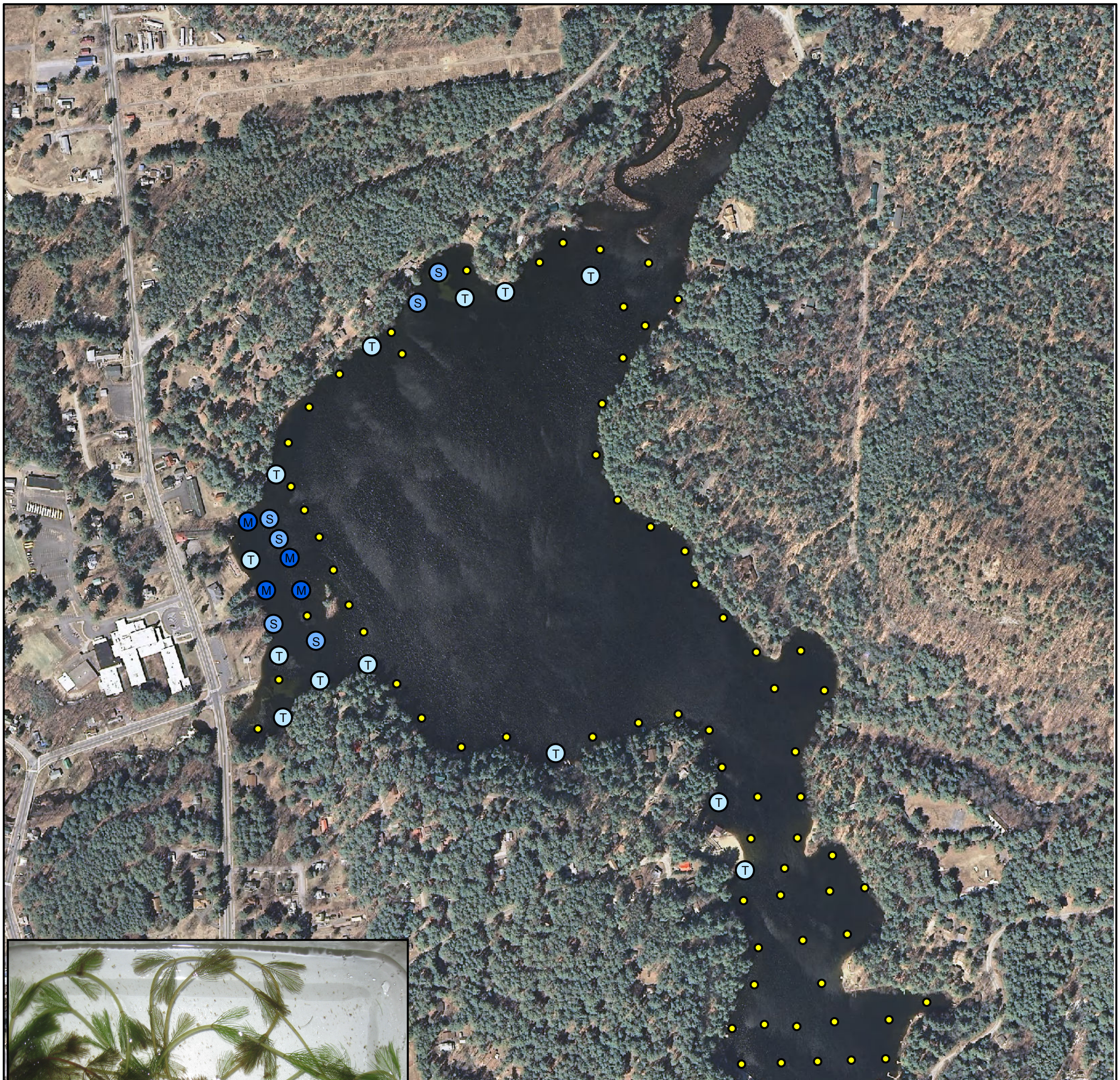
- D = Dense Plants

0 220 440 880
Feet

Eurasian Water Milfoil (*Myriophyllum spicatum*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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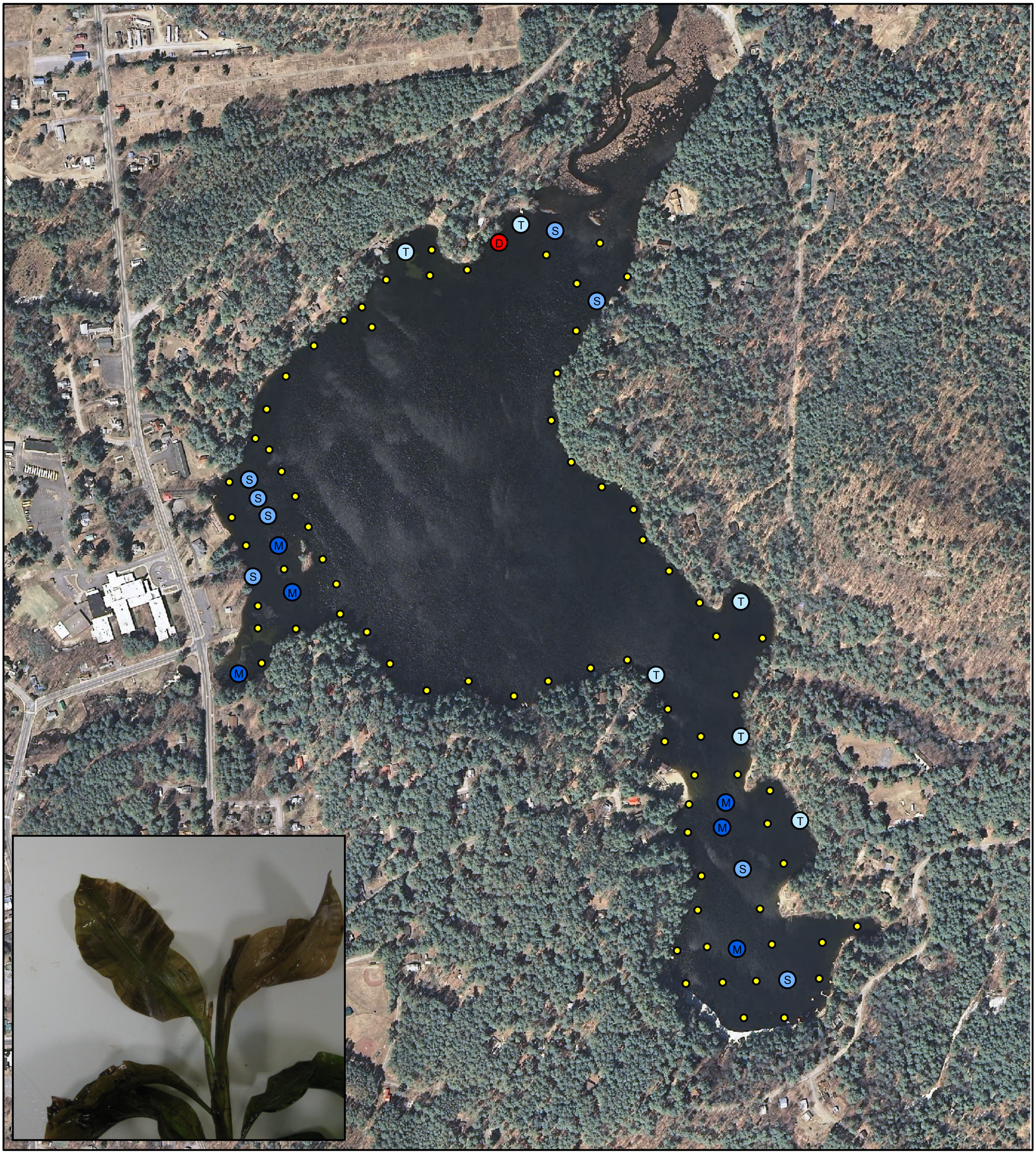
- D = Dense Plants

N

0 220 440 880 Feet

Bass Weed (*Potamogeton amplifolius*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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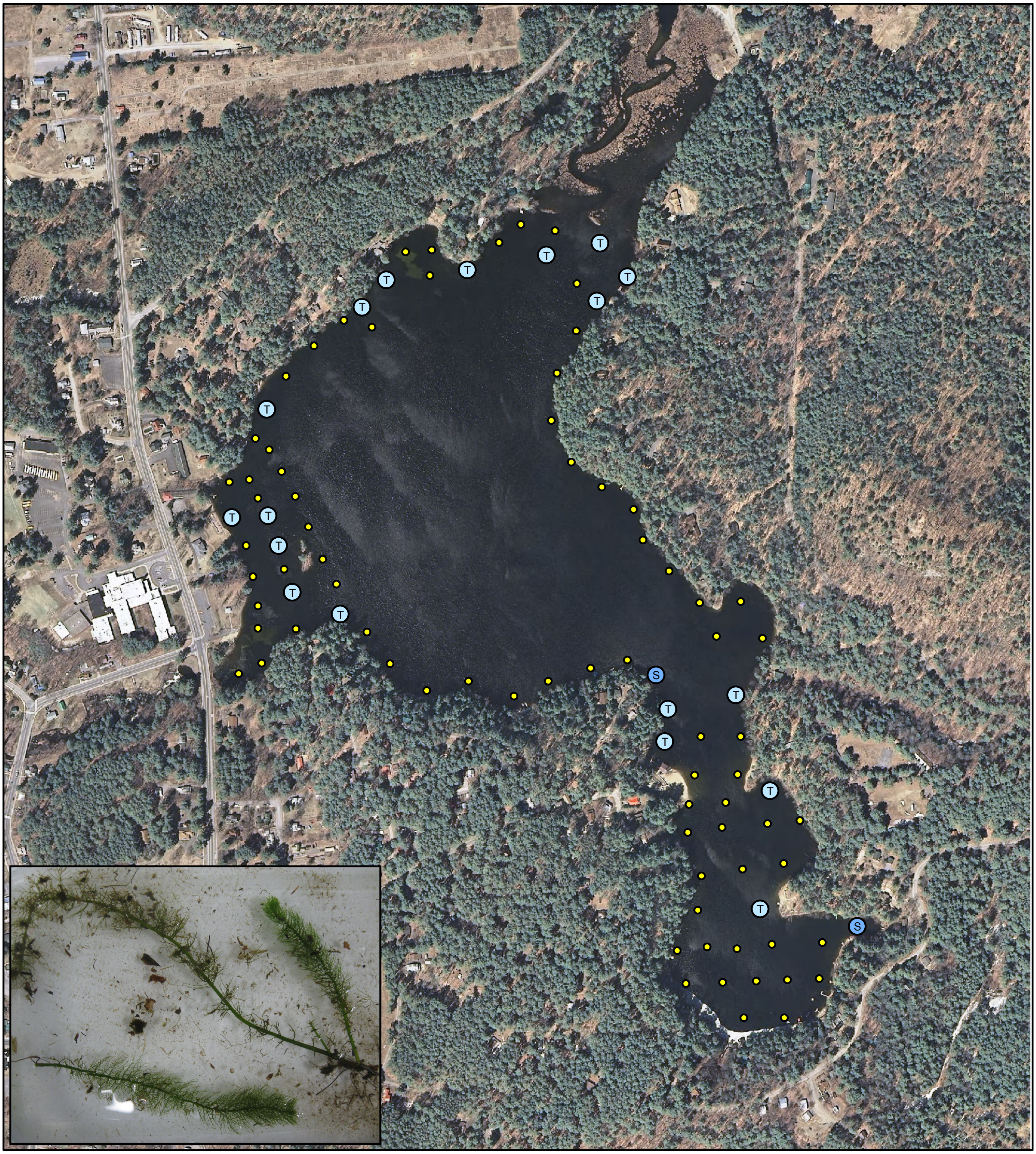
0 220 440 880 Feet

Little Water Milfoil (*Myriophyllum alterniflorum*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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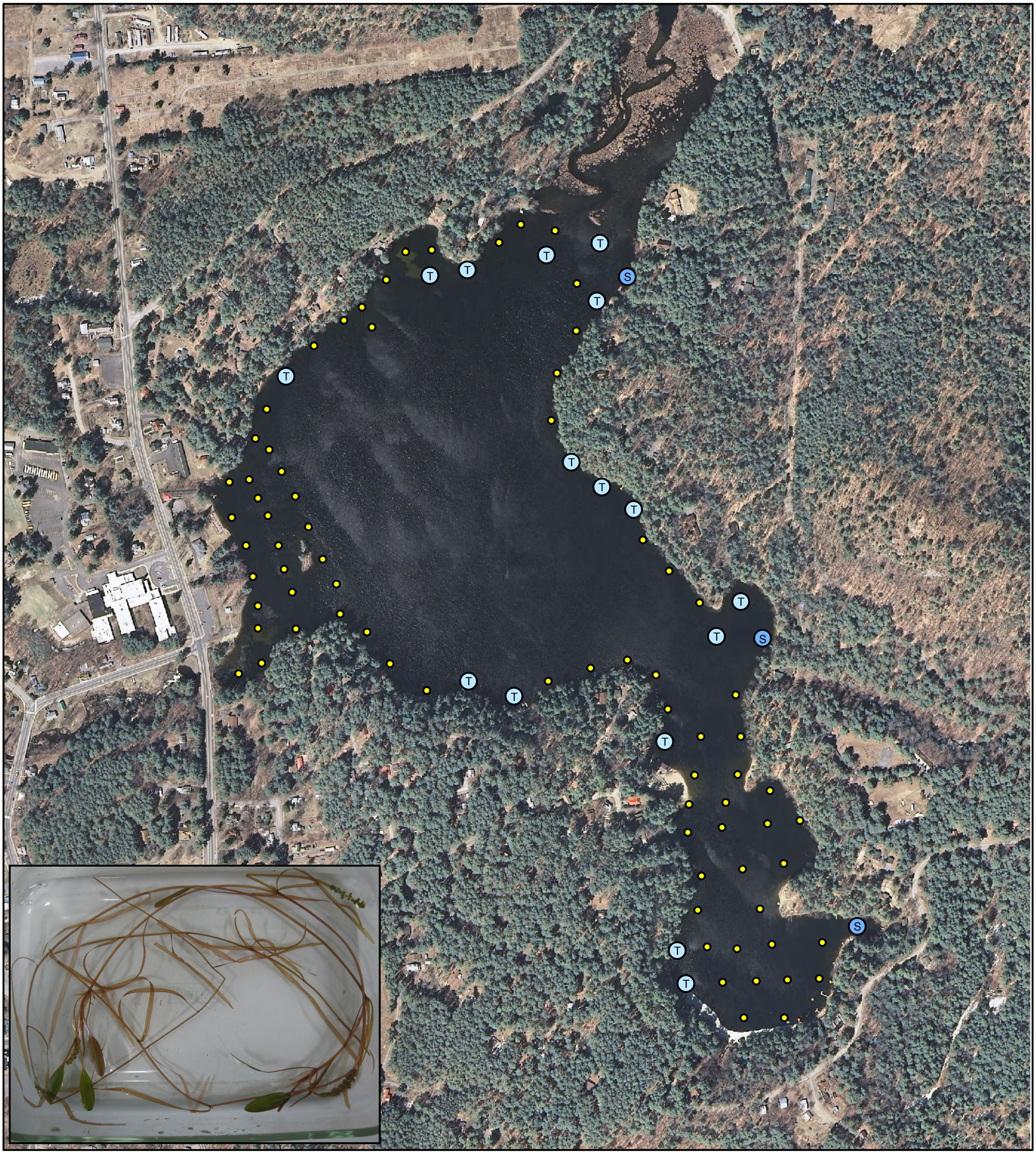
- M = Medium Plants
- D = Dense Plants

0 220 440 880 Feet

Ribbon-leaf Pondweed (*Potamogeton epihydrus*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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Vasey's Pondweed (*Potamogeton vaseyi*) Distribution
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September 14, 2011

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LEGEND

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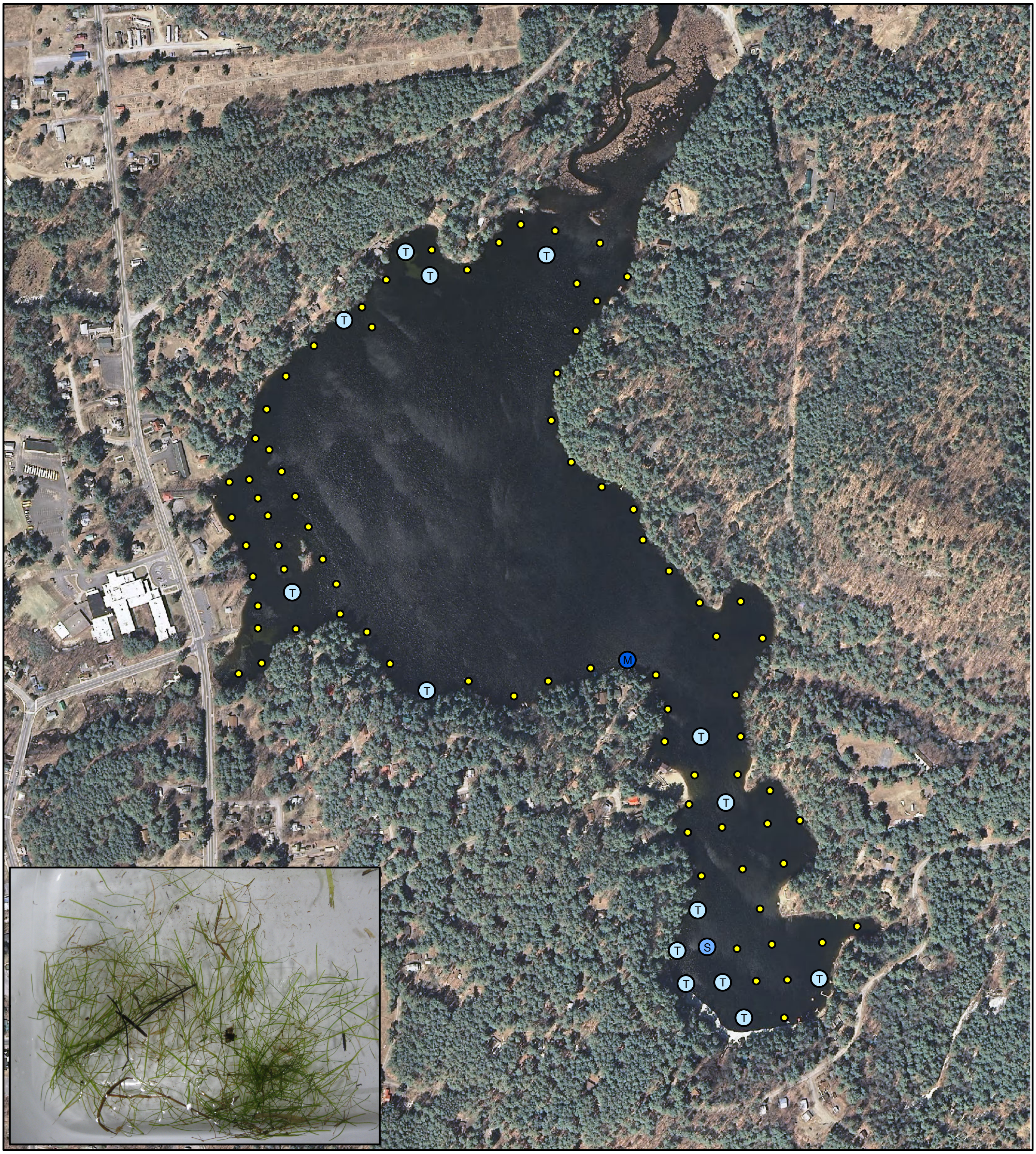
- M = Medium Plants
- D = Dense Plants

N

0 220 440 880
Feet

Small Pondweed (*Potamogeton pusillus*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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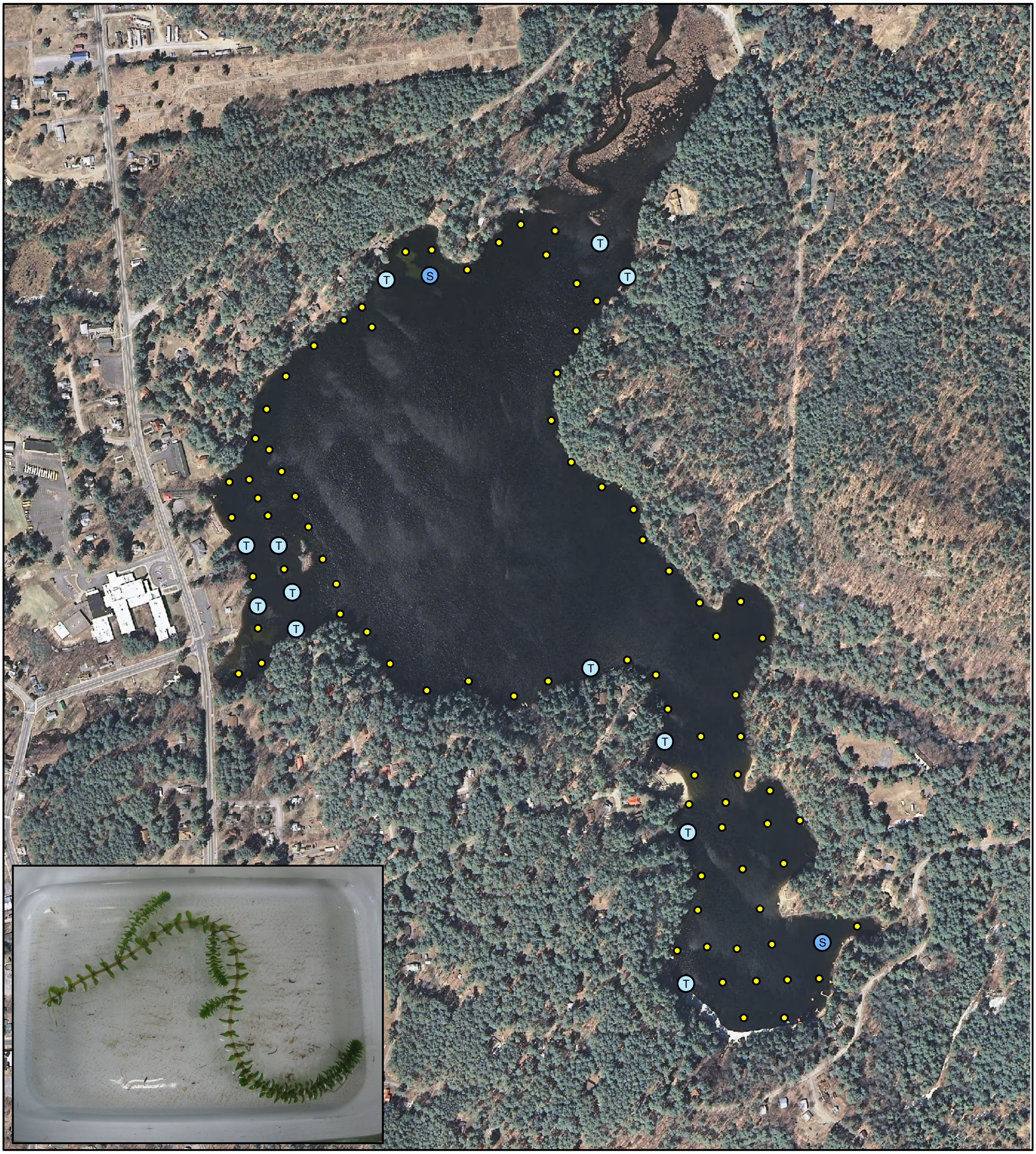
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

0 220 440 880
Feet

Common Waterweed (*Elodea canadensis*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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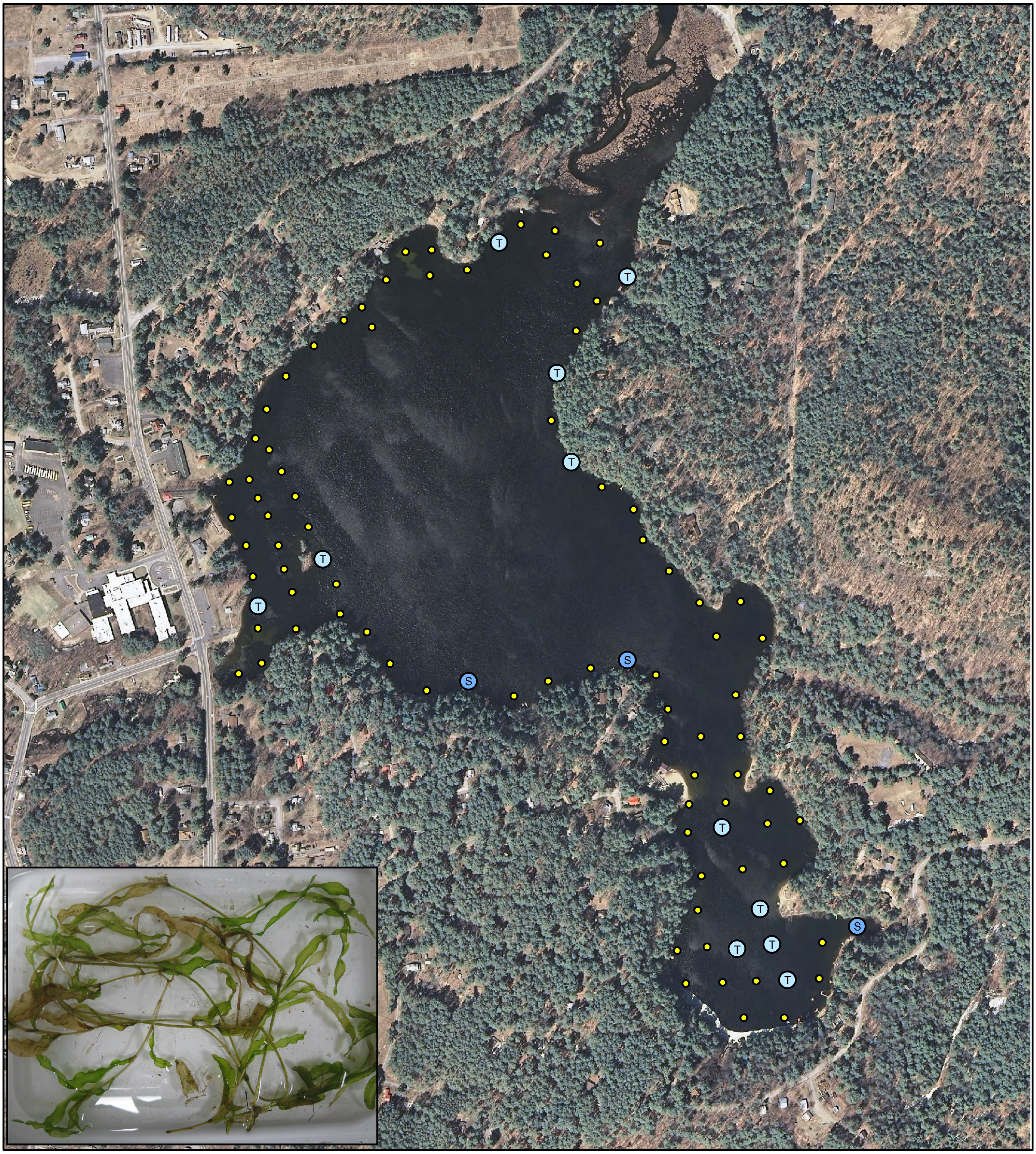
- M = Medium Plants
- D = Dense Plants

0 220 440 880 Feet

Variable Pondweed (*Potamogeton gramineus*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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0 220 440 880 Feet

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Common Bladderwort (*Utricularia vulgaris*) Distribution
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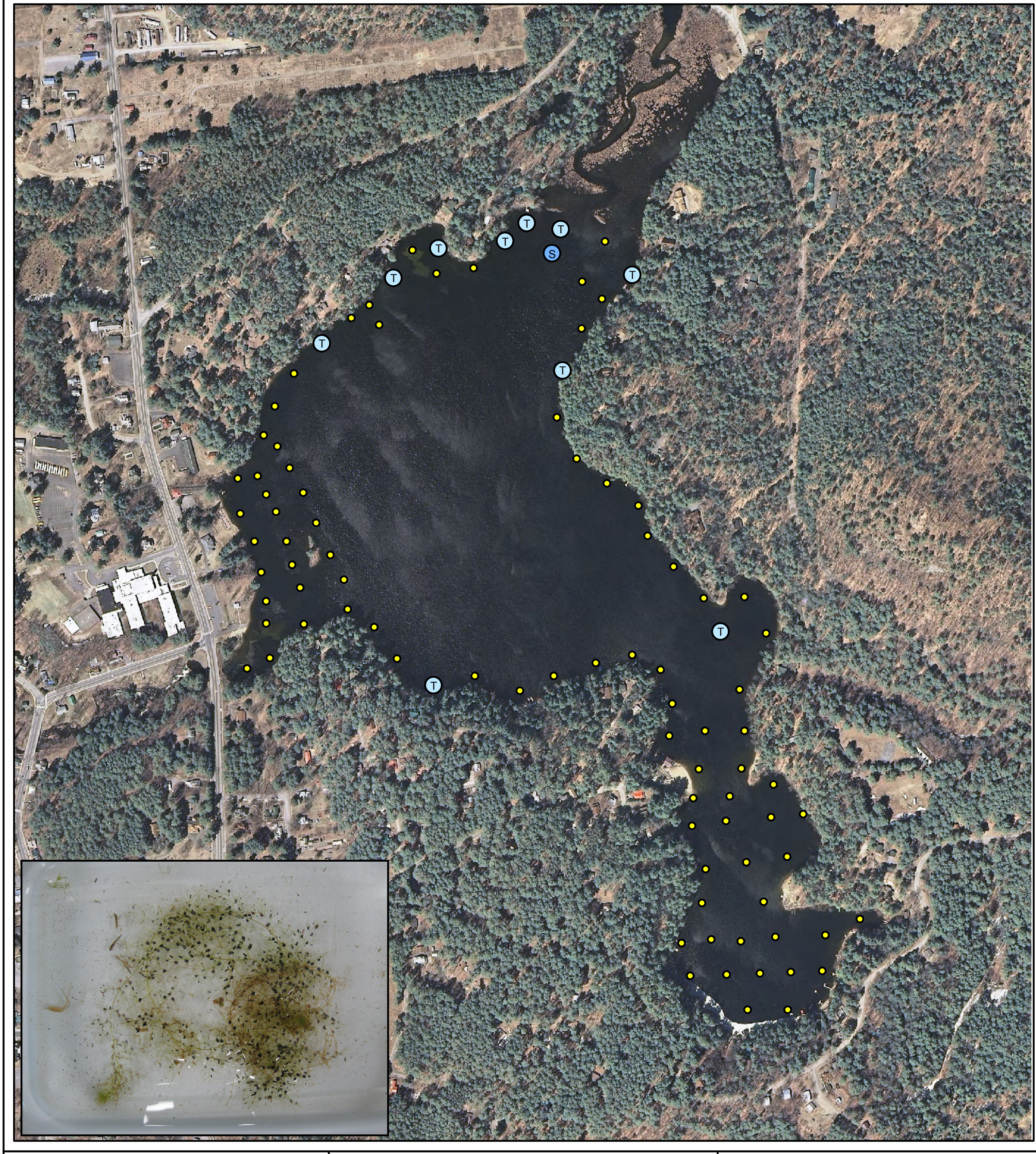
September 14, 2011



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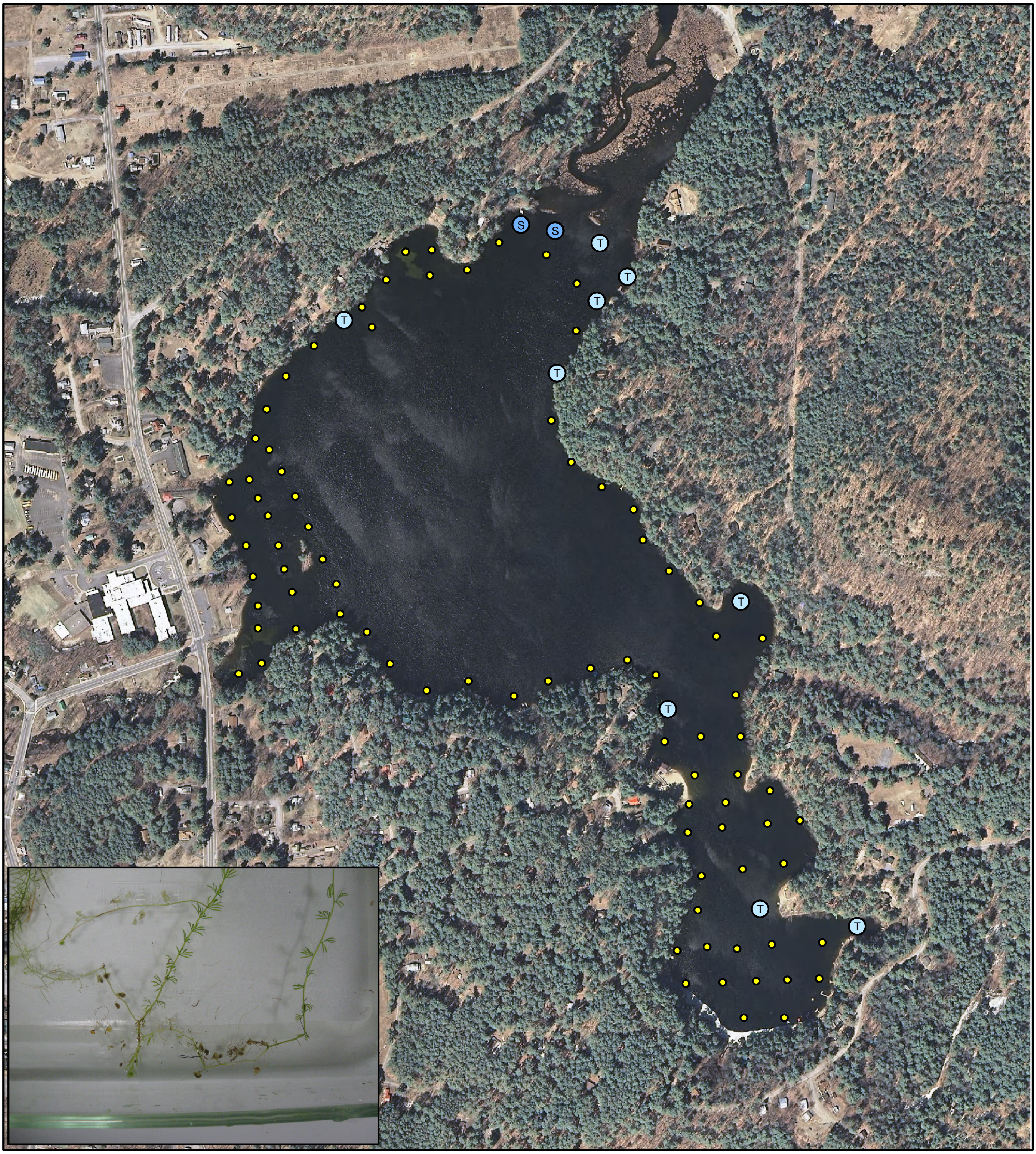
LEGEND

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

N

0 220 440 880
Feet

Northern Bladderwort (*Utricularia intermedia*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

- = No Plants
- T = Trace Plants
- S = Sparse Plants
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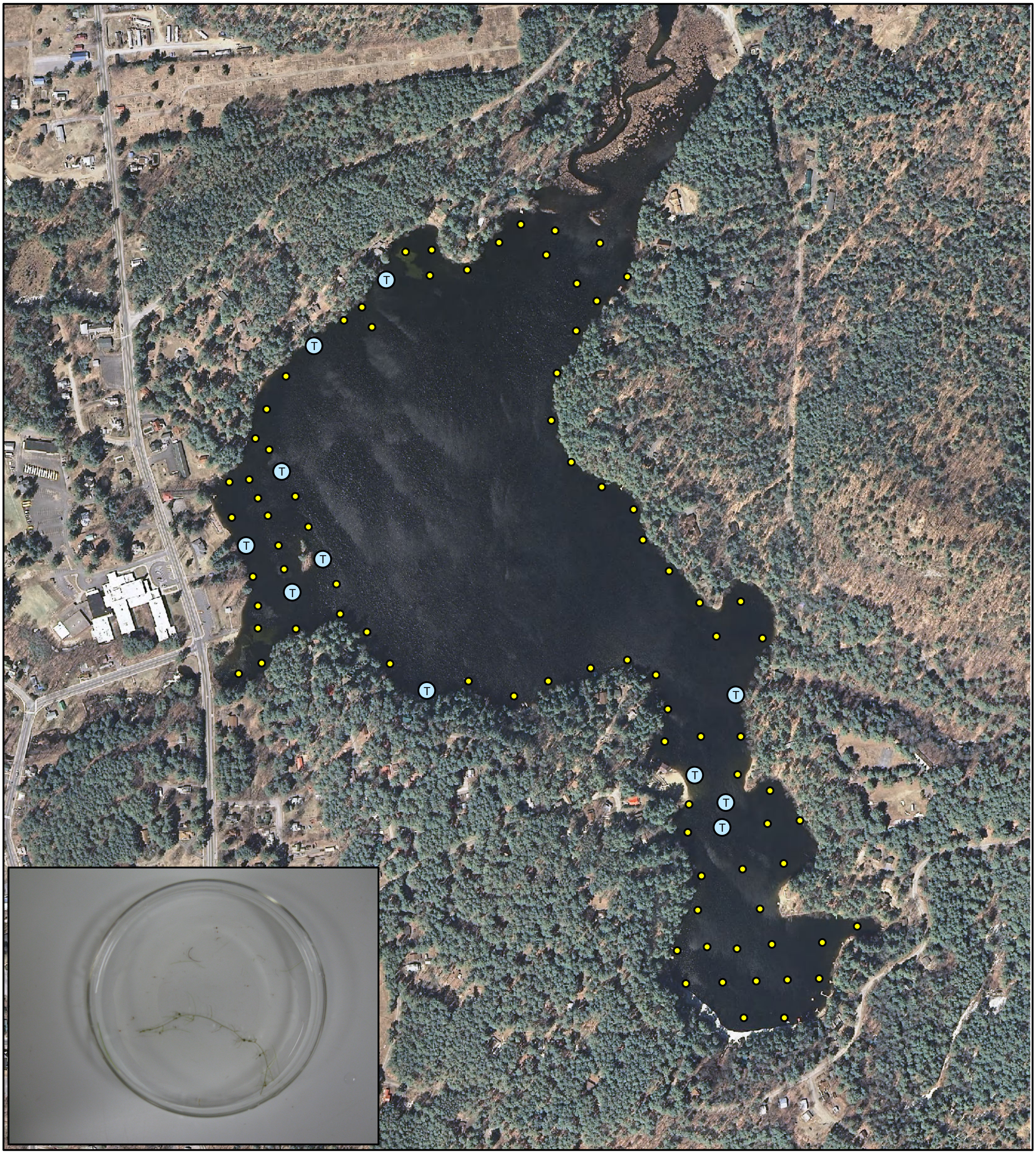
- D = Dense Plants

0 220 440 880 Feet

Small Bladderwort (*Utricularia minor*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

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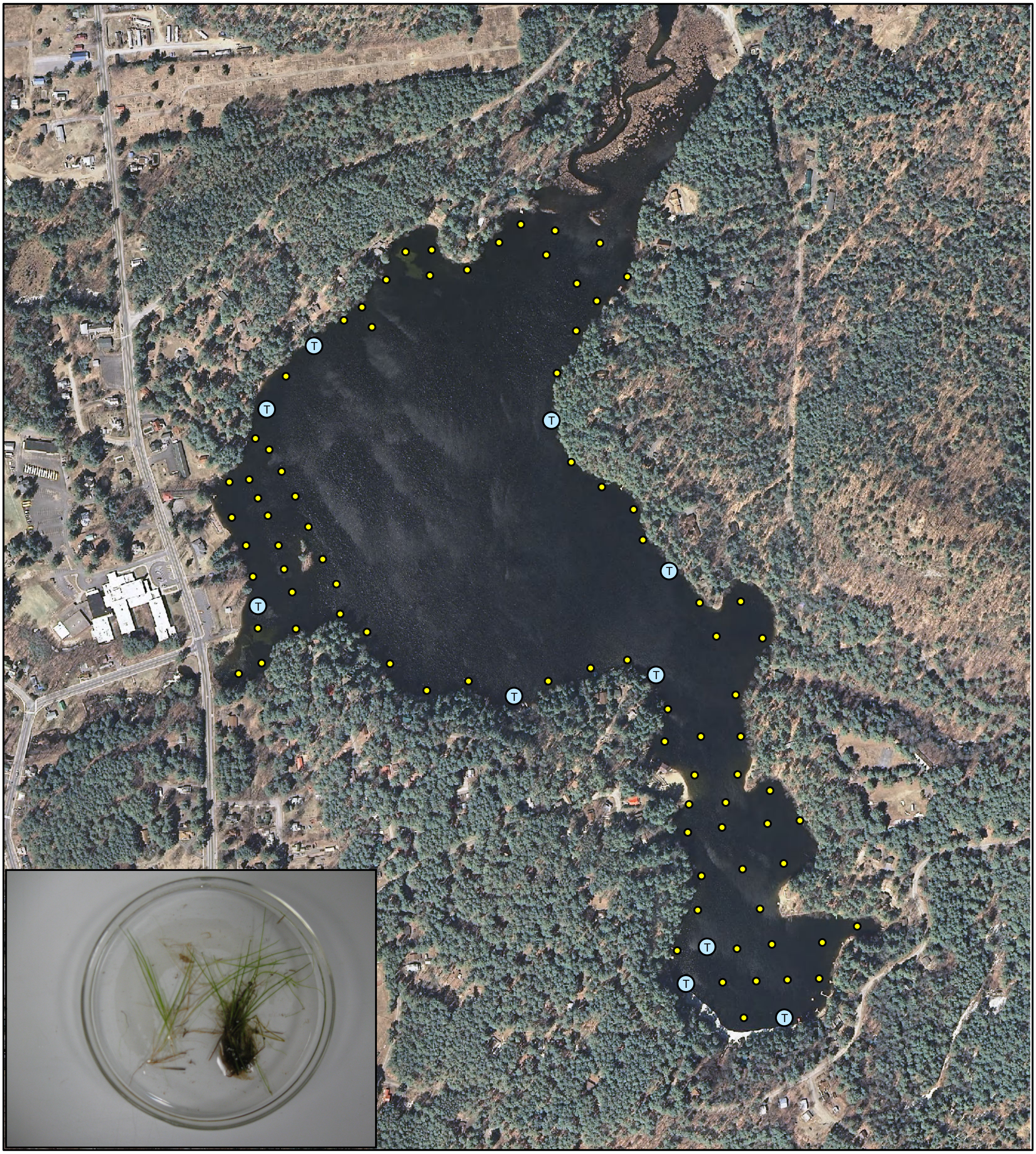
- D = Dense Plants

N

0 220 440 880 Feet

Spikerush (*Eleocharis* sp.) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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LEGEND

- = No Plants
- T = Trace Plants
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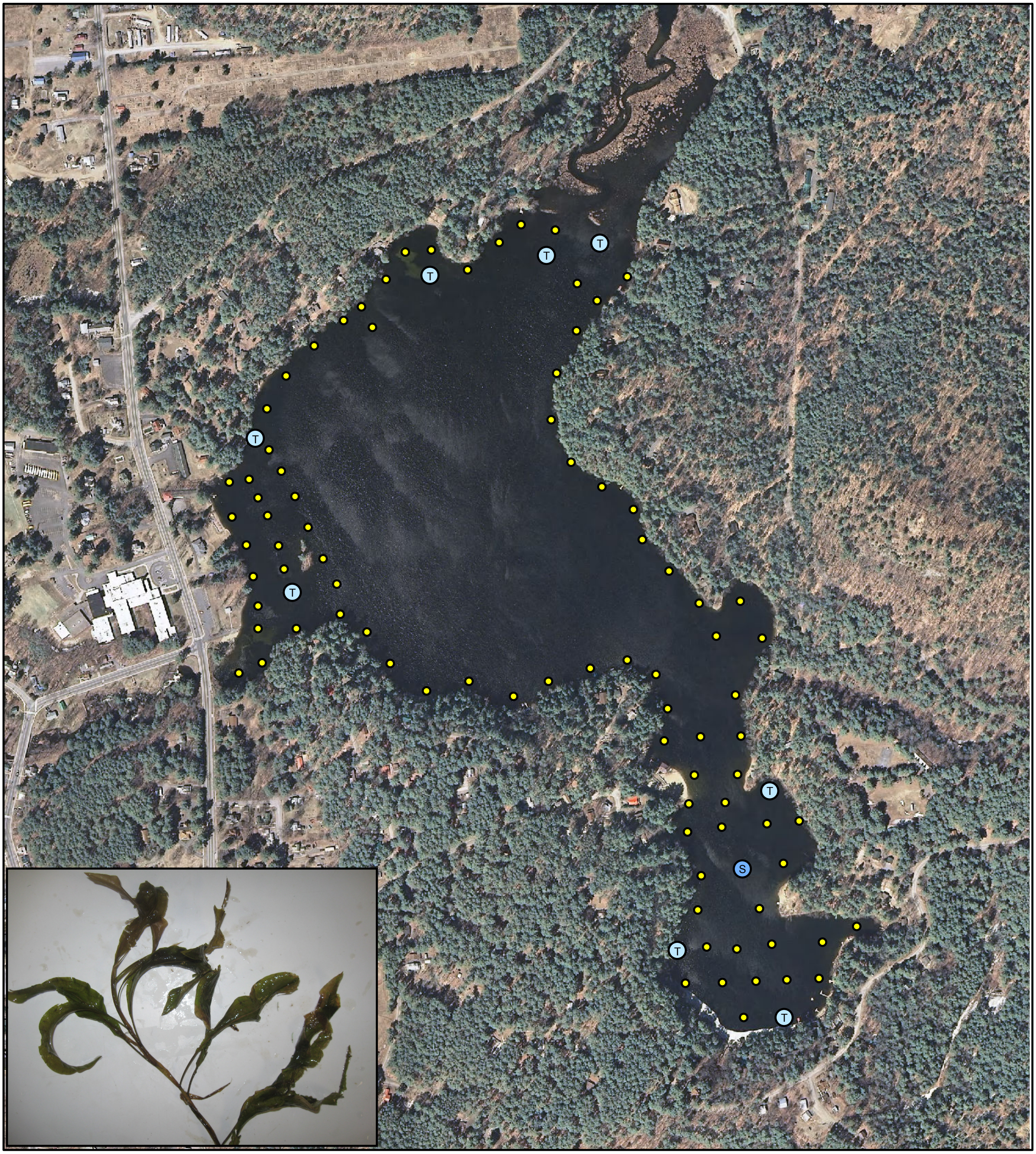
N

0 220 440 880 Feet

Illinois Pondweed (*Potamogeton illinoensis*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



Allied Biological

Corporate Office: 580 Rockport Road, Hackettstown, NJ 07840
Northern NY Office: 984 County Highway 53, Maryland, NY 12116

1-800-245-2932 www.alliedbiological.com

LEGEND

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

0 215 430 860
Feet

Slender Naiad (*Najas flexilis*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011

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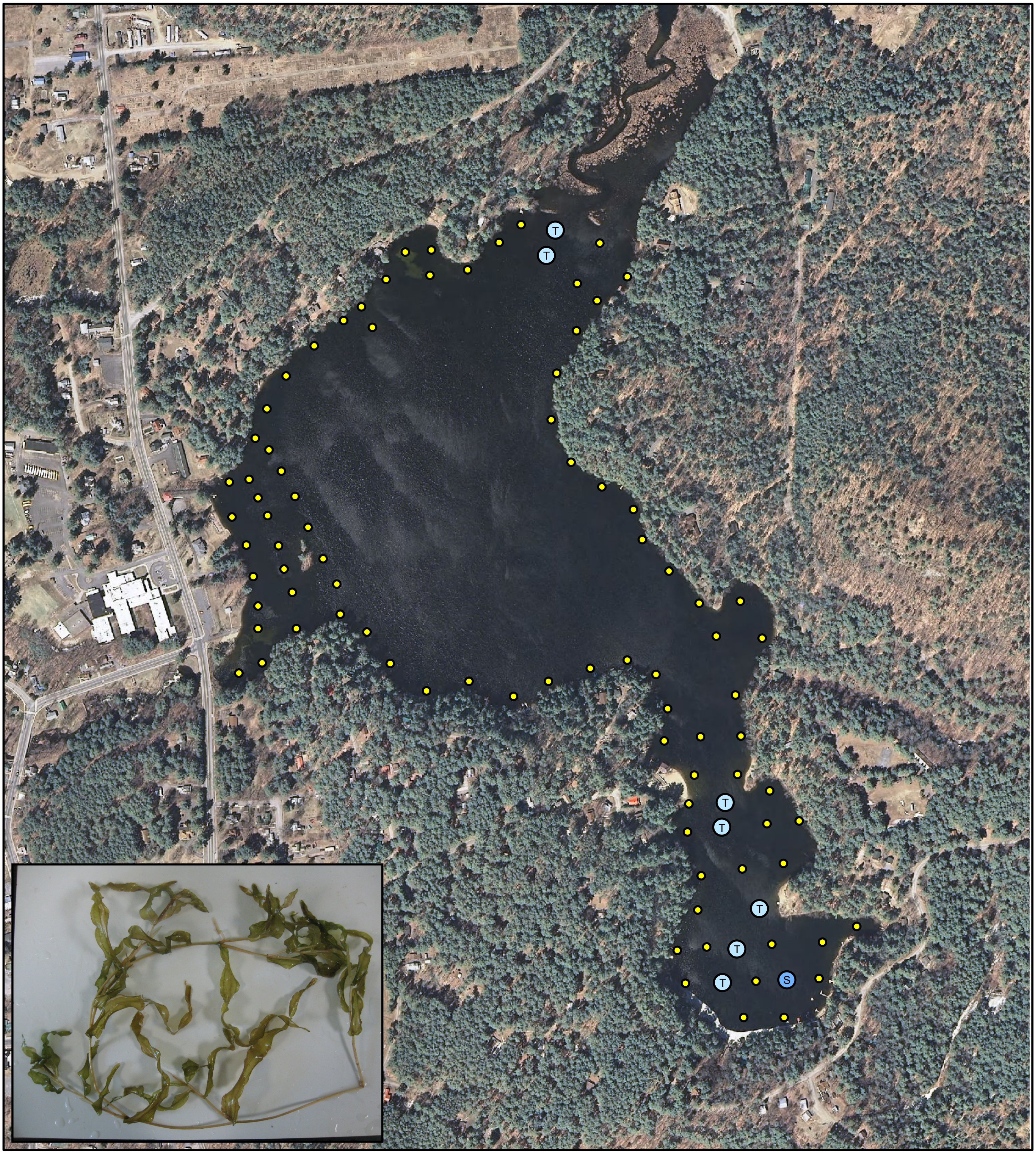
N

0 220 440 880
Feet

White-stem Pondweed (*Potamogeton praelongus*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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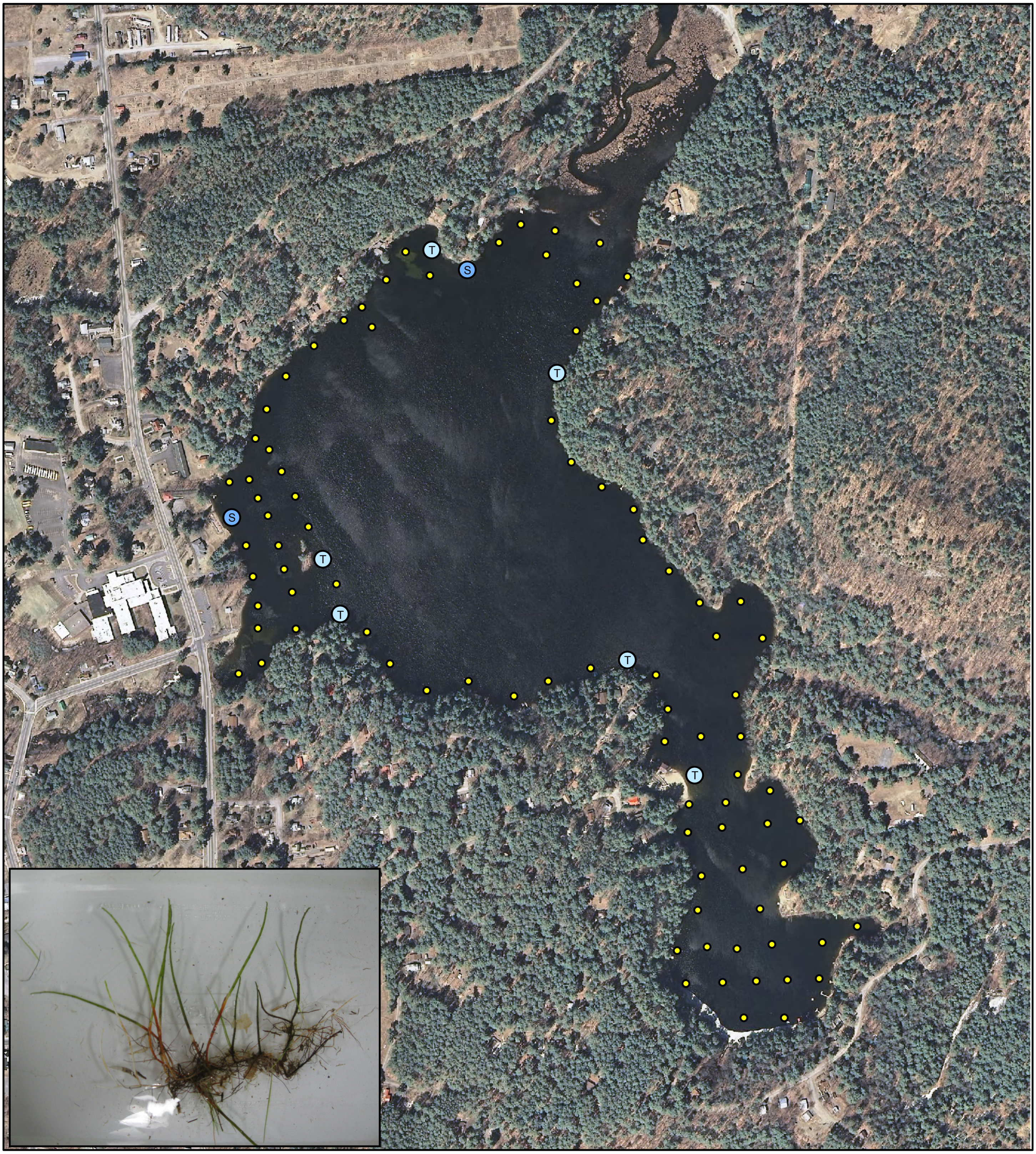
N

0 215 430 860 Feet

Dwarf Water Milfoil (*Myriophyllum tenellum*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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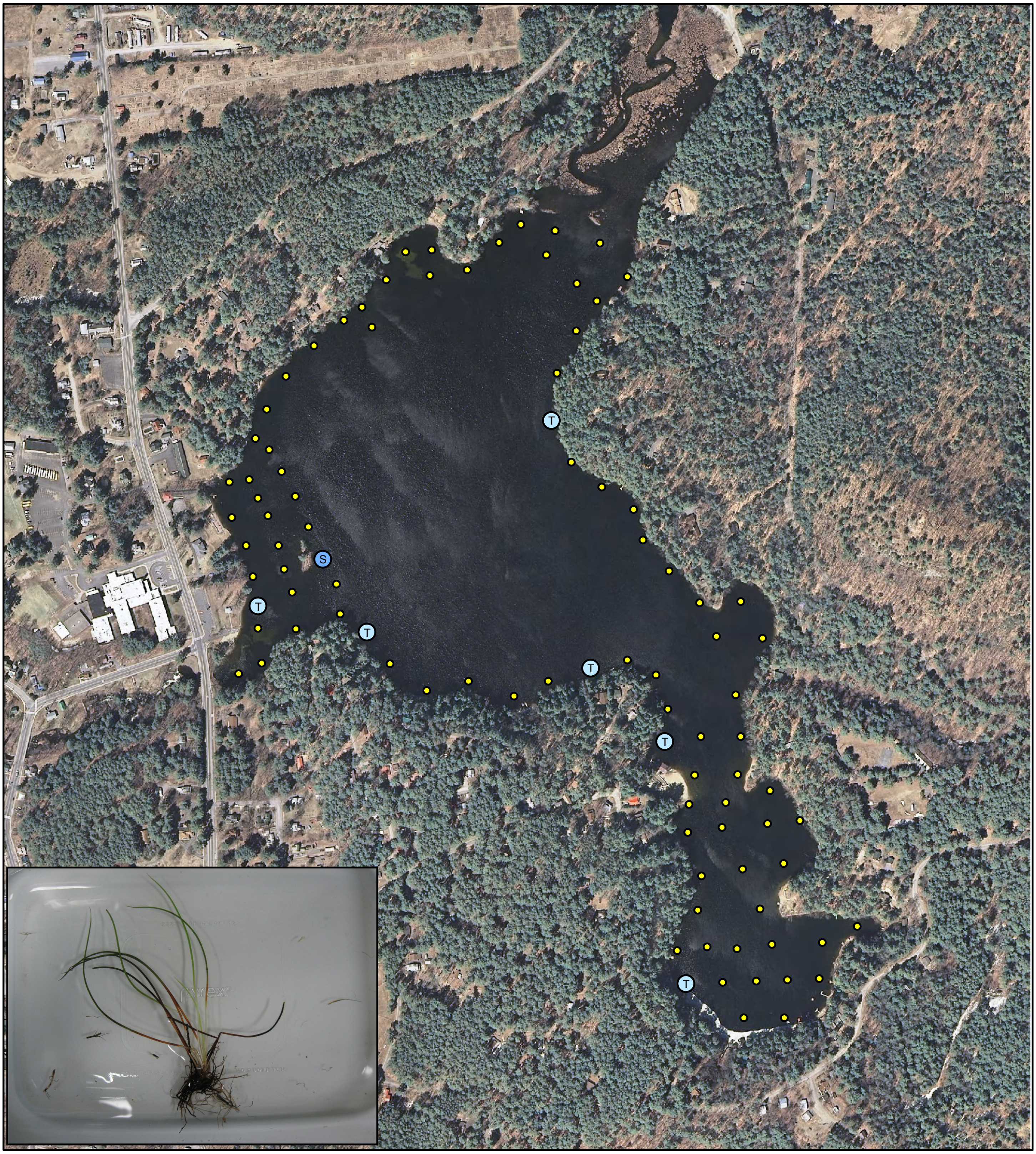
0 220 440 880 Feet

Quillwort (*Isoetes* sp.) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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N

0 220 440 880
Feet

Clasping-leaf Pondweed (*Potamogeton richardsonii*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011

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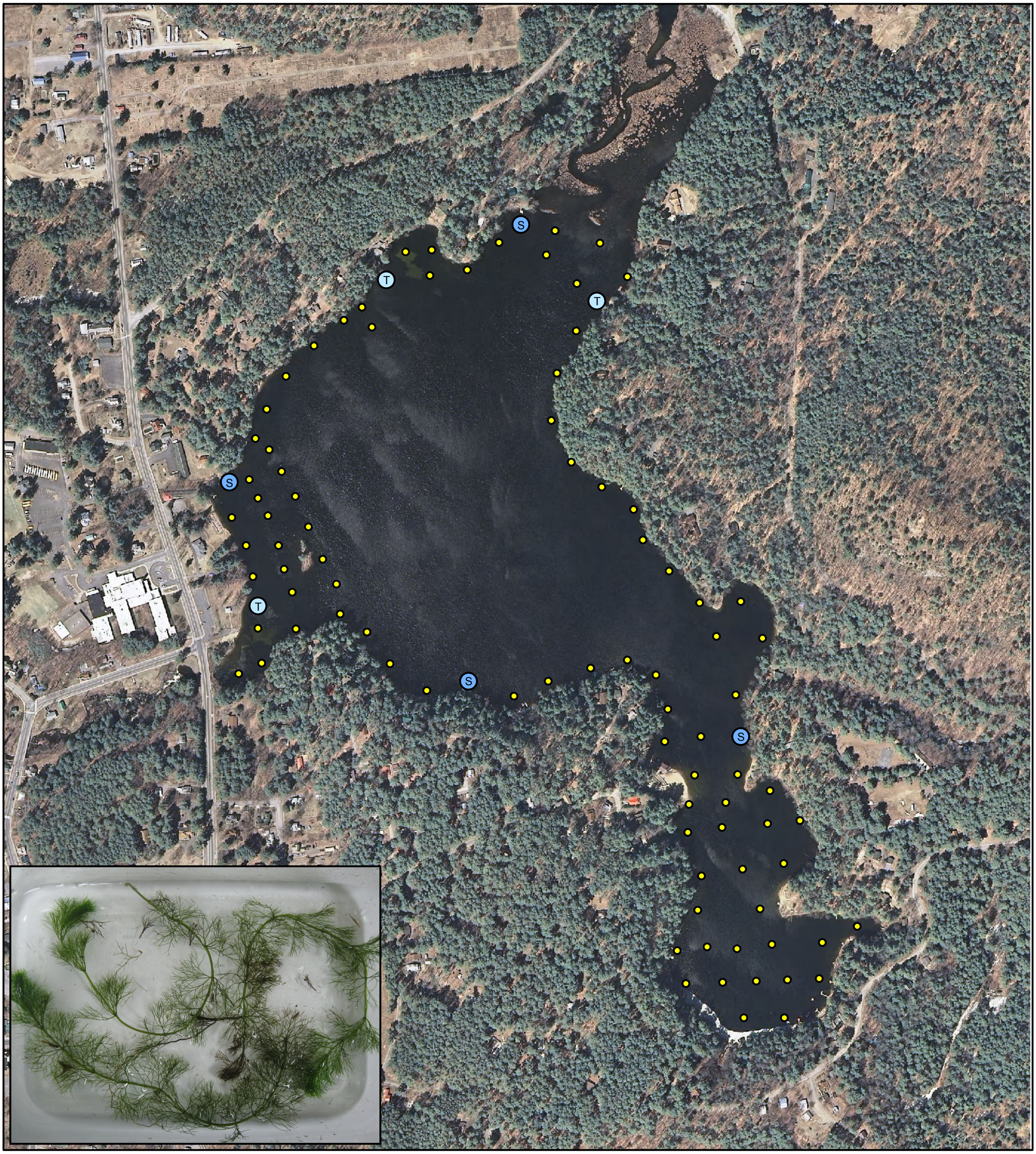
M = Medium Plants

D = Dense Plants

N

0 220 440 880 Feet

Water Marigold (*Bidens beckii*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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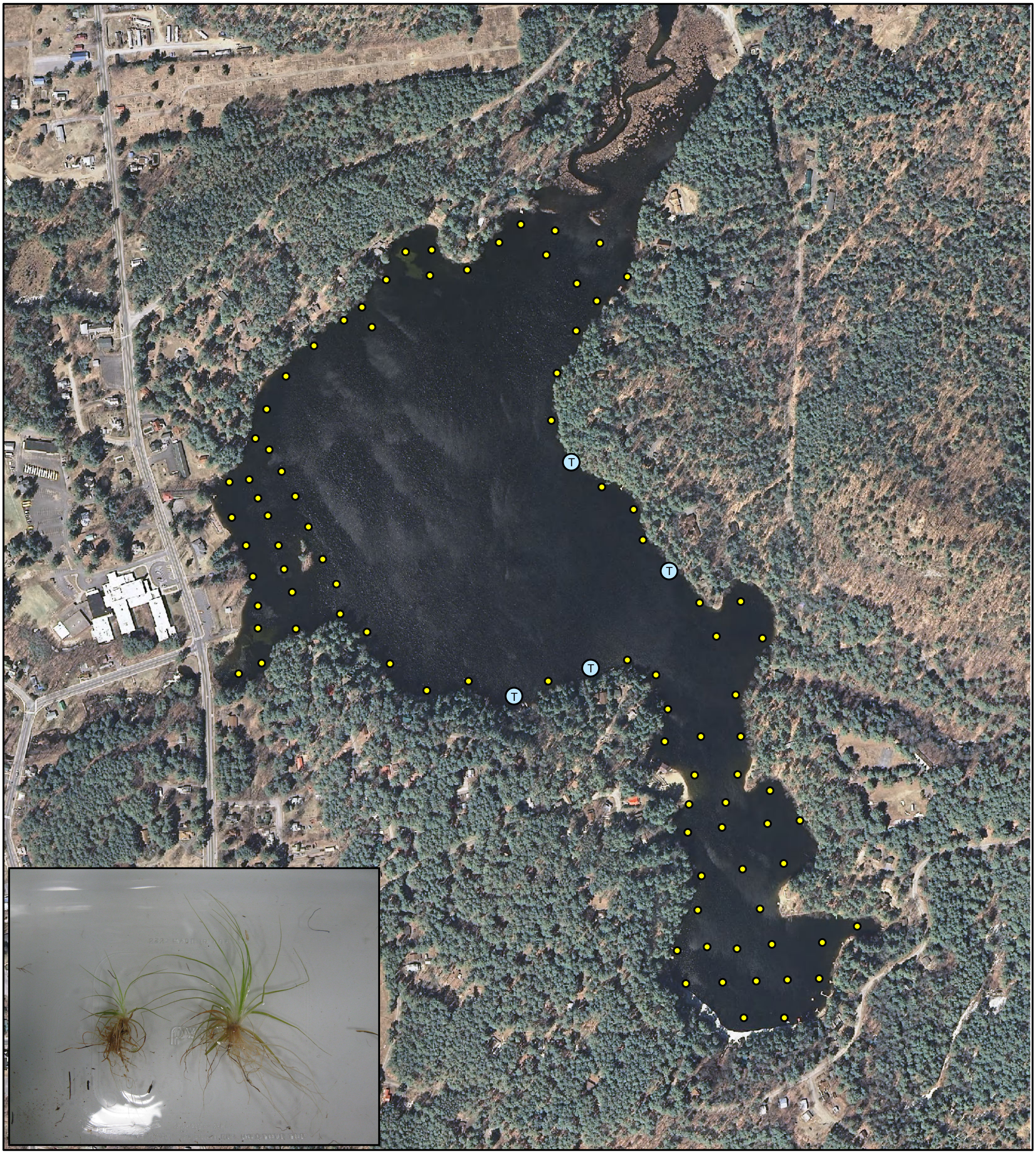
N

0 220 440 880 Feet

Pipewort (*Eriocaulon aquaticum*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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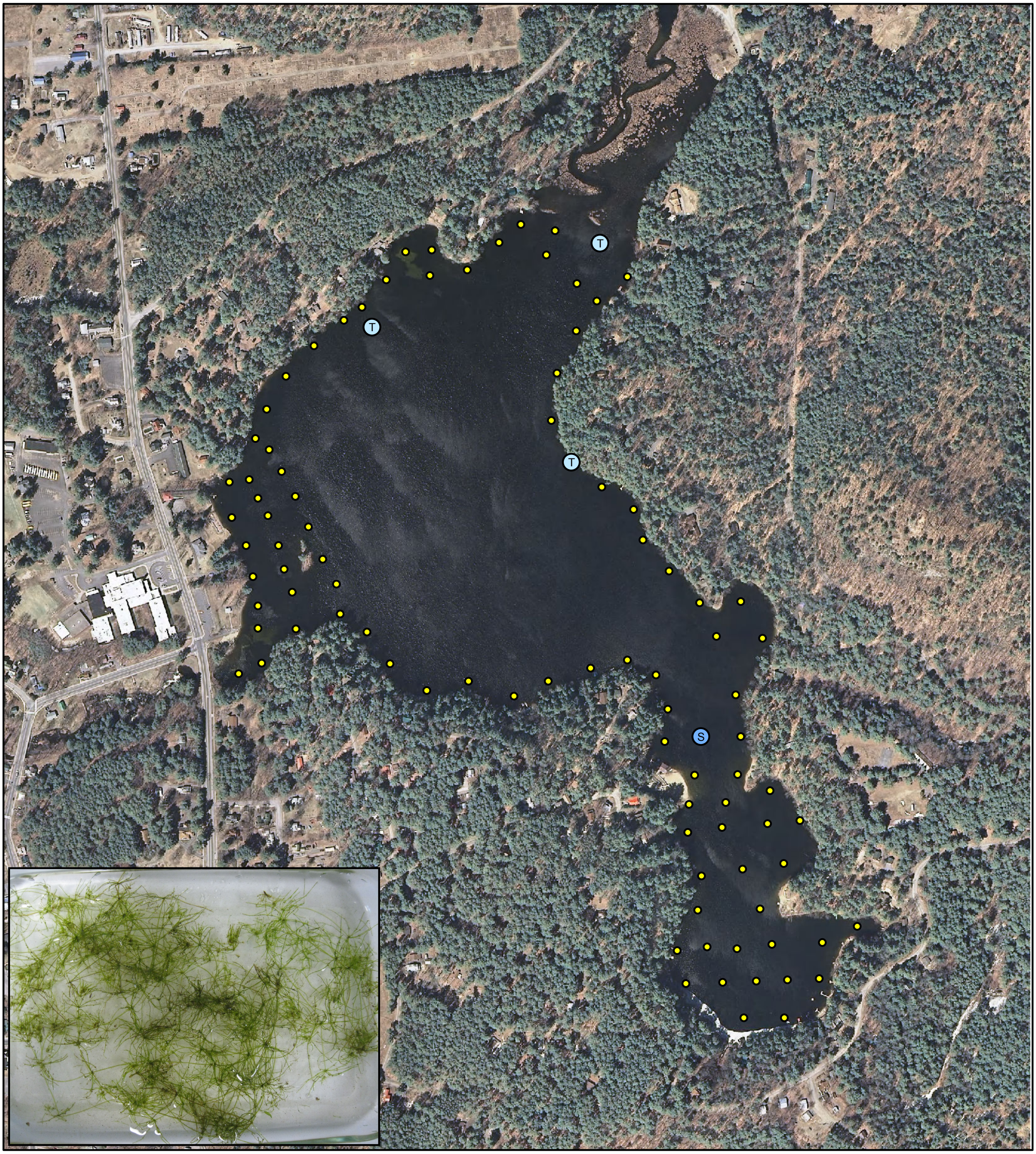
0 220 440 880
Feet

Stonewort (*Nitella* sp.) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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0 220 440 880
Feet

Low Water Milfoil (*Myriophyllum humile*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011

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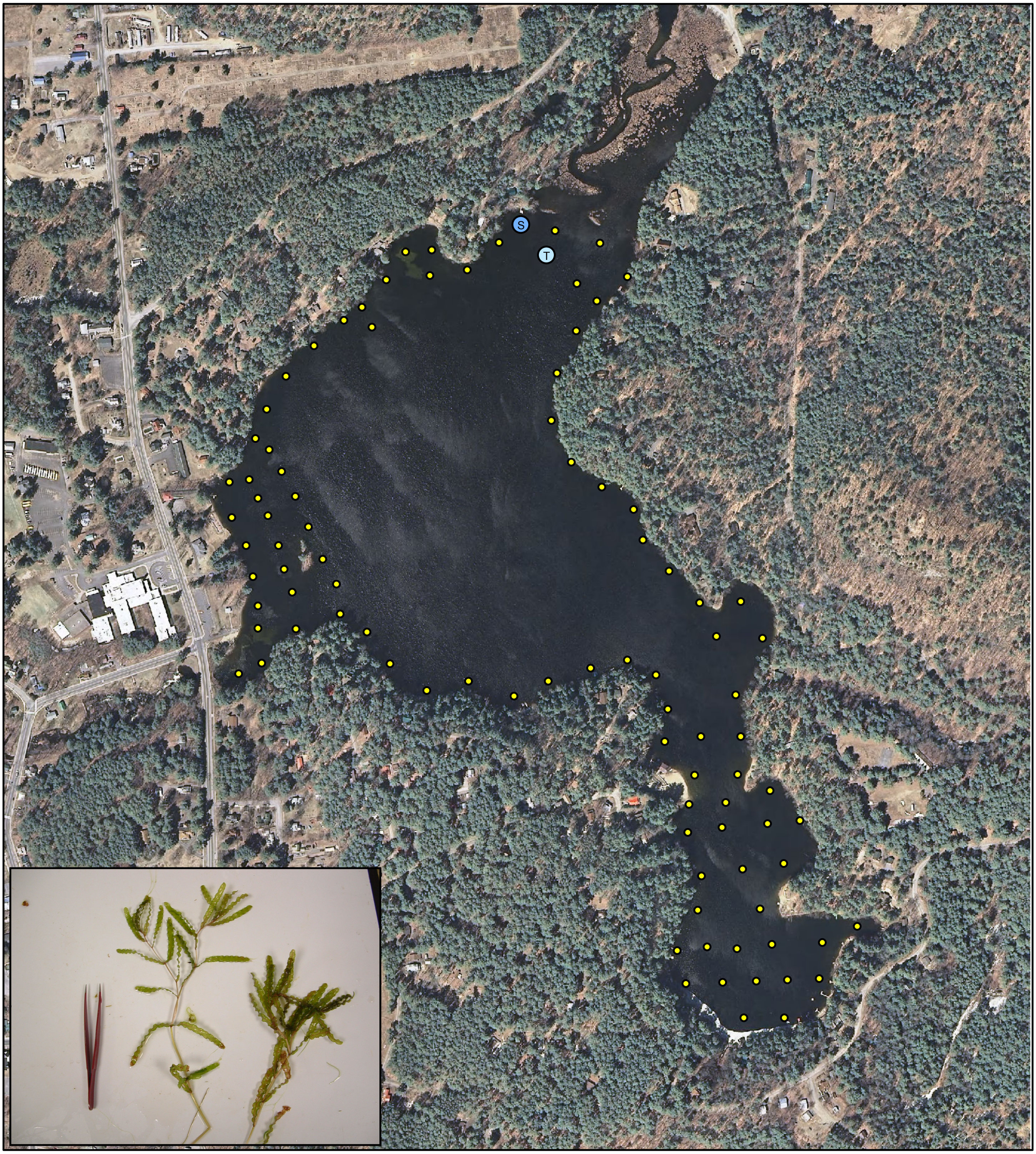
N

0 220 440 880 Feet

Curly-leaf Pondweed (*Potamogeton crispus*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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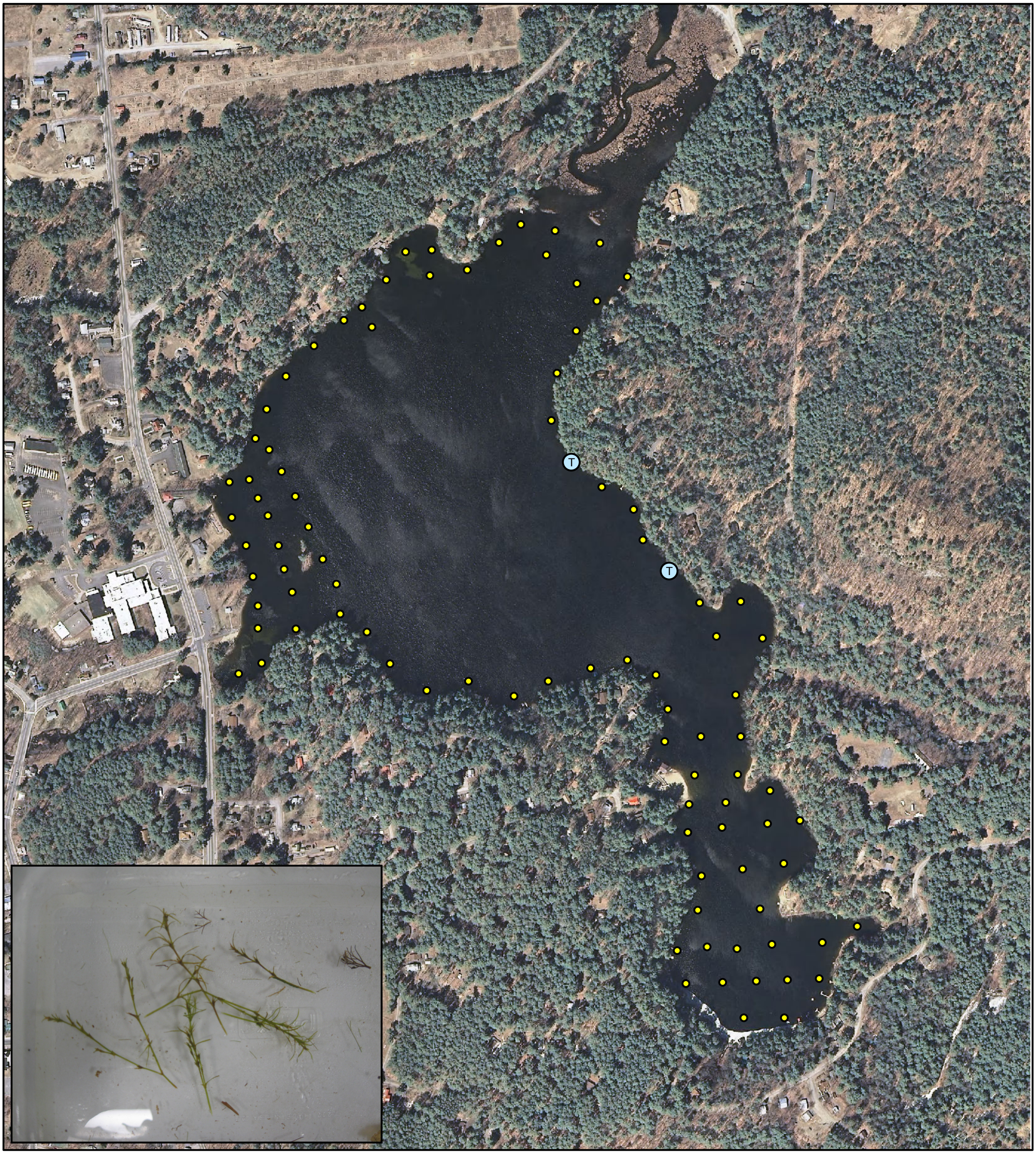
N

0 220 440 880 Feet

Southern Naiad (*Najas guadalupensis*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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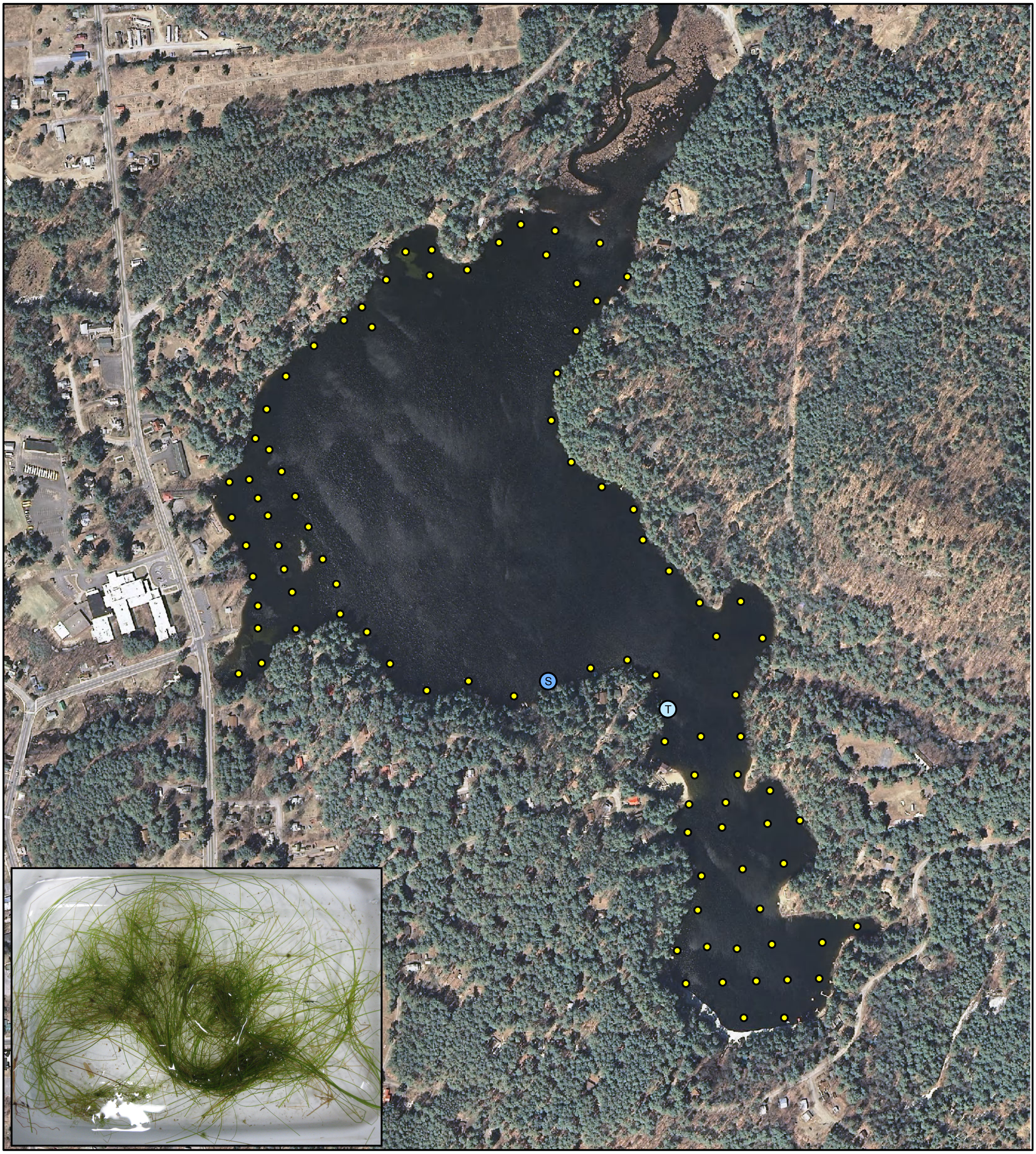
N

0 220 440 880 Feet

Water Bulrush (*Scirpus subterminalis*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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- S = Sparse Plants
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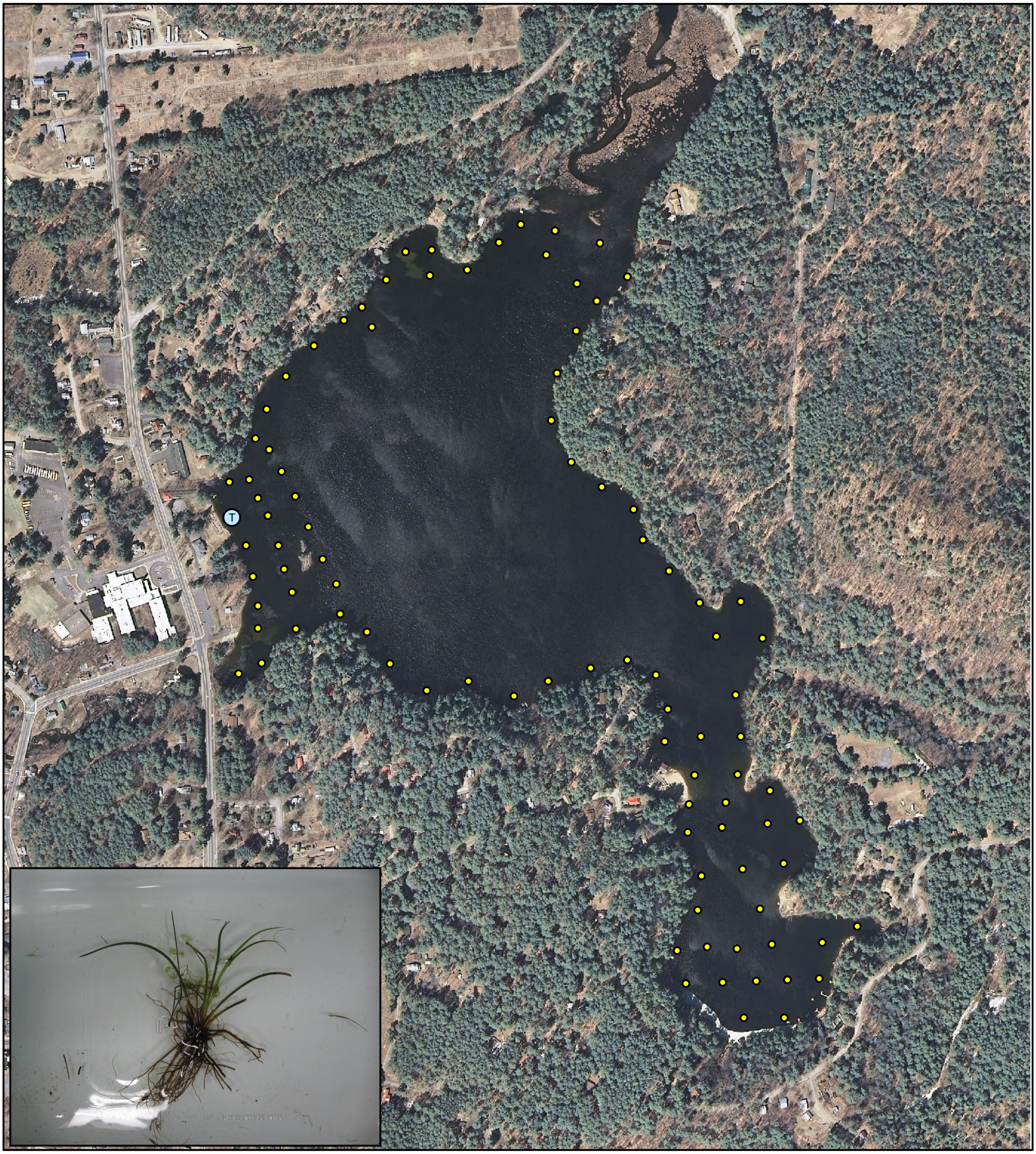
- D = Dense Plants

N

0 220 440 880 Feet

Lake Quillwort (*Isoetes lacustris*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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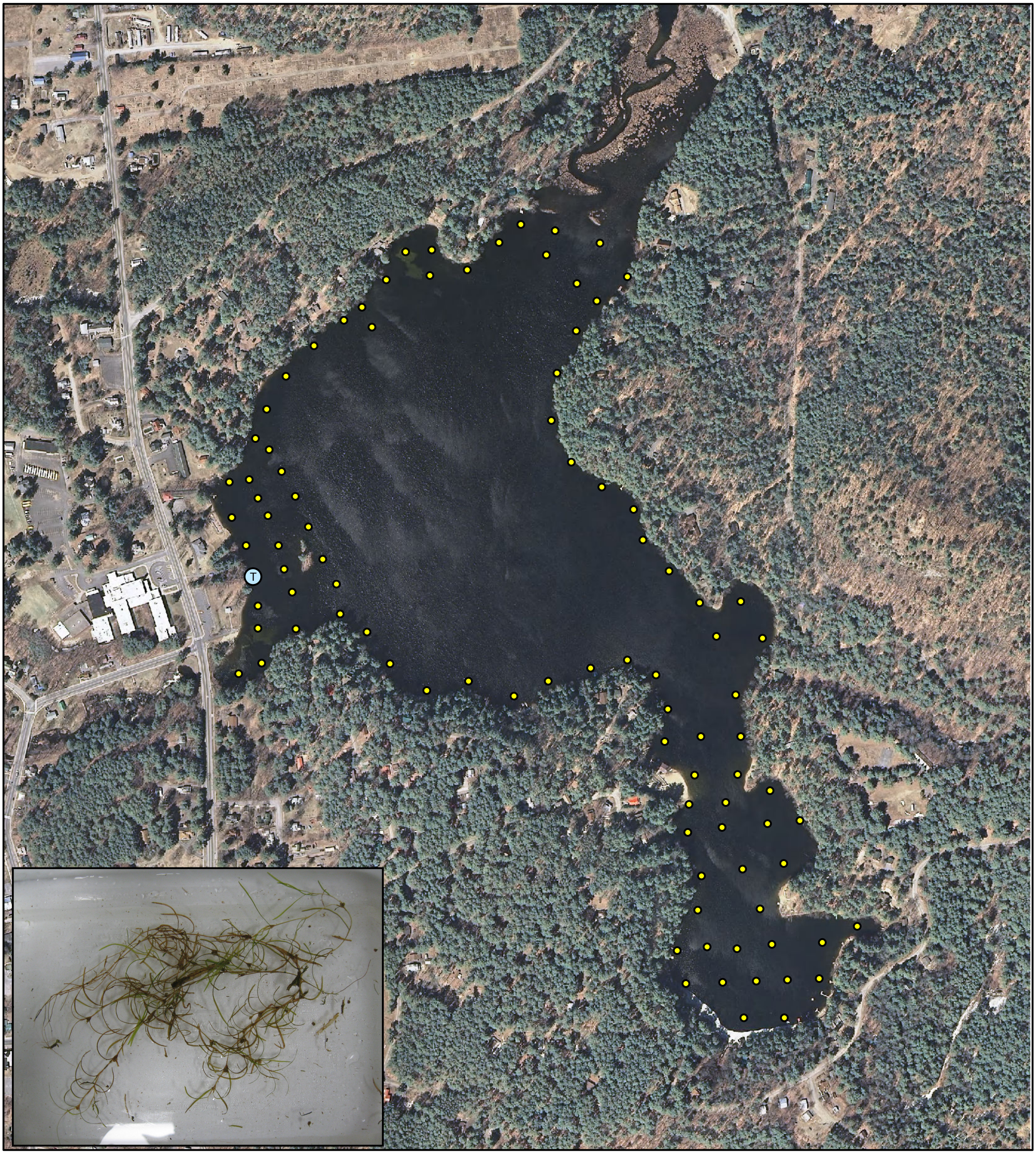
- D = Dense Plants

N

0 220 440 880 Feet

Spiral-fruited Pondweed (*Potamogeton spirillus*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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N

0 220 440 880 Feet

Floating-leaf Pondweed (*Potamogeton natans*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011

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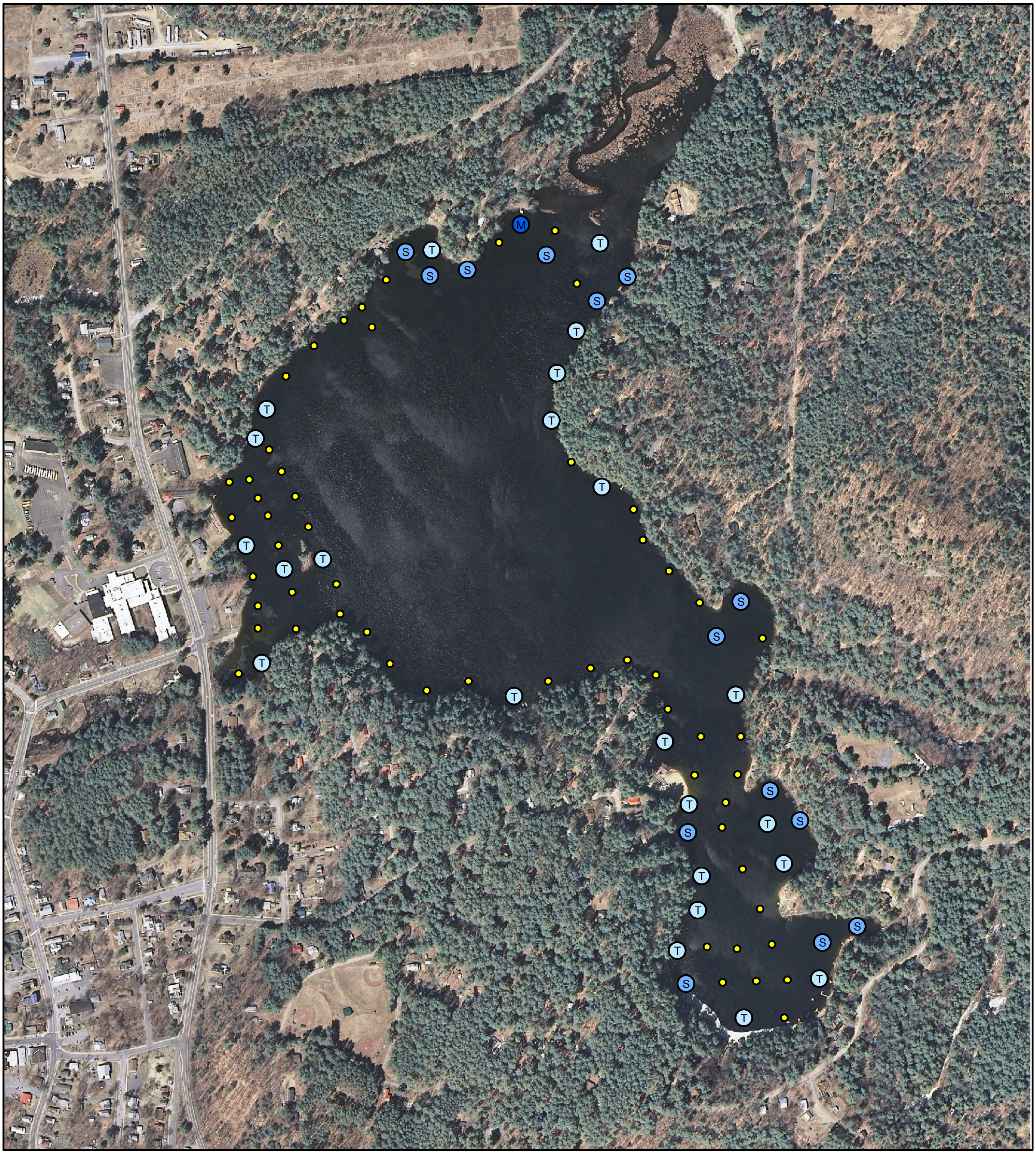
0 220 440 880 Feet

Total Floating Vegetation Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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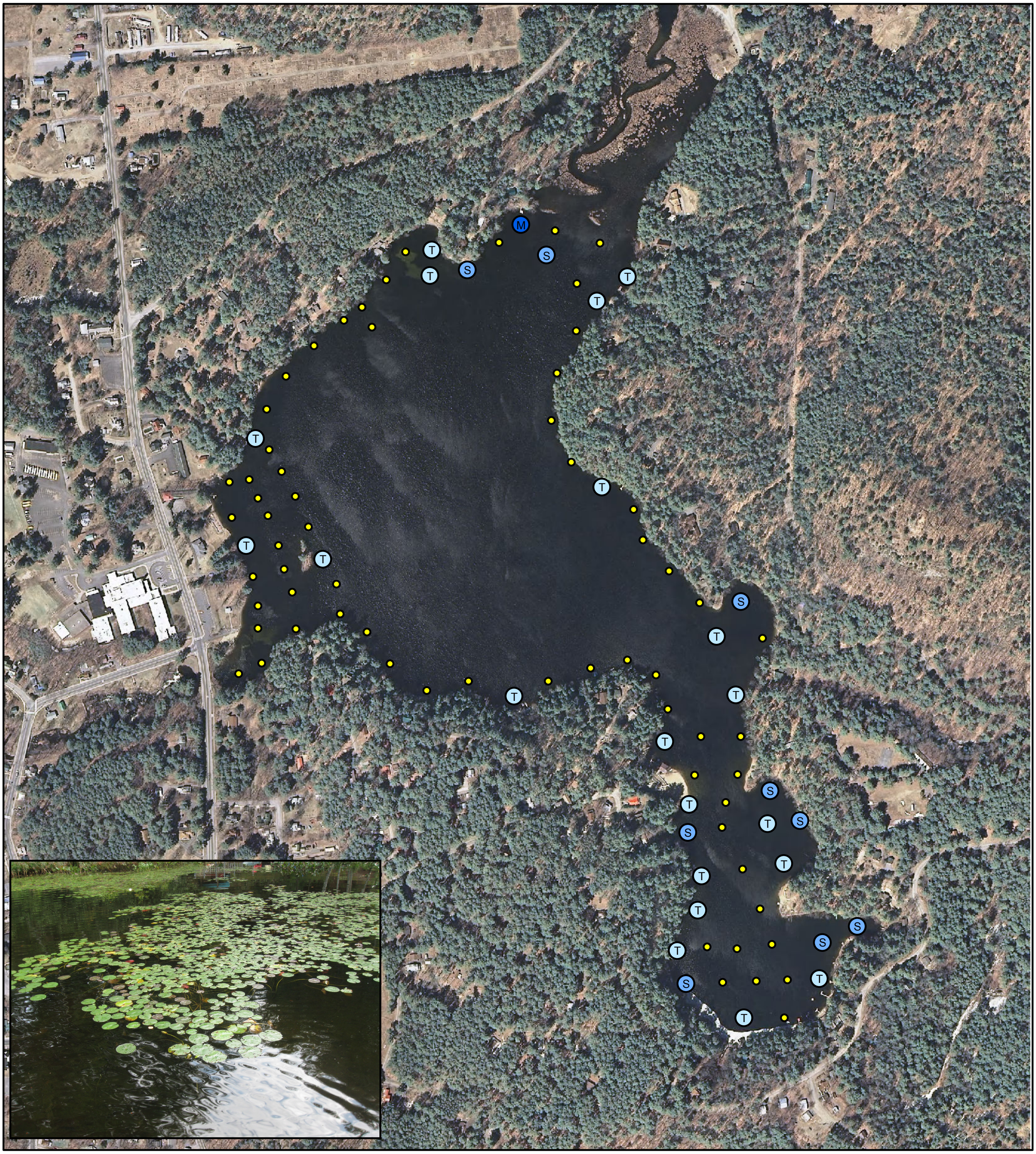
N

0 220 440 880 Feet

White Water Lily (*Nymphaea odorata*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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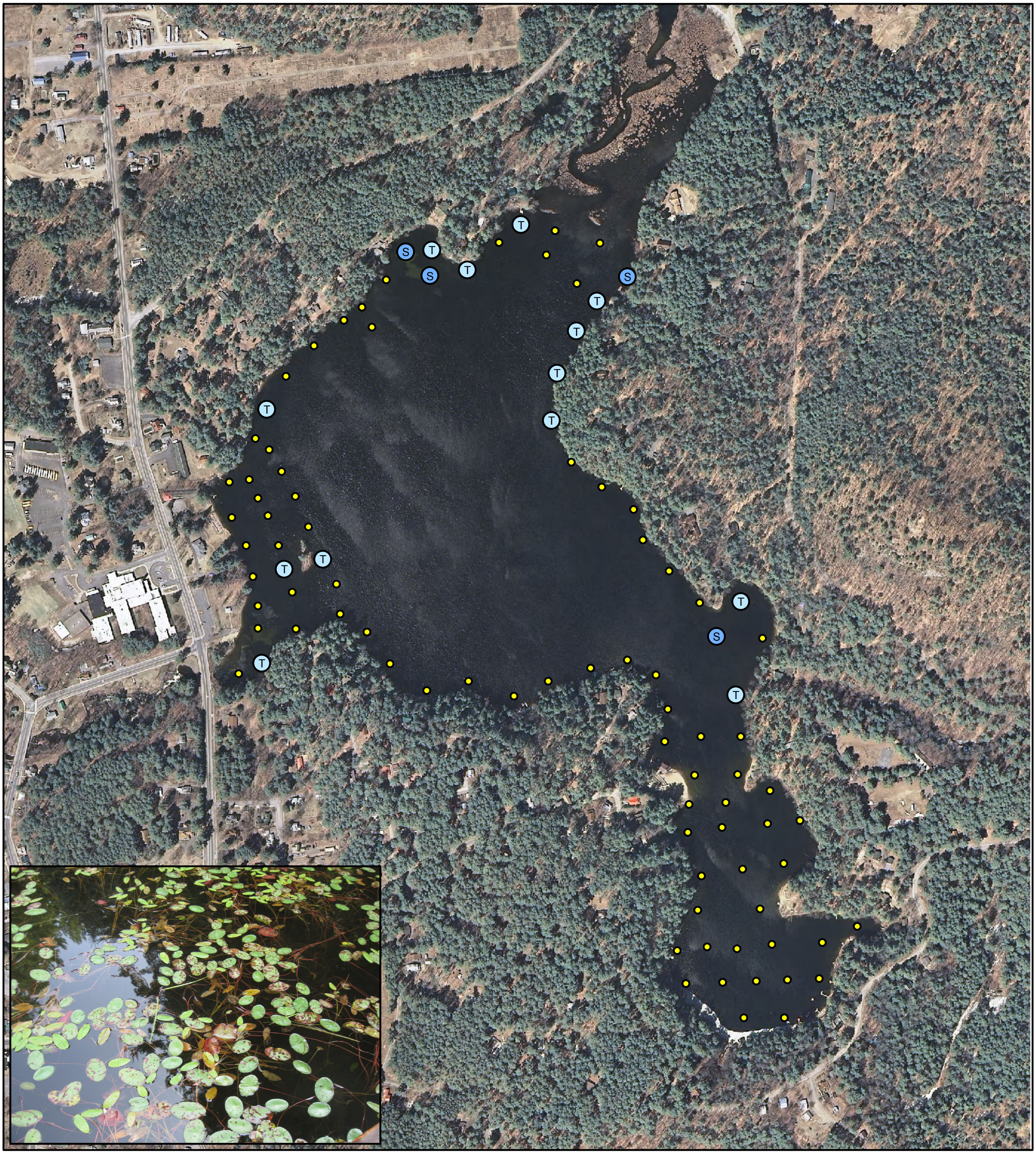
N

0 220 440 880
Feet

Watershield (*Brasenia schreberi*) Distribution
Lake Luzerne Aquatic Vegetation Survey
September 14, 2011



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0 220 440 880
Feet

Spatterdock (*Nuphar variegata*) Distribution
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September 14, 2011

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0 220 440 880 Feet

N

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Small Duckweed (*Lemna minor*) Distribution
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N

0 220 440 880
Feet

Submersed Aquatic Plant Density

Trace

Medium

Sparse

Dense

Allied Biological

Floating Aquatic Plant Density

Trace

Medium

Sparse

Dense

Allied Biological

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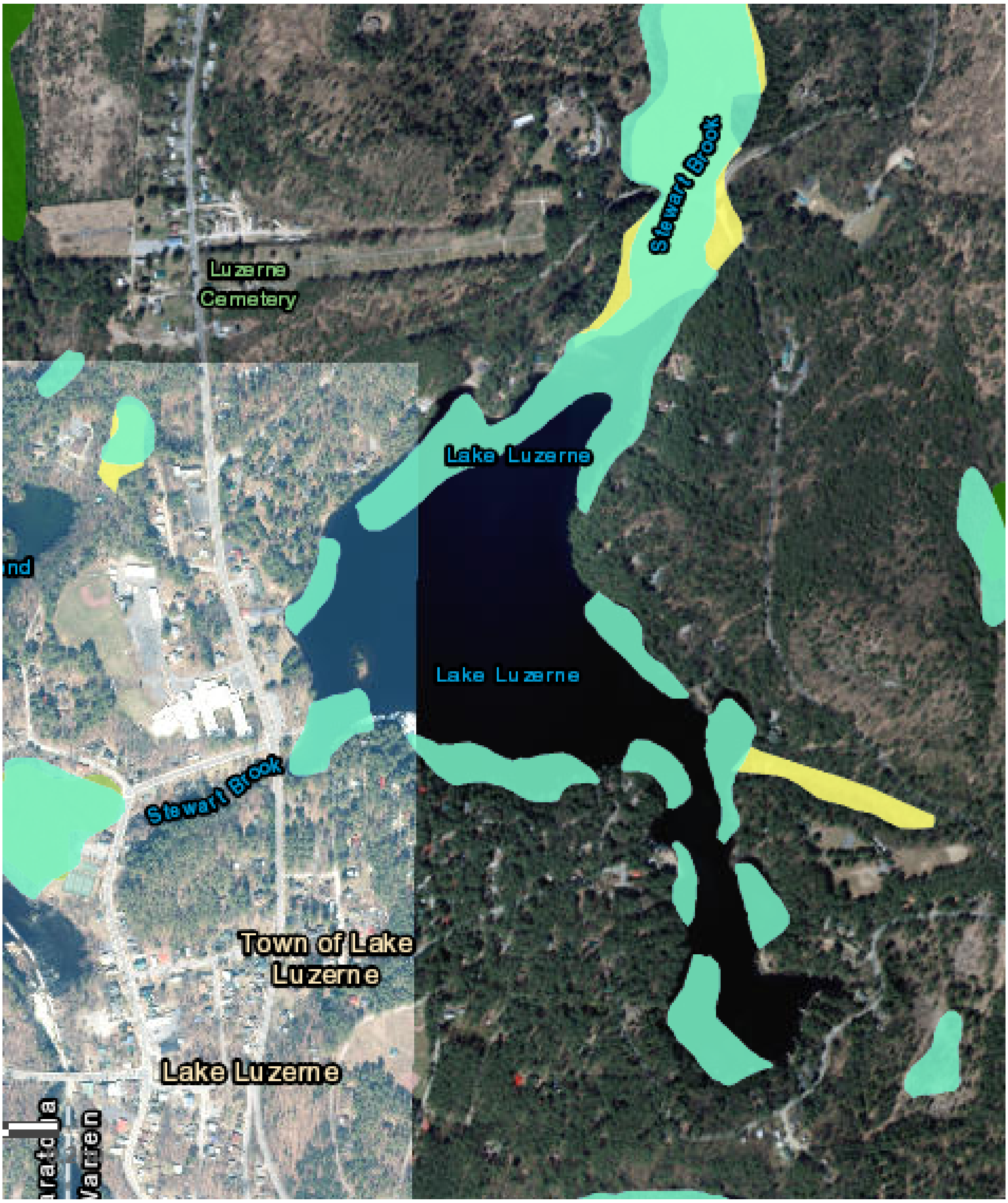
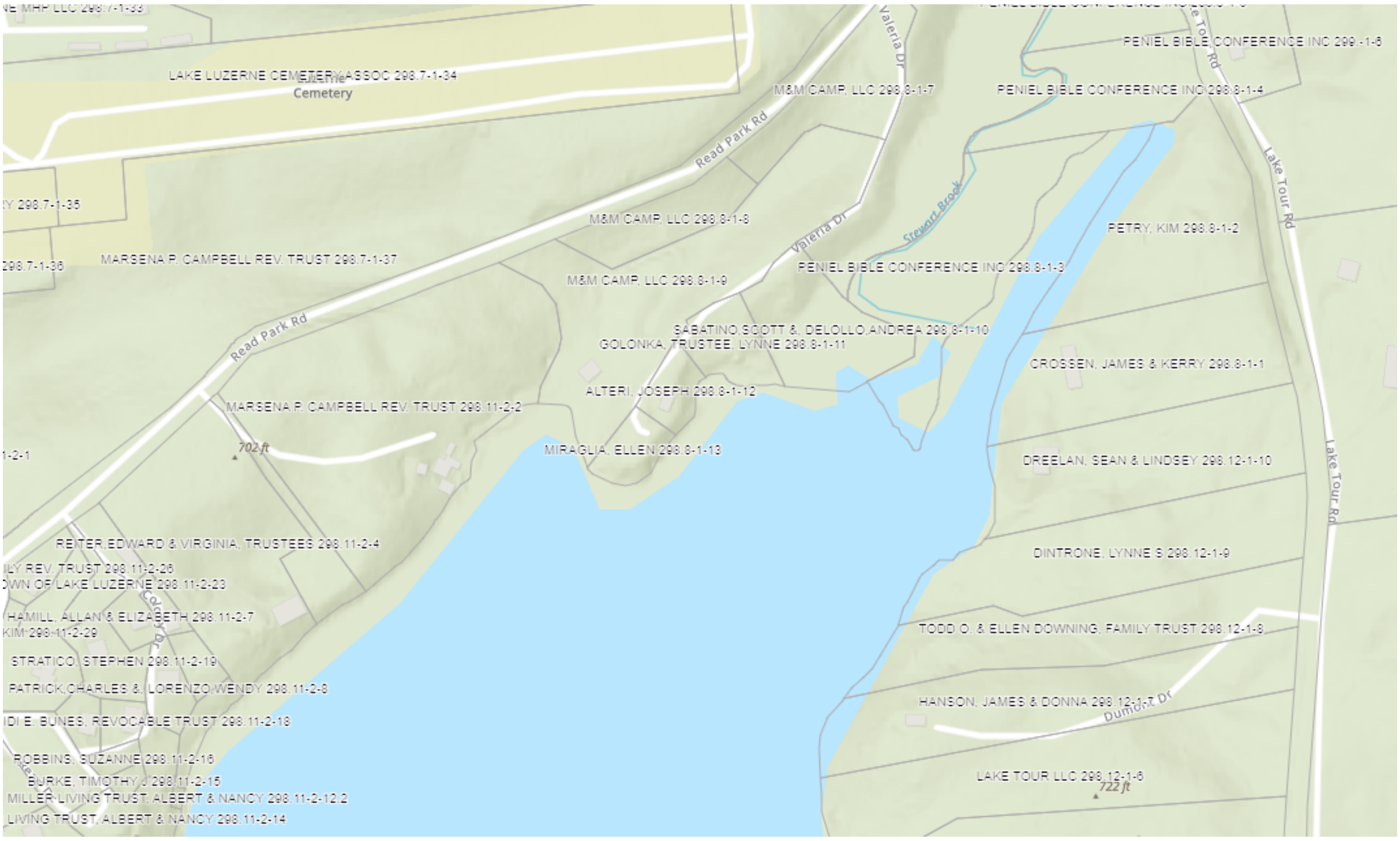
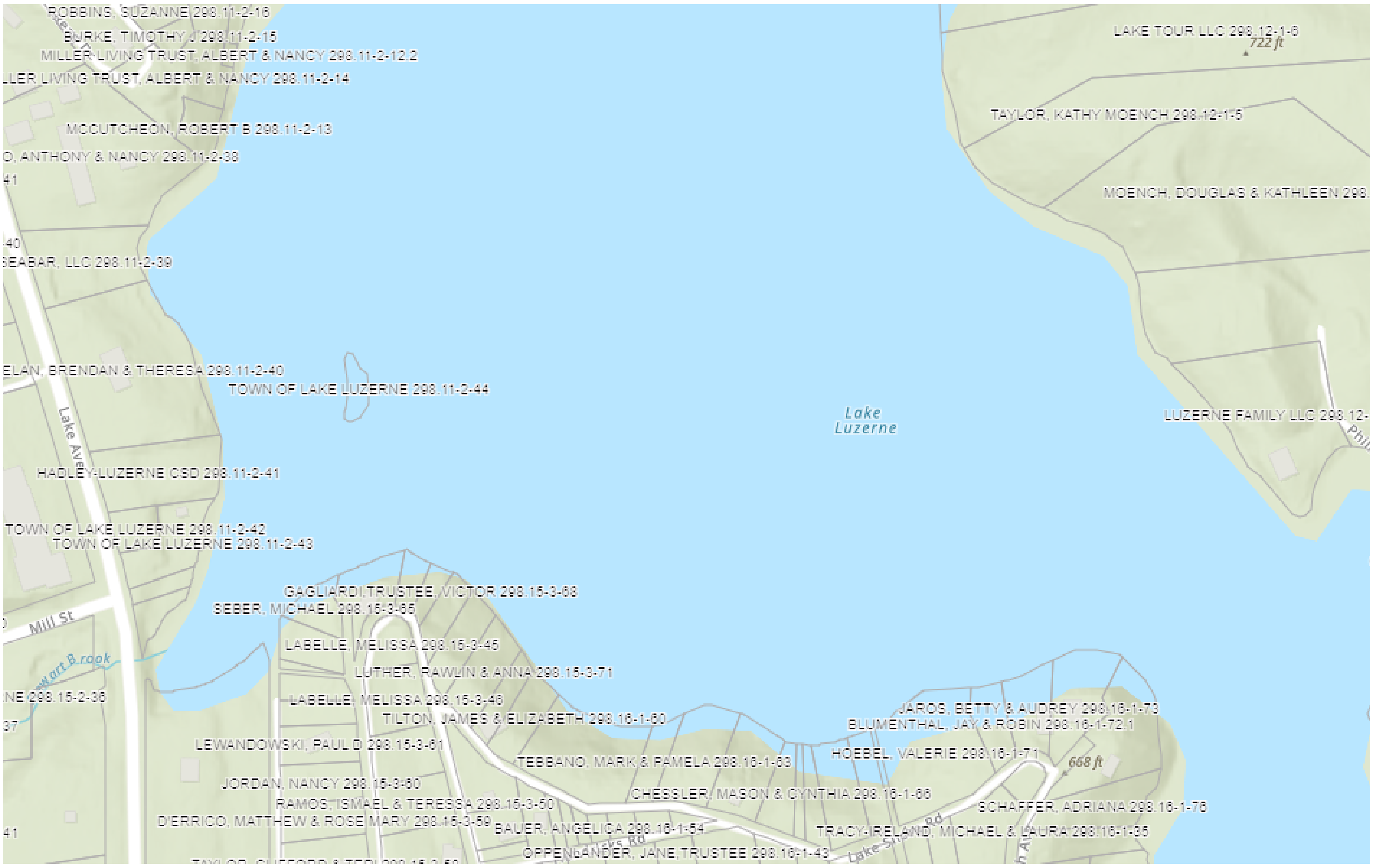
Date: March 10, 2023

Lake Luzerne map of APA wetland areas



Lake Luzerne Tax parcels maps





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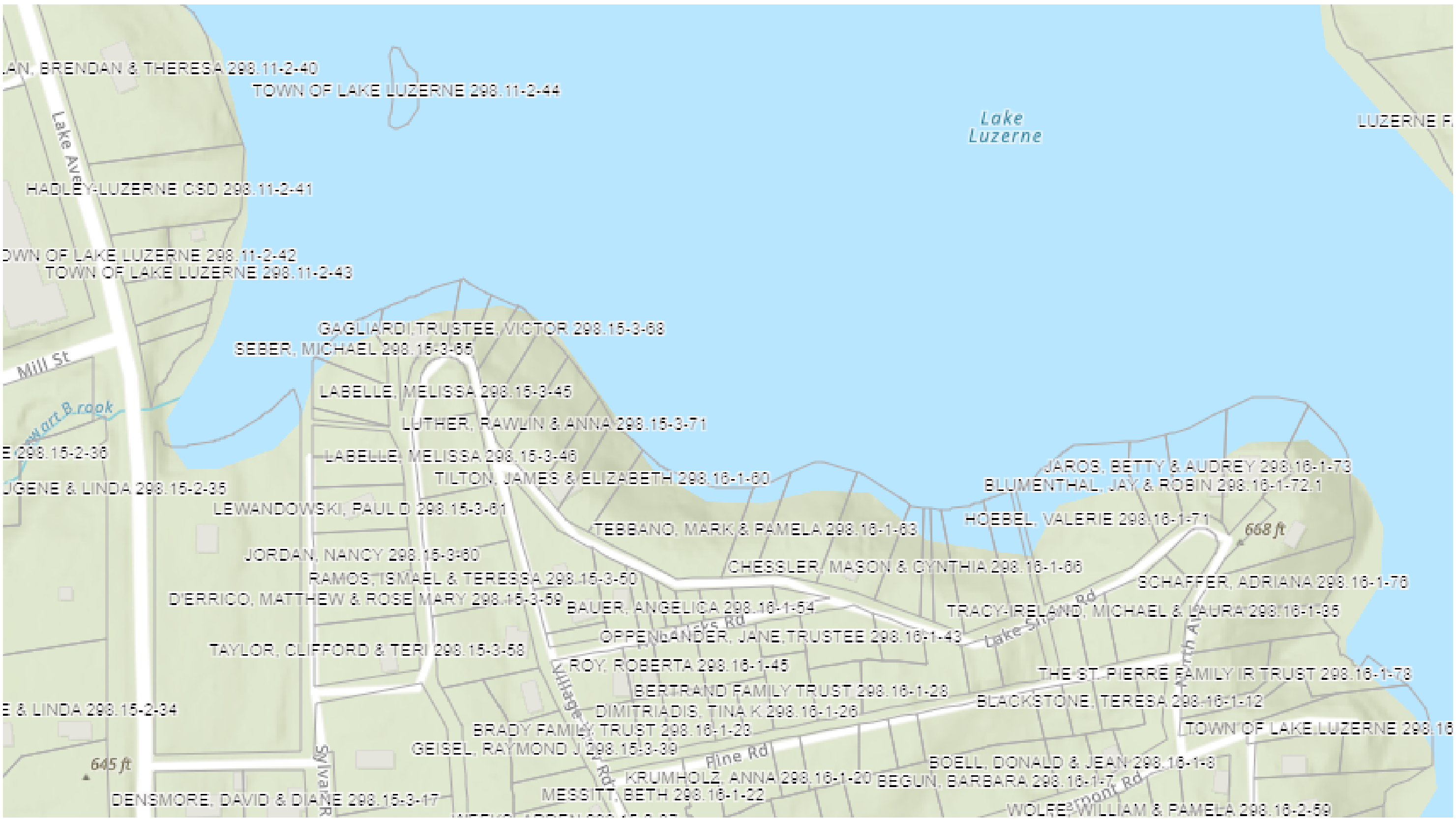
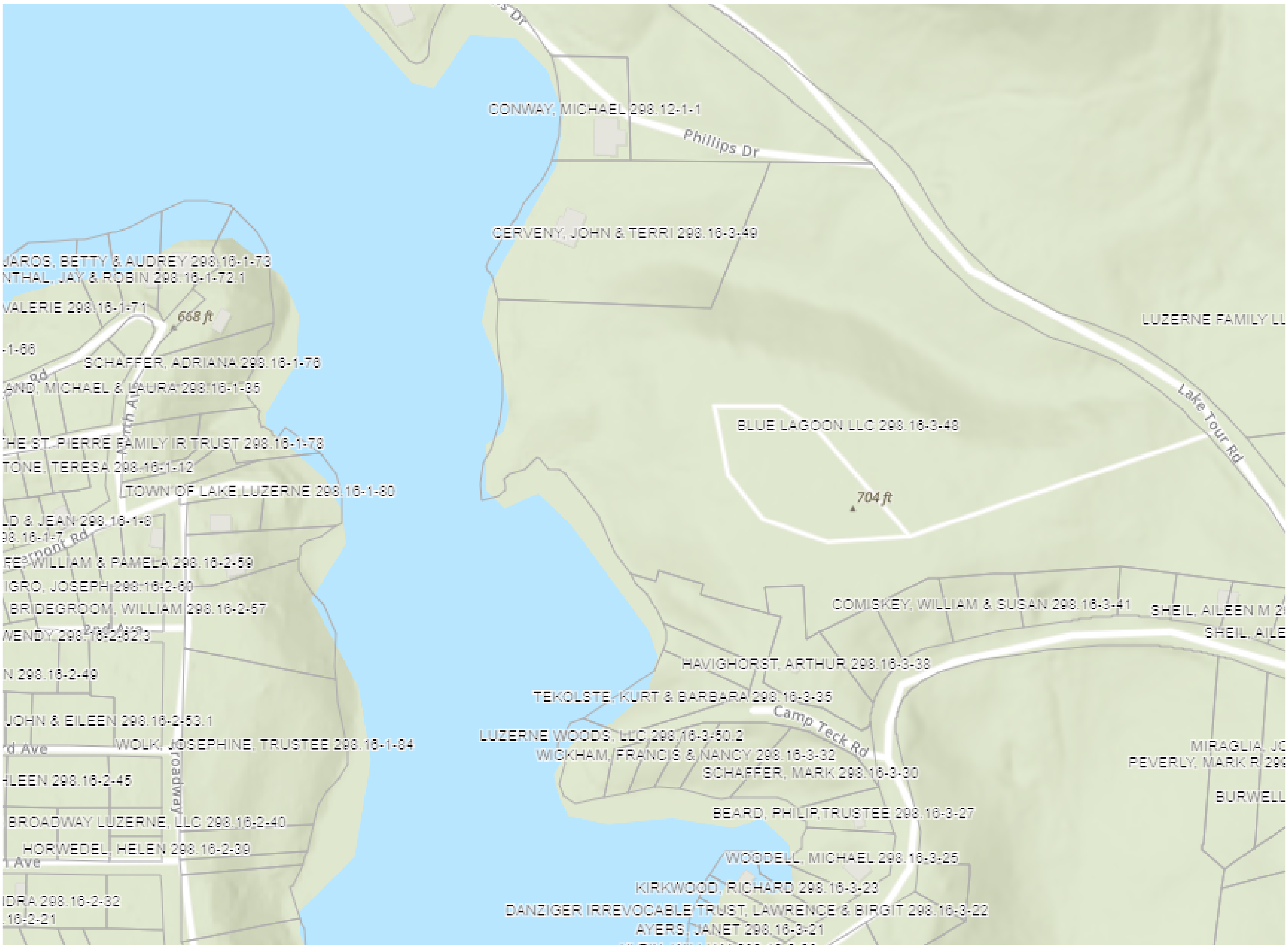
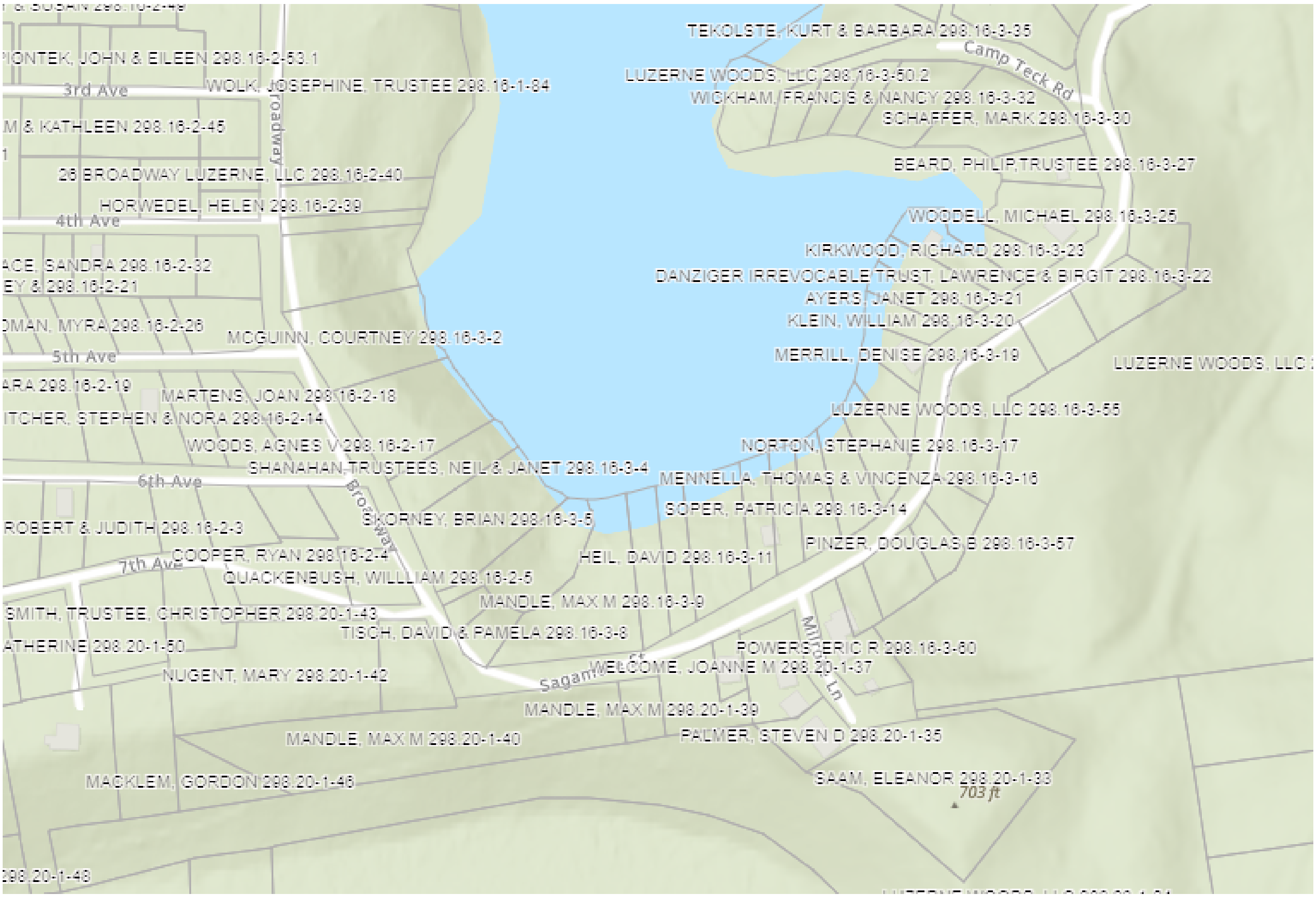
RECEIVED
Date: March 10, 2023

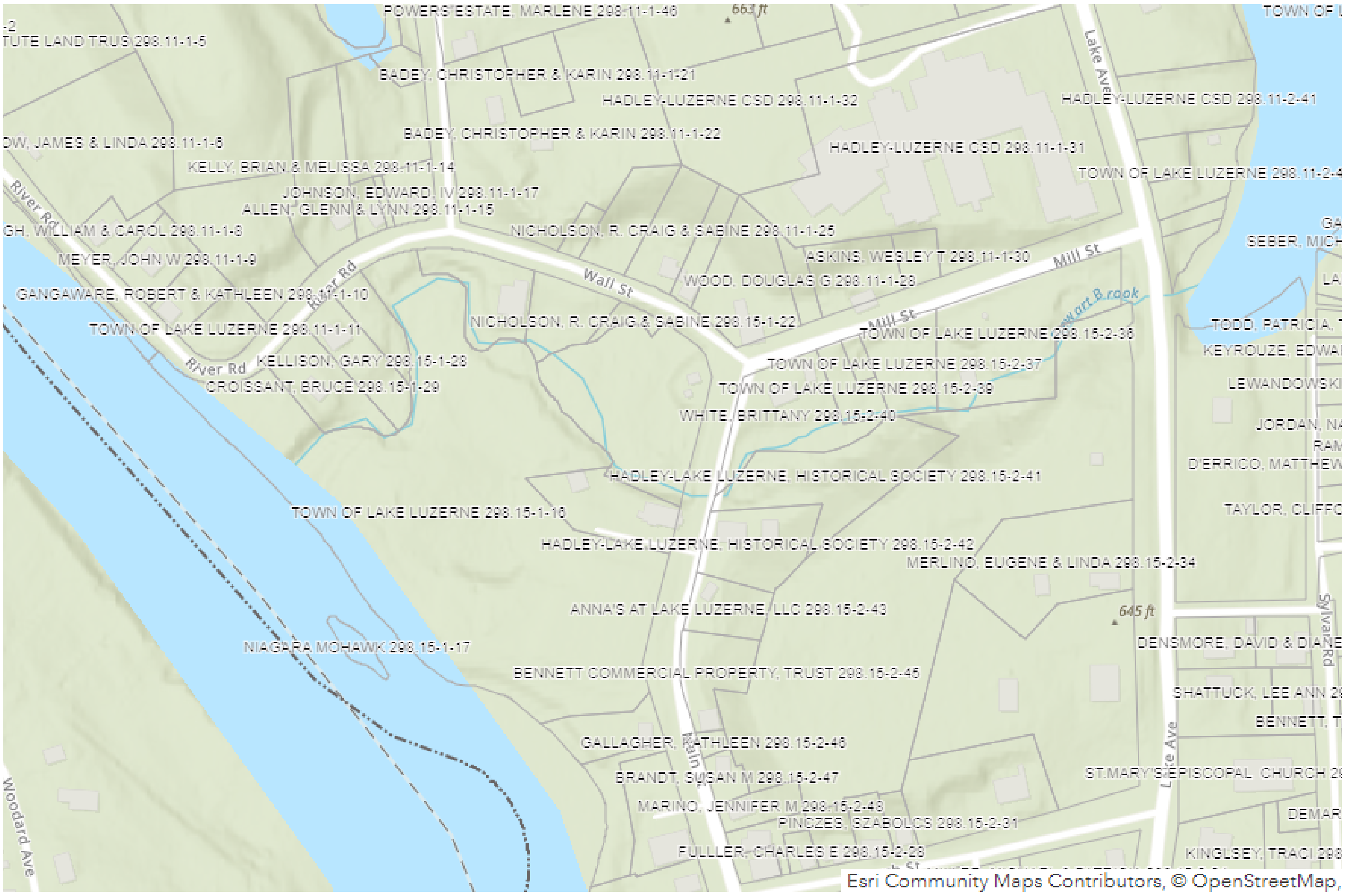


AN, BRENDAN & THERESA 298.11-2-40
TOWN OF LAKE LUZERNE 298.11-2-44
Lake Luzerne
LUZERNE F
Lake Ave
HADLEY-LUZERNE CSD 298.11-2-41
OWN OF LAKE LUZERNE 298.11-2-42
TOWN OF LAKE LUZERNE 298.11-2-43
GAGLIARDI,TRUSTEE, VICTOR 298.15-3-68
SEBER, MICHAEL 298.15-3-65
Mill St
LABELLE, MELISSA 298.15-3-45
LUTHER, RAWLIN & ANNA 298.15-3-71
E 298.15-2-36
LABELLE, MELISSA 298.15-3-46
JAROS, BETTY & AUDREY 298.16-1-73
UGENE & LINDA 298.15-2-35
TILTON, JAMES & ELIZABETH 298.16-1-60
BLUMENTHAL, JAY & ROBIN 298.16-1-72.1
LEWANDOWSKI, PAUL D 298.15-3-61
HOEBEL, VALERIE 298.16-1-71
668 ft
TEBBANO, MARK & PAMELA 298.16-1-63
JORDAN, NANCY 298.15-3-60
CHESSLER, MASON & CYNTHIA 298.16-1-66
RAMOS, ISMAEL & TERESSA 298.15-3-50
SCHAFFER, ADRIANA 298.16-1-76
D'ERRICO, MATTHEW & ROSE MARY 298.15-3-59
BAUER, ANGELICA 298.16-1-54
TRACY-IRELAND, MICHAEL & LAURA 298.16-1-35
OFFENLANDER, JANE,TRUSTEE 298.16-1-43
Lake Shore Rd
TAYLOR, CLIFFORD & TERI 298.15-3-58
ROY, ROBERTA 298.16-1-45
THE ST. PIERRE FAMILY IR TRUST 298.16-1-78
BERTRAND FAMILY TRUST 298.16-1-28
BLACKSTONE, TERESA 298.16-1-12
E & LINDA 298.15-2-34
DIMITRIADIS, TINA K 298.16-1-26
BRADY FAMILY TRUST 298.16-1-23
TOWN OF LAKE LUZERNE 298.16
GEISEL, RAYMOND J 298.15-3-39
Pine Rd
645 ft
BOELL, DONALD & JEAN 298.16-1-8
KRUMHOLZ, ANNA 298.16-1-20
BEGUN, BARBARA 298.16-1-7
DENSMORE, DAVID & DIANE 298.15-3-17
MESSITT, BETH 298.16-1-22
WOLFE, WILLIAM & PAMELA 298.16-2-59



CONWAY, MICHAEL 298.12-1-1
Phillips Dr
CERVENY, JOHN & TERRI 298.16-3-49
JAROS, BETTY & AUDREY 298.16-1-73
NTHAL, JAY & ROBIN 298.16-1-72.1
VALERIE 298.16-1-71
668 ft
LUZERNE FAMILY LL
SCHAFFER, ADRIANA 298.16-1-76
AND, MICHAEL & LAURA 298.16-1-35
Lake Tour Rd
BLUE LAGOON LLC 298.16-3-48
THE ST. PIERRE FAMILY IR TRUST 298.16-1-78
TONE, TERESA 298.16-1-12
TOWN OF LAKE LUZERNE 298.16-1-80
704 ft
LD & JEAN 298.16-1-8
98.16-1-7
FE, WILLIAM & PAMELA 298.16-2-59
IGRO, JOSEPH 298.16-2-60
BRIDEGROOM, WILLIAM 298.16-2-57
COMISKEY, WILLIAM & SUSAN 298.16-3-41
SHEIL, AILEEN M 2
SHEIL, AILE
WENDY 298.16-2-52.3
HAVIGHORST, ARTHUR 298.16-3-38
N 298.16-2-49
TEKOLSTE, KURT & BARBARA 298.16-3-35
JOHN & EILEEN 298.16-2-53.1
Camp Teck Rd
WOLK, JOSEPHINE, TRUSTEE 298.16-1-84
LUZERNE WOODS, LLC 298.16-3-50.2
MIRAGLIA, JO
WICKHAM, FRANCIS & NANCY 298.16-3-32
PEVERLY, MARK R 29
SCHAFFER, MARK 298.16-3-30
HLEEN 298.16-2-45
BURWELL
BEARD, PHILIP,TRUSTEE 298.16-3-27
BROADWAY LUZERNE, LLC 298.16-2-40
HORWEDEL, HELEN 298.16-2-39
WOODELL, MICHAEL 298.16-3-25
KIRKWOOD, RICHARD 298.16-3-23
IDRA 298.16-2-32
16-2-21
DANZIGER IRREVOCABLE TRUST, LAWRENCE & BIRGIT 298.16-3-22
AYERS, JANET 298.16-3-21


TEKOLSTE, KURT & BARBARA 298.16-3-35
PIONTEK, JOHN & EILEEN 298.16-2-53.1
Camp Teck Rd
LUZERNE WOODS, LLC 298.16-3-50.2
3rd Ave
WOLK, JOSEPHINE, TRUSTEE 298.16-1-84
WICKHAM, FRANCIS & NANCY 298.16-3-32
SCHAFFER, MARK 298.16-3-30
M & KATHLEEN 298.16-2-45
Broadway
26 BROADWAY LUZERNE, LLC 298.16-2-40
BEARD, PHILIP,TRUSTEE 298.16-3-27
HORWEDEL, HELEN 298.16-2-39
4th Ave
WODDELL, MICHAEL 298.16-3-25
ACE, SANDRA 298.16-2-32
KIRKWOOD, RICHARD 298.16-3-23
EY & 298.16-2-21
DANZIGER IRREVOCABLE TRUST, LAWRENCE & BIRGIT 298.16-3-22
AYERS, JANET 298.16-3-21
OMAN, MYRA 298.16-2-26
KLEIN, WILLIAM 298.16-3-20
MCGUINN, COURTNEY 298.16-3-2
5th Ave
MERRILL, DENISE 298.16-3-19
ARA 298.16-2-19
MARTENS, JOAN 298.16-2-18
ITCHER, STEPHEN & NORA 298.16-2-14
LUZERNE WOODS, LLC 298.16-3-55
WOODS, AGNES V 298.16-2-17
NORTON, STEPHANIE 298.16-3-17
SHANAHAN,TRUSTEES, NEIL & JANET 298.16-3-4
6th Ave
MENNELLA, THOMAS & VINCENZA 298.16-3-16
Broadway
SOPER, PATRICIA 298.16-3-14
SKORNEY, BRIAN 298.16-3-5
ROBERT & JUDITH 298.16-2-3
PINZER, DOUGLAS B 298.16-3-57
COOPER, RYAN 298.16-2-4
7th Ave
HEIL, DAVID 298.16-3-11
QUACKENBUSH, WILLLIAM 298.16-2-5
MANDLE, MAX M 298.16-3-9
SMITH, TRUSTEE, CHRISTOPHER 298.20-1-43
Mill Ln
TISCH, DAVID & PAMELA 298.16-3-8
ATHERINE 298.20-1-50
POWERS, ERIC R 298.16-3-60
Sagamore St
WELCOME, JOANNE M 298.20-1-37
NUGENT, MARY 298.20-1-42
MANDLE, MAX M 298.20-1-39
PALMER, STEVEN D 298.20-1-35
MANDLE, MAX M 298.20-1-40
MACKLEM, GORDON 298.20-1-46
SAAM, ELEANOR 298.20-1-33
703 ft
298.20-1-48


POWERS ESTATE, MARLENE 298.11-1-46
663 ft
TOWN OF L
TUTE LAND TRUS 298.11-1-5
Lake Ave
BADEY, CHRISTOPHER & KARIN 298.11-1-21
HADLEY-LUZERNE CSD 298.11-1-32
HADLEY-LUZERNE CSD 298.11-2-41
BADEY, CHRISTOPHER & KARIN 298.11-1-22
OW, JAMES & LINDA 298.11-1-6
HADLEY-LUZERNE CSD 298.11-1-31
KELLY, BRIAN & MELISSA 298.11-1-14
TOWN OF LAKE LUZERNE 298.11-2-4
River Rd
JOHNSON, EDWARD, IV 298.11-1-17
ALLEN, GLENN & LYNN 298.11-1-15
GH, WILLIAM & CAROL 298.11-1-8
NICHOLSON, R. CRAIG & SABINE 298.11-1-25
SEBER, MIC
MEYER, JOHN W 298.11-1-9
ASKINS, WESLEY T 298.11-1-30
Mill St
River Rd
Wall St
WOOD, DOUGLAS G 298.11-1-28
GANGAWARE, ROBERT & KATHLEEN 298.11-1-10
Stewart Brook
NICHOLSON, R. CRAIG & SABINE 298.15-1-22
Mill St
TODD, PATRICIA,
TOWN OF LAKE LUZERNE 298.11-1-11
TOWN OF LAKE LUZERNE 298.15-2-36
KEYROUZE, EDWA
River Rd
KELLISON, GARY 298.15-1-28
TOWN OF LAKE LUZERNE 298.15-2-37
LEWANDOWSKI
CROISSANT, BRUCE 298.15-1-29
TOWN OF LAKE LUZERNE 298.15-2-39
WHITE, BRITTANY 298.15-2-40
JORDAN, N
D'ERRICO, MATTHEW
HADLEY-LAKE LUZERNE, HISTORICAL SOCIETY 298.15-2-41
TOWN OF LAKE LUZERNE 298.15-1-16
TAYLOR, CLIFF
HADLEY-LAKE LUZERNE, HISTORICAL SOCIETY 298.15-2-42
MERLINO, EUGENE & LINDA 298.15-2-34
ANNA'S AT LAKE LUZERNE, LLC 298.15-2-43
645 ft
Sylvan Rd
DENSMORE, DAVID & DIANE
NIAGARA MOHAWK 298.15-1-17
BENNETT COMMERCIAL PROPERTY, TRUST 298.15-2-45
SHATTUCK, LEE ANN
BENNETT, T
GALLAGHER, KATHLEEN 298.15-2-46
Main St
Lake Ave
BRANDT, SUSAN M 298.15-2-47
ST.MARY'S EPISCOPAL CHURCH
Woodard Ave
MARINO, JENNIFER M 298.15-2-48
DEMAR
PINCZES, SZABOLCS 298.15-2-31
FULLLER, CHARLES E 298.15-2-28
KINGLSEY, TRACI
Esri Community Maps Contributors, © OpenStreetMap,

New York State Parks, Recreation and Historic Preservation

KATHY HOCHUL
Governor

ERIK KULLESEID
Commissioner

February 15, 2023

Glenn Sullivan
Solitude Lake Management
7256 Rt. 9W
Catskill, NY 12414

Re: APA
Herbicide Application to Lake Luzerne
Town of Lake Luzerne, Warren County, NY
23PR01244

Dear Glenn Sullivan:

Thank you for requesting the comments of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the project in accordance with the New York State Historic Preservation Act of 1980 (Section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the OPRHP and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6 NYCRR Part 617).

Based upon this review, it is the opinion of OPRHP that no properties, including archaeological and/or historic resources, listed in or eligible for the New York State and National Registers of Historic Places will be impacted by this project.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Roger Daniel Mackay

R. Daniel Mackay

Deputy Commissioner for Historic Preservation
Division for Historic Preservation

rev: J. Schreyer

Town of Lake Luzerne
Regular Town Board Meeting
April 11, 2022

Resolution No. 66 of 2022
Accepting Agreement with Solitude for 2022

Resolved, Supervisor Merlino is hereby authorized to take the necessary actions to accept the Agreement with Solitude Lake Management for the total of $5,580 for survey and permitting services.

Introduced by: Councilman Lewandowski, **Seconded by:** Supervisor Merlino

In Favor: 5; Opposed: 0, carried 5/0

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

November 23, 2010

John W. Bennett, Pesticide Control Specialist
NYSDEC Region 5 Warrensburg Sub-Office
232 Golf Course Road
P.O. Box 220
Warrensburg, NY 12885-0220

Re: Annual Report – Lake Luzerne Renovate OTF Herbicide Treatment – DEC # 5-5232-00139

Dear Mr. Bennett:

Please accept the following as the Annual Report for the 2010 Aquatic Management Program at the south end of Lake Luzerne in Lake Luzerne, NY.

Project Applicant:	Town of Lake Luzerne
Applicant Spokesperson:	Robert Sherman, Lake Luzerne Aquatic Conservation Task Force (LLACT)
Applicator:	Marc Bellaud / Aquatic Control Technology, Inc. / ID# C0806081 / Bus. Reg. 07865

A summary of the 2010 chemical treatments performed at the Lake Luzerne is provided below.

2010 TREATMENT PROGRAM SUMMARY

A chronology of the management program activities performed in 2010 is provided below:

- Pre-treatment inspection 5/10
- Sequestering curtain installation (LLACT) 5/16
- Renovate OTF (triclopyr) herbicide treatment of 9.7 acres 5/17
- FasTEST analysis of triclopyr residues (LLACT) 5/18, 5/24, 5/31, 6/7, 6/21, 6/28, 9/17
- Post-treatment inspections by Aquatic Control Technology 7/15, 1014

The 2010 treatment area was finalized following a pre-treatment inspection performed by Aquatic Control Technology on May 10th. At that time active growth of Eurasian watermilfoil (*Myriophyllum spicatum)* was documented and 4-5 feet of "new" growth was observed on the milfoil plants. LLACT completed the required pre-treatment notification and the May 17th treatment date was finalized. On May 16th LLACT installed the sequestering curtain to isolate the treatment area from the rest of the lake.

The treatment was performed as scheduled on May 17th. Approximately 9.7 acres inside of the sequestering curtain were treated with Renovate OTF (EPA Reg. No. 67690-42) herbicide. A total of 920 pounds of Renovate OTF were applied.

The final application rate targeted an in-water concentration of 0.5 ppm over the milfoil beds. This was lower than the 0.75 ppm concentration was originally permitted for this project. The lower concentration was selected to further reduce impacts to non-target native species.

The treatment was performed using a granular eductor system that applies the granular herbicide in a stream of lake water that is pumped through fan-pattern spray nozzles. The system was mounted in an Airboat to avoid using a conventional gas-powered outboard motor; which are banned in Lake Luzerne. A Differential/WAAS GPS unit was used on-board the sprayboat to insure an even application of the herbicide. The herbicide was applied in under 2 hours.

The herbicide treatment was performed by Marc Bellaud (Certification No. C0806081) and Dominic Meringolo (Certification No. C0806083) of Aquatic Control Technology. The treatment was performed in accordance with the product label instructions and permit conditions.

Immediately prior to treatment water clarity was measured with a Secchi disk to be 3.8 meters. Water temperature and dissolved oxygen were checked immediately prior to treatment within the treatment area. The following readings were recorded:

Recorded on 5/17/10

Depth (m)	Temp (°C)	DO (mg/l)
Surface	17.4	8.9
1	16.5	9.0
2	16.3	9.0
3	14.7	9.6
4	13.9	9.0
5 (bottom)	13.8	---

In-lake triclopyr concentrations were monitored by LLACT following treatment to comply with APA permit requirements. A summary of the triclopyr residue sampling results and the actual laboratory reports are attached. The highest concentrations detected within the treatment area were 0.198 ppm. Within 6 weeks of the treatment, the concentration had dropped below 50 ppb within the treatment area, allowing for the sequestering curtain to be removed. The highest concentrations detected outside of the sequestering curtain were 0.002 ppm.

A post-treatment inspection was conducted by Aquatic Control Technology on July 17th. Only a few scattered floating fragments of milfoil were observed within the treatment area. No rooted milfoil was found. Several species of pondweed, bladderwort, muskgrass and even northern watermilfoil were observed. These non-target native species appeared to be actively growing and did not appear to be adversely impacted by the treatment. On October 14th, Aquatic Control Technology and SePRO performed a late-season inspection. The treatment area still appeared to be free of rooted milfoil, while robust native plant growth remained.

Comprehensive aquatic vegetation monitoring was completed by Lawrence Eichler and a report was previously provided under separate cover.

SUMMARY

The Renovate OTF herbicide spot-treatment program provided effective and highly-selective control of the targeted Eurasian watermilfoil throughout the balance of the 2010 season. The use of the sequestering curtain provided extended herbicide exposure time. This necessitated the use of a lower application rate to avoid elevated triclopyr concentrations within the treatment area. Higher concentrations may have had greater impact on non-target plants and would have extended the period of time that the sequestering curtain needed to remain in-place.

Based on the results of other Renovate OTF herbicide treatments that we have performed in the Northeast in recent years, some limited amount of milfoil regrowth should be anticipated during the 2011 season. It is hoped that the density and distribution of milfoil will be reduced enough that it can be effectively managed using non-chemical controls, namely diver hand-pulling.

Please feel free to contact us should you have any questions or require additional information.

Sincerely,

AQUATIC CONTROL TECHNOLOGY, INC.

Marc Bellaud
Senior Biologist

Enclosures

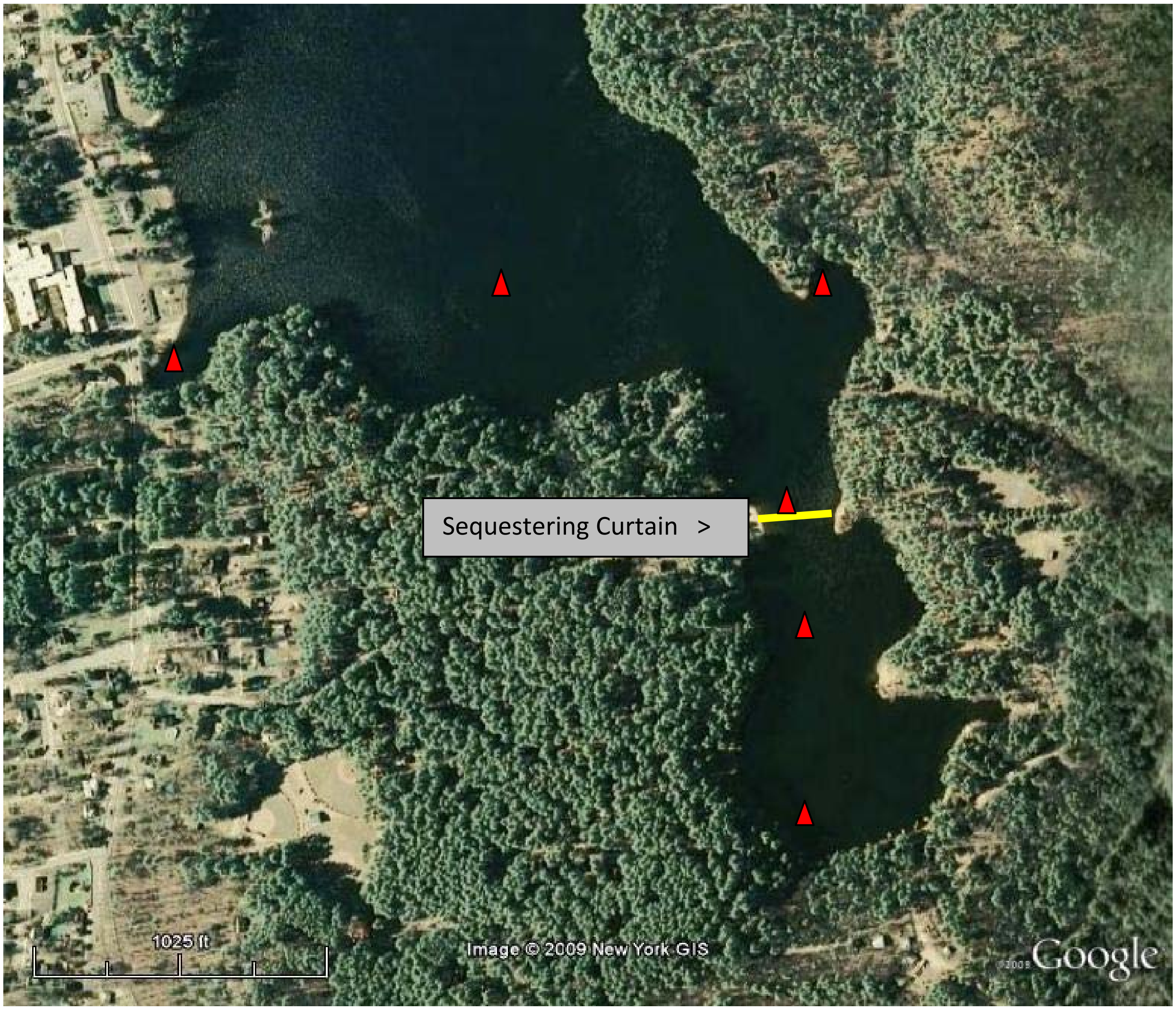
CC: Robert Sherman, Lake Luzerne Aquatic Conservation Task Force
Eugene Merlino, Supervisor, Town of Lake Luzerne
Edward Snizek, Adirondack Park Agency

ATTACHMENT A

FasTEST Information

- Map of sample locations (prepared by LLACT)
- Summary table and chart of results
- Laboratory report forms

Recommended FasTEST Sampling Locations



▲ FasTEST sampling locations for residual triclopyr concentrations

Flow in the Lake is difficult to document. Because the area is small, sheltered and constricted it is probably more driven by wind than anything else. The sequestering curtain itself should prevent virtually all water drift and therefore all herbicide drift.

Nonetheless we have selected six(6) sampling sites: two within the treatment area, one *immediately* outside the sequestering curtain, one in the cove where *M*. Beckii was located, one approximately equidistant from the curtain to the outlet, and one at the outlet of the Lake. The site immediately outside the curtain will document any seepage due to the high solubility of triclopyr; those in the lake and at the outlet will detect if measurable concentrations are leaving the lake. Lake Luzerne volunteers will be trained how to collect and ship the samples.

Sampling frequency will be based upon the model used by the Applicator (ACT) in Vermont.

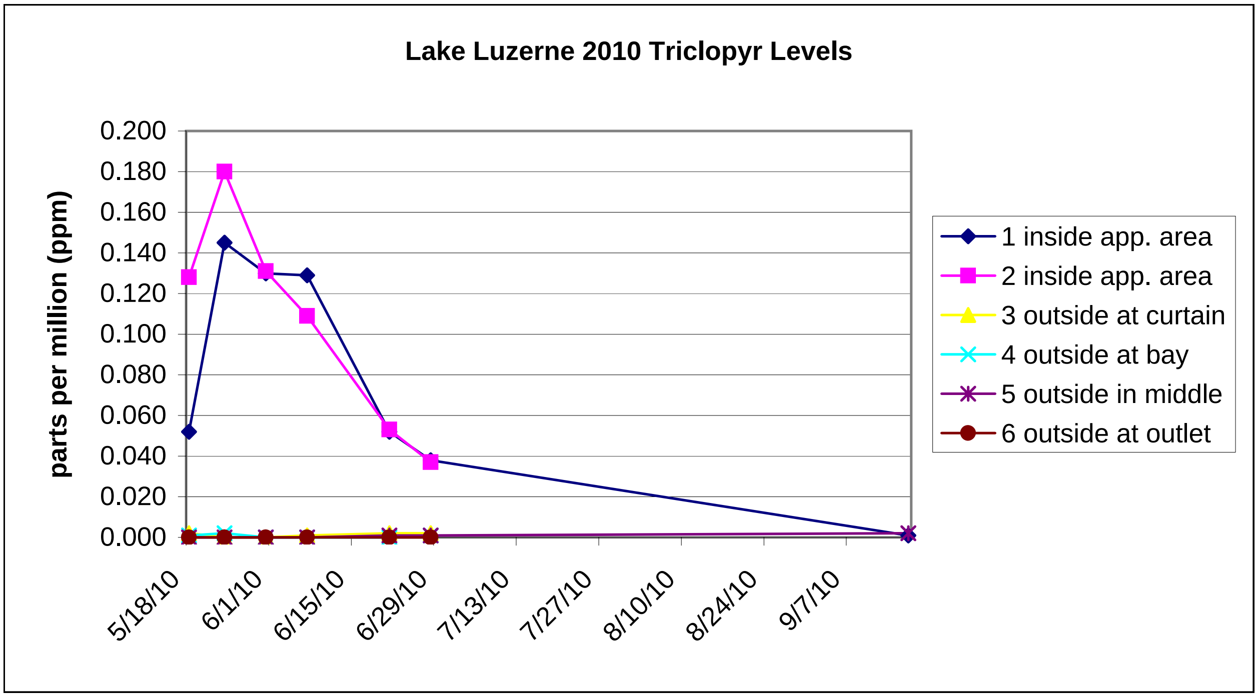
- 24 hours after treatment
- 7 days after treatment
- weekly until concentrations drop below the 50 ppb drinking threshold
- at least one more round to determine when the concentration is non-detectable (<1 ppb)

We expect this will mean 4 or 5 sampling rounds of 6 samples each.

Lake Luzerne 2010 Triclopyr Levels (ppm)

Treatment Date: 5/17/10
Application Rate: 0.5 ppm to 9.7 acres with 7 foot average depth = 94.5 lbs/ac or 920 lbs total

Site	Description	5/18/10	5/24/10	5/31/10	6/7/10	6/21/10	6/28/10	9/17/10
1	inside app. area	0.052	0.145	0.130	0.129	0.052	0.038	0.001
2	inside app. area	0.128	0.180	0.131	0.109	0.053	0.037	
3	outside at curtain	0.002	0.000	0.000	0.001	0.002	0.002	
4	outside at bay	0.001	0.002	0.000	0.000	0.000	0.001	
5	outside in middle	0.000	0.000	0.000	0.000	0.001	0.001	0.002
6	outside at outlet	0.000	0.000	0.000	0.000	0.000	0.000	
1A	inside app. area		0.198					
2B	inside app. area		0.148					



SePRO Research & Technology Campus

Chain of Custody C7982389-0

Customer Company

Customer Contact

Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Products	Acres Treated	Rate	Active	Result
1	05/17/2010	05/18/2010	Renovate OTF	10	0.5	Triclopyr	**0.052 ppm**
2	05/17/2010	05/18/2010	Renovate OTF	10	0.5	Triclopyr	**0.128 ppm**
3	05/17/2010	05/18/2010	Renovate OTF	10	0.5	Triclopyr	**0.002 ppm**
4	05/17/2010	05/18/2010	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
5	05/17/2010	05/18/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
6	05/17/2010	05/18/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**

Laboratory Information

Date Received:	5/20/2010	Date Analysis Performed:	5/20/2010
Date Results Sent:	5/20/2010	Storage Conditions	Analyzed Immediately

Chain of Custody 3A121A6B-F

Customer Company		Customer Contact	
Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Products	Acres Treated	Rate	Active	Result
1	05/17/2010	05/24/2010	Renovate OTF	10	0.5	Triclopyr	**0.145 ppm**
2	05/17/2010	05/24/2010	Renovate OTF	10	0.5	Triclopyr	**0.180 ppm**
3	05/17/2010	05/24/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
4	05/17/2010	05/24/2010	Renovate OTF	10	0.5	Triclopyr	**0.002 ppm**
5	05/17/2010	05/24/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
6	05/17/2010	05/24/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
1A	05/17/2010	05/20/2010	Renovate OTF	10	0.5	Triclopyr	**0.198 ppm**
2B	05/17/2010	05/20/2010	Renovate OTF	10	0.5	Triclopyr	**0.148 ppm**

Laboratory Information

Date Received:	5/27/2010	Date Analysis Performed:	5/27/2010
Date Results Sent:	5/27/2010	Storage Conditions	Analyzed Immediately

SePRO Research
& Technology Campus

Chain of Custody 4EFF51D0-7

Customer Company

Customer Contact

Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Products	Acres Treated	Rate	Active	Result
1	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.129 ppm**
2	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.109 ppm**
3	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
4	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
5	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
6	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**

Laboratory Information

Date Received:	6/10/2010	Date Analysis Performed:	6/11/2010
Date Results Sent:	6/11/2010	Storage Conditions	Analyzed Immediately

SePRO Research & Technology Campus

Chain of Custody 4EFF51D0-7

Customer Company

Customer Contact

Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Products	Acres Treated	Rate	Active	Result
1	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.129 ppm**
2	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.109 ppm**
3	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
4	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
5	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
6	05/17/2010	06/07/2010	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**

Laboratory Information

Date Received:	6/10/2010	Date Analysis Performed:	6/11/2010
Date Results Sent:	6/11/2010	Storage Conditions	Analyzed Immediately

SePRO Research & Technology Campus

Chain of Custody ACA3C594-4

Customer Company

Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Customer Contact

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Sample Location	Products	Acres Treated	Rate	Active	Result
1	05/17/2010	06/21/2010	inside app. area	Renovate OTF	10	0.5	Triclopyr	**0.052 ppm**
2	05/17/2010	06/21/2010	inside app. area	Renovate OTF	10	0.5	Triclopyr	**0.053 ppm**
3	05/17/2010	06/21/2010	outside at curtain	Renovate OTF	10	0.5	Triclopyr	**0.002 ppm**
4	05/17/2010	06/21/2010	outside at bay	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**
5	05/17/2010	06/21/2010	outside in middle	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
6	05/17/2010	06/21/2010	outside at outlet	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**

Laboratory Information

Date Received:	6/24/2010	Date Analysis Performed:	6/24/2010
Date Results Sent:	6/24/2010	Storage Conditions	Analyzed Immediately

SePRO Research & Technology Campus

Chain of Custody 582711D2-0

Customer Company

Customer Contact

Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Sample Location	Products	Acres Treated	Rate	Active	Result
1	06/17/2010	06/28/2010	inside app. area	Renovate OTF	10	0.5	Triclopyr	**0.038 ppm**
2	06/17/2010	06/28/2010	inside app. area	Renovate OTF	10	0.5	Triclopyr	**0.037 ppm**
3	06/17/2010	06/28/2010	outside at curtain	Renovate OTF	10	0.5	Triclopyr	**0.002 ppm**
4	06/17/2010	06/28/2010	outside at bay	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
5	06/17/2010	06/28/2010	outside in middle	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
6	06/17/2010	06/28/2010	outside at outlet	Renovate OTF	10	0.5	Triclopyr	**0.000 ppm**

Laboratory Information

Date Received:	7/1/2010	Date Analysis Performed:	7/1/2010
Date Results Sent:	7/1/2010	Storage Conditions	Analyzed Immediately

SePRO Research & Technology Campus

Chain of Custody AEEDB342-6

Customer Company

Customer Contact

Company Name:	Aquatic Control Technology, Inc.	Contact Person:	Gerald N
Address:	11 John Road	E-mail Address:	gnsmith@aquaticcontroltech.com
City:	Sutton	Phone:	
State:	MA 01590-2509	Fax:	

Payment Information

Payment Type:	Invoice	Card Number/Expiration Num:	

Waterbody Information

Waterbody:	Lake Luzerne	Waterbody Size (acres):	110.00
Depth Average:	7.00		
Target Plants	Eurasian Watermilfoil,		

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Sample Location	Products	Acres Treated	Rate	Active	Result
2	05/17/2010	09/17/2010	inside app. area	Renovate OTF	10	0.5	Triclopyr	**0.001 ppm**
5	05/17/2010	09/17/2010	outside in middle	Renovate OTF	10	0.5	Triclopyr	**0.002 ppm**

Laboratory Information

Date Received:	9/23/2010	Date Analysis Performed:	9/23/2010
Date Results Sent:	9/23/2010	Storage Conditions	Analyzed Immediately

FIFRA 24(C)

SPECIAL LOCAL NEED (SLN) LABEL

SePRO Corporation 11550 N. Meridian St., Suite 600, Carmel, IN 46032 USA www.sepro.com

This is a Restricted Use Pesticide in New York State
For Distribution and Use Only in The State of New York

ACCEPTED
FOR REGISTRATION
December 14, 2022
New York State Department
of Environmental Conservation
Division of Materials Management
Pesticide Product Registration

Classified for
"RESTRICTED USE"
in New York State
under 6NYCRR Part 326

ProcellaCOR® EC

Active Ingredient:
Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester: 2.7%
Other Ingredients: 97.3%
Total:.. 100.0%

Contains 0.0052 lb florpyrauxifen-benzyl per Prescription Dose Unit (PDU) or 0.21 lb florpyrauxifen-benzyl /gallon. 1 PDU is equal to 3.2 fl. oz. of product.

EPA Reg. No. 67690-80
EPA SLN No. NY-190001

This Special Local Need label expires on, and must not be distributed or used after December 31, 2025.

ATTENTION

- It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read all Directions for Use carefully before applying.
- **In the state of New York, ProcellaCOR EC is registered under FIFRA Section 24(c) as a Special Local Need (SLN) registration. For the state of New York, this 24(c) supplemental labeling provides directions for use, including use precautions and limitations applicable to the use of ProcellaCOR EC and supersedes the Directions for Use on the product/package label.**
- **See product label for Precautionary Statements, Environmental Hazards, First Aid, Storage and Disposal, Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies.**
- This FIFRA Section 24(c) labeling must be in the possession of the user at the time of application.
- Notice to All Pesticide Applicators in the State of New York: Before application under any project program, notification of and approval by the NYS Department of Environmental Conservation is required, either by an aquatic permit issued pursuant to ECL Section 15.0313(4) or issuance of purchase permits for such use.
- This supplemental labeling must accompany every container of ProcellaCOR EC (EPA Reg. No. 67690-80) sold or distributed in New York State.
- ProcellaCOR EC (EPA Reg. No. 67690-80) is a Restricted Use Pesticide in New York State and may be sold, offered for sale, distributed, possessed or used only by a certified applicator or purchase permit holder.
- All restrictions and precautions on the EPA registered label are to be followed.

DIRECTIONS FOR USE

Clarification of Use Restrictions

- A Prescription Dose Unit (PDU) is equal to 3.17 fluid ounces.
- For in-water applications, the maximum single application rate is 25 PDU (79.25 fluid ounces) per acre foot of water with a limit of three applications per year.
- For aquatic foliar applications, do not exceed 10 PDU (31.7 fluid ounces) per acre for a single application, and do not apply more than 20 PDU (63.4 fluid ounces) total per acre per year.

Use Precautions

- **Agricultural crop, greenhouse, nursery, and hydroponic irrigation; livestock watering**: Do not use treated water until the active ingredient has dissipated. Treated water must be analyzed and determined to be less than 1 ppb active ingredient or determined by Department approved model to have degraded/diluted to below 1 ppb unless an activated carbon or similar filtration process is utilized prior to the water use.

- **Aerial applications**: Do not use for aerial application in New York State unless allowed by site specific FIFRA Section 24(c) permit.

- **In-water applications**: In-water application to target species includes submersed, emersed, or floating plants as listed in Table 3 of the ProcellaCOR EC container Label.

- **For New York State annual reports and record keeping requirements:** All applicators must keep records of ProcellaCOR EC use in Conventional U.S. standard units of measure. For this product, the standard units of measure would be **fluid ounces; quarts; or gallons.** Please refer to list below for PDU conversions (1 PDU = 3.17 fl. oz.)

  Net Contents:
  22 PDU = 69.74 fl. oz. (2.18 quarts)
  40 PDU = 126.8 fl. oz. (3.96 quarts)
  100 PDU = 317 fl. oz. (2.48 gallons)

FPL20221211

DOC ID 560559

ACCEPTED FOR REGISTRATION
ONLY IN CONJUNCTION WITH
NEW YORK STATE SPECIFIC
SUPPLEMENTAL LABELING
SLN NY- 190001

February 22, 2019

New York State Department of
Environmental Conservation
Division of Materials Management
Pesticide Product Registration Section

Classified for
"RESTRICTED USE"
in New York State
under 6NYCRR Part 326

1103.240

ProcellaCOR™ EC

A selective systemic herbicide for management of freshwater aquatic vegetation in slow-moving/quiescent waters with little or no continuous outflow: ponds, lakes, reservoirs, freshwater marshes, wetlands, bayous, drainage ditches, and non-irrigation canals, including shoreline and riparian areas in or adjacent to these sites. Also for management of invasive freshwater aquatic vegetation in slow-moving/quiescent areas of rivers (coves, oxbows or similar sites).

FLORPYRAUXIFEN-BENZYL	GROUP	4	HERBICIDE

Keep Out of Reach of Children

CAUTION

Refer to the inside of label booklet for additional precautionary information including directions for use.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Active Ingredient:
Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester........................ 2.7%
Other Ingredients:.. 97.3%
TOTAL:...100.0%

Contains 0.0052 lb florpyrauxifen-benzyl per Prescription Dose Unit (PDU) or 0.21 lb florpyrauxifen-benzyl/gallon. 1 PDU is equal to 3.2 fl. oz. of product.

Notice: Read the entire label before using. Use only according to label directions. **Before buying or using this product, read *Warranty Disclaimer* and *Misuse* statements inside label booklet. If terms are not acceptable, return at once unopened.**

Produced for:
SePRO Corporation
11550 North Meridian Street, Suite 600
Carmel, IN 46032, U.S.A.

170306

FPL20180226
EPA Reg. No. 67690-80
EPA Est. No. 067690-NC-002

Net Contents 40 PDU

Aquatic Herbicide

(Non-refillable)

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION. Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:
- Long-sleeved shirt and long pants;
- Shoes plus socks;
- Protective eyewear; and
- Waterproof gloves.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls: When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(5)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations
Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

FIRST AID	
If in eyes	• Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. • Remove contact lenses, if present, after the first 5 minutes; then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
HOTLINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In case of emergency endangering health or the environment involving this product, call **INFOTRAC** at **1-800-535-5053**.	

Environmental Hazards
Under certain conditions, treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants, which may cause fish suffocation. Water bodies containing very high plant

density should be treated in sections to prevent the potential suffocation of fish. Consult with the State agency for fish and game before applying to public waters to determine if a permit is needed.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

Shake well before using.

PRODUCT INFORMATION

ProcellaCOR EC is a selective systemic herbicide for management of freshwater aquatic vegetation in slow-moving/quiescent waters with little or no continuous outflow: ponds, lakes, reservoirs, freshwater marshes, wetlands, bayous, drainage ditches, and non-irrigation canals, including shoreline and riparian areas in or adjacent to these sites. Also for management of invasive freshwater aquatic vegetation in slow-moving/quiescent areas of rivers (coves, oxbows or similar sites).

Apply ProcellaCOR EC directly into water or spray onto emergent foliage of aquatic plants. Depending upon method of application and target plant, ProcellaCOR EC is absorbed by aquatic vascular plants through emergent or floating leaves and from water through submersed plant shoots and leaves. In-water treatments are effective in spot and partial treatment designs with relatively short exposure times (hours to several days). Species susceptibility to ProcellaCOR EC may vary depending upon time of year, stage of growth, and water movement. For best results, apply to actively growing plants. However, effective control can be achieved over a broad range of growth stages and environmental conditions. Application to mature target plants may require higher application rates and longer exposure periods to achieve control.

Resistance Management

ProcellaCOR EC is classified as a WSSA Group 4 Herbicide (HRAC Group O). Weed populations may contain or develop biotypes that are resistant to ProcellaCOR EC and other Group 4 herbicides. If herbicides with the same mode of action are used repeatedly at the same site, resistant biotypes may eventually dominate the weed population and may not be controlled by these products. Unless ProcellaCOR EC is used as part of an eradication program or in a plant management system where weed escapes are aggressively controlled, do not use ProcellaCOR EC alone in the same treatment area for submersed and emergent plant control for more than 2 consecutive years, unless used in combination or rotated with an herbicide with an alternate mode of action.

To further delay herbicide resistance consider taking one or more of the following steps:

- Use tank mixtures with herbicides from a different group if such use is permitted; Consult your local extension service or SePRO Corporation if you are unsure as to which active ingredient is currently less prone to resistance.
- Adopt an integrated weed-management program for herbicide use that includes scouting and uses historical information related to herbicide use, and that considers other management practices.

- Scout after herbicide application to monitor weed populations for early signs of resistance development. Indicators of possible herbicide resistance include: (1) failure to control a weed species normally controlled by the herbicide at the dose applied, especially if control is achieved on adjacent weeds; (2) a spreading patch of non-controlled plants of a particular weed species; (3) surviving plants mixed with controlled individuals of the same species. If resistance is suspected, prevent weed seed production in the affected area by using an alternative herbicide from a different group or by a mechanical method that minimizes plant fragmentation.
- If a weed pest population continues to progress after treatment with this product, switch to another management strategy or herbicide with a different mode of action, if available.
- Contact your local extension specialist or SePRO Corporation for additional pesticide resistance-management and/or integrated weed-management recommendations for specific weed biotypes.

Stewardship Guidelines For Use

Apply this product in compliance with Best Management Practices (BMP) that include site assessment, prescription, and implementation. BMP have been developed to ensure accurate applications, minimize risk of resistance development, and monitor concentrations in water to document levels needed for optimal performance and manage potential irrigation use. SePRO Corporation will work with applicators and resource managers to implement BMP for application and monitoring to meet management objectives and ensure compatibility with potential water uses.

Use Precautions

- There are no restrictions for recreational purposes, including swimming and fishing.

Use Restrictions

- **Obtain Required Permits:** Consult with appropriate state or local water authorities before applying this product to public waters. State or local public agencies may require permits.
- **Chemigation:** Do not apply this product through any type of irrigation system.
- For in-water applications, the maximum single application rate is 25.0 Prescription Dose Units (PDU) per acre-foot of water with a limit of three applications per year.
- For aquatic foliar applications, do not exceed 10.0 PDU per acre for a single application, and do not apply more than 20.0 PDU total per acre per year.
- To minimize potential exposure in compost, do not allow livestock to drink treated water.
- Do not compost any plant material from treated area.
- Allow 14 days or greater between applications.
- Do not use water containing this product for hydroponic farming.
- Do not use treated water for any form of irrigation, except as described in the *Application to Water Used for Irrigation on Turf and Landscape Vegetation* section.
- Do not use for greenhouse or nursery irrigation.
- Make applications in a minimum of 10 gallons per acre (GPA) for ground and a minimum of 15 gallons per acre (GPA) for aerial applications.
- Do not apply to salt/brackish water.
- Do not apply ProcellaCOR EC directly to, or otherwise permit ProcellaCOR EC to come into contact during an application, with carrots, soybeans, grapes, tobacco, vegetable crops, flowers, ornamental shrubs or

trees, or other desirable broadleaf plants, as serious injury may occur. Do not permit spray mists containing ProcellaCOR EC to drift onto desirable broadleaf plants. Further information on spray drift management is provided in the *Spray Drift Management* section of this label.

- For treatments out of water, do not permit spray mists containing this product to drift onto desirable broadleaf plants as injury may occur. Further information on spray drift management is provided in the *Spray Drift Management* section of this label.
- Do not allow tank mixes of ProcellaCOR EC to sit overnight. See additional tank mix restrictions below.
- Do not use organosilicone surfactants in spray mixtures of this product.
- Do not tank mix this product with malathion or methyl parathion.
- Do not make an application of malathion or methyl parathion within 7 days of an application of this product. See additional tank mix restrictions below.

Application to Water Used for Irrigation on Turf and Landscape Vegetation

To reduce the potential for injury to sensitive vegetation, follow the waiting periods (between application and irrigation) and restrictions below, and inform those who irrigate with water from the treated area. Follow local and state requirements for informing those who irrigate.

When monitoring ProcellaCOR EC concentrations, analyze water samples using an appropriate analytical method for both the active ingredient and the acid form. Use of HPLC (High-Performance Liquid Chromatography), which is also referenced as FasTEST®, is recommended.

Applications to invasive freshwater aquatic vegetation in slow-moving/quiescent areas of rivers (coves, oxbows or similar sites).

- Users must be aware of relevant downstream use of water for irrigation that may be affected by the treatment and must ensure all label restrictions are followed. All potential downstream water intakes with irrigation practices that may be affected by the treatment must be documented and affected irrigation users notified of the restrictions associated with such treatment.

Residential and other Non-Agricultural Irrigation (such as shoreline property use including irrigation of residential landscape plants and homeowner gardens, golf course irrigation, and non-residential property irrigation around business or industrial properties. Excludes greenhouse or nursery irrigation).

- **Turf Irrigation:** Turf may be irrigated immediately after treatment.
- **For irrigation of landscape vegetation or other forms of non-agricultural irrigation not excluded above, conduct one of the following:**
  - analytically verify that water contains less than 2 ppb (SePRO recommends use of FasTEST); or
  - if treated area(s) have the potential to dilute with untreated water, follow the precautionary waiting periods described in the tables 1 and 2 below for in-water or foliar application.

TABLE 1: Non-agricultural irrigation following in-water application

Waiting Period (Days) for Irrigation at Specific Target Treatment Rates (PDU per acre-foot)						
Percent Area of Waterbody Treated*	1-3 PDU	>3-5 PDU	>5.0 to 10.0 PDU	>10.0 to 15.0 PDU	>15.0 to 20.0 PDU	>20.0 to 25.0 PDU
2% or less	6 hours	1 day	1 day	2 days	2 days	3 days
3 - 10%	1 day	3 days	5 days	7 days	10 days	14 days
11 - 20%	3 days	7 days	10 days	10 days	14 days	21 days
21 - 30%	5 days	10 days	14 days	21 days	28 days	35 days
>30%	7 days	14 days	21 days	28 days	35 days	35 days

* Assumes treated area(s) have the potential to dilute with untreated water. If the treated area is not projected to dilute rapidly (example: confined cove area), utilize FasTEST to confirm below 2 ppb or verify vegetation tolerance before irrigation use. Consult a SePRO Aquatic Specialist for additional site-specific recommendations.

TABLE 2: Non-agricultural irrigation following foliar application

Waiting Period (days) for Irrigation at Specific Target Treatment Rates		
Percent Area of Waterbody Treated*	5.0 PDU / acre	>5.0 to 10.0 PDU / acre
10% or less	0.5 day	1 day
11 - 20%	1 day	2 days
>20%	2 days	3 days

* Assumes treated area(s) have the potential to dilute with untreated water. If the treated area is not projected to dilute rapidly (example: confined cove area), utilize FasTEST to confirm below 2 ppb or verify vegetation tolerance before irrigation use. Consult a SePRO Aquatic Specialist for additional site-specific recommendations.

Susceptible Plants

Do not apply where spray drift may occur to food, forage, or other plantings that might be damaged. Spray drift may damage or render crops unfit for sale, use or consumption. Small amounts of spray drift that may not be visible may injure susceptible broadleaf plants. **Before making a foliar or surface spray application, please refer to your state's sensitive crop registry (if available) to identify any commercial specialty or certified organic crops that may be located nearby. At the time of a foliar or surface spray application, the wind cannot be blowing toward adjacent cotton, carrots, soybeans, corn, grain sorghum, wheat, grapes, tobacco, vegetable crops, flowers, ornamental shrubs or trees, or other desirable broadleaf plants.**

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment- and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to limit off-target drift movement from aerial applications:

Aerial Application:

- Aerial applicators must use a minimum finished spray volume of 15 gallons per acre.
- Drift potential is lowest between wind speeds of 2 to 10 mph. Do not apply below 2 mph due to variable wind direction and high potential for temperature inversion. Do not apply in wind speeds greater than 10 mph.
- To minimize spray drift from aerial application, apply with a nozzle class that ensures coarse or coarser spray (according to ASABE S572) at spray boom pressure no greater than 30 psi.
- The distance of the outer most operating nozzles on the boom must not exceed 70% of wingspan or 80% of rotor diameter.
- Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.
- Do not apply under conditions of a low-level air temperature inversion.
- The maximum release height must be 10 feet from the top of the weed canopy, unless a greater application height is required for pilot safety.

Evaluate spray pattern and droplet size distribution by applying sprays containing a water-soluble dye marker or appropriate drift control agents over a paper tape (adding machine tape). Mechanical flagging devices may also be used. Do not apply under conditions of a low-level air temperature inversion. A temperature inversion is characterized by little or no wind and lower air temperature near the ground than at higher levels. The behavior of smoke generated by an aircraft-mounted device or continuous smoke column released at or near site of application will indicate the direction and velocity of air movement. A temperature inversion is indicated by layering of smoke at some level above the ground and little or no lateral movement.

Ground Application

- Ground applicators must use a minimum finished spray volume of 10 gallons per acre.
- To minimize spray drift from ground application, apply with a nozzle class that ensures coarse or coarser spray (according to ASABE S572).
- For boom spraying, the maximum release height is 36 inches from the soil for ground applications.
- Where states have more stringent regulations, they must be observed.

The applicator should be familiar with, and take into account the information covered in the following Aerial Drift Reduction Advisory (this information is advisory in nature and does not supersede mandatory label requirements.)

Aerial Drift Reduction Advisory

Information on Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's specified pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the air stream produces larger droplets than other orientations. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: To further reduce drift without reducing swath width, boom must not exceed 70% of wingspan or 80% of rotor diameter.

Application Height: Do not make applications at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Do not make applications below 2 mph due to variable wind direction and high inversion potential. Do not apply in wind speeds greater than 10 mph. Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Do not apply during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

USE DIRECTIONS

ProcellaCOR EC performance and selectivity may depend on dosage, time of year, stage of growth, method of application, and water movement.

Aquatic Plants Controlled: In-Water Application

Table 3 lists the expected susceptible species under favorable treatment conditions for aquatic plant control. Use of lower rates will increase selectivity on some species listed. Consultation with SePRO Corporation is recommended before applying ProcellaCOR EC to determine best in-water treatment protocols for given target vegetation.

TABLE 3. Vascular aquatic plant control with in-water application

Vascular Aquatic Plants Controlled: In-Water Application	
Common name	**Scientific name**
Floating Plants	
Mosquito fern	*Azolla* spp.
Water hyacinth	*Eichhornia crassipes*
Emersed Plants	
Alligatorweed	*Alternanthera philoxeroides*
American lotus	*Nelumbo lutea*
Floating heart	*Nymphoides* spp.
Water pennywort	*Hydrocotyle umbellata*
Water primrose	*Ludwigia* spp.
Watershield	*Brasenia schreberi*
Submersed Plants	
Bacopa	*Bacopa* spp.
Coontail[1]	*Ceratophyllum demersum*
Hydrilla[1]	*Hydrilla verticillata*
Parrotfeather	*Myriophyllum aquaticum*
Water chestnut	*Trapa* spp.
Watermilfoil, Eurasian	*Myriophyllum spicatum*
Watermilfoil, Hybrid Eurasian	*Myriophyllum spicatum X M.* spp.
Watermilfoil, Variable	*Myriophyllum heterophyllum*

[1] Higher-rate applications within the specified range may be required to control less-sensitive weeds.

Aquatic Plants Controlled: Foliar Application

Table 4 lists the expected susceptible species using labeled foliar rates (5.0 – 10.0 PDU per acre) under favorable treatment conditions for aquatic plant control. Use higher rates in the rate range on more established, dense vegetation. Consultation with SePRO Corporation is recommended before applying ProcellaCOR EC to determine best foliar treatment protocols for given target vegetation.

TABLE 4. Vascular aquatic plant control with foliar application

Vascular Aquatic Plants Controlled: Foliar Application	
Common name	**Scientific name**
Floating Plants	
Mosquito fern	*Azolla* spp.
Water hyacinth	*Eichhornia crassipes*
Emersed Plants	
Alligatorweed	*Alternanthera philoxeroides*
American lotus	*Nelumbo lutea*
Floating heart	*Nymphoides* spp.
Parrotfeather (emersed)	*Myriophyllum aquaticum*
Water pennywort	Hydrocotyle umbellata
Water primrose	*Ludwigia spp.*
Watershield	*Brasenia schreberi*

APPLICATION INFORMATION

Mixing Instructions

In-Water Application to Submersed or Floating Aquatic Weeds

ProcellaCOR EC can be applied undiluted or diluted with water for in-water applications. To dilute with water, it is recommended to fill the spray tank to one-half full with water. Start agitation. Add correct quantity of ProcellaCOR EC. Continue agitation while filling spray tank to required volume and during application.

Foliar Application to Floating and Emergent Weeds

Dilute ProcellaCOR EC with water to achieve proper coverage of treated plants. To dilute with water, it is recommended to fill spray tank to one-half full with water. Start agitation. A surfactant must be used with all post-emergent foliar applications. Use only surfactants that are approved or appropriate for aquatic use. For best performance, a methylated seed oil (MSO) surfactant is recommended. Read and follow all use directions and precautions on aquatic surfactant label. After adding ProcellaCOR EC and surfactant, continue agitation while filling spray tank to required volume and during application.

TANK-CLEANOUT INSTRUCTIONS

ProcellaCOR EC should be fully cleaned from application equipment prior to use for other applications. Contact a SePRO Aquatic Specialist for guidance on methods for thorough cleaning of application equipment after use of the product.

APPLICATION METHODS

In-Water Application to Submersed or Floating Aquatic Weeds

ProcellaCOR EC can be applied via trailing hose, by sub-surface injection, or surface spray as an in-water application to control weeds such as hydrilla, floating heart, water hyacinth, and other susceptible weed species. This product has relatively short exposure requirements for in-water treatments (hours to days), but treatments with high exchange and short exposure periods should be carefully planned to achieve best results. Where greater plant selectivity is desired - such as when controlling hydrilla or other more susceptible species, choose a lower dose in the specified range. A SePRO Aquatic Specialist can provide site-specific prescriptions for optimal control based on target weed, management objectives, and site conditions.

Apply ProcellaCOR EC to the treatment area at a prescription dose unit (PDU) to achieve appropriate concentrations. A PDU is a unit of measure that facilitates the calculation of the amount of product required to control target plants in 1 acre-foot of water or 1 acre for foliar applications. Per Table 5 below, 1-25 PDU are needed to treat 1 acre-foot of water, depending on target species and the percent of waterbody to be treated.

Use Table 5 to select the dose needed to treat 1 acre-foot of water.

TABLE 5: Prescription Dose Units (PDU) per acre-foot of water***

Percent Area of Waterbody Treated	Target Species			
	Eurasian Watermilfoil	Hybrid Watermilfoil	Variable Leaf Watermilfoil	Other
≤ 2%	3 - 4	4 - 5	3 - 5	3 - 25
>2 - 10%	2 - 3	3 - 5	3 - 4	3 - 20
>10 - 20%	1 - 3	3 - 4	2 - 4	3 - 15
>20 - 30%	1 - 2	2 - 3	2 - 3	2 - 10
>30%	1 - 2	2 - 3	1 - 2	1 - 5

* In all cases, user may apply up to the maximum of 25 PDU per acre-foot. Consult your SePRO Aquatics Specialist for site-specific recommendations.

** 1 PDU contains 3.17 fl. oz. of product.

To calculate the amount of product needed in fluid ounces, use the formula below:

Number of acres X average depth (feet) X PDU* X 3.17 = fluid ounces

*: from Table 5

Example Calculation:

To control hybrid watermilfoil in 2 acres of a 5-acre lake (>30% treated) with an average depth of 2 feet:

2 acres X 2 feet X 3 PDU X 3.17 = 38.04 fl. oz.

For in-water applications, the maximum single application is 25.0 PDU / acre-foot, with a limit of three applications per year. Allow 14 days or greater between applications. Product may be applied as a concentrate or diluted with water prior to or during the application process. Use an appropriate application method that ensures sufficiently uniform application to the treated area.

Foliar Application to Floating and Emergent Weeds
Apply ProcellaCOR EC as a foliar application to control weeds such as water hyacinth, water primrose, and other susceptible floating and emergent species. Use an application method that maximizes spray interception by target weeds while minimizing the amount of overspray that inadvertently enters the water.

For all foliar applications, apply ProcellaCOR EC at 5.0 to 10.0 PDU per acre. Use of a surfactant is required for all foliar applications of ProcellaCOR EC. Use only surfactants that are approved or appropriate for aquatic use. Methylated seed soil (MSO) is a recommended surfactant and is typically applied at 1.0% volume/volume. Refer to the surfactant label for use directions. For best results, apply to actively growing weeds. ProcellaCOR EC may be applied more than once per growing season to meet management objectives. Do not exceed 10.0 PDU per acre during any individual application or 20.0 PDU total per acre, per year from all combined treatments.

Foliar Spot Treatment
To prepare the spray solutions, thoroughly mix ProcellaCOR EC in water at a ratio of 5.0 to 10.0 PDU per 100 gallons (0.12 to 0.24% product) plus an adjuvant. For best results, a methylated seed oil at 1% volume/volume is the recommended spray adjuvant. When making spot application, ensure spray coverage is sufficient to wet the leaves of the target vegetation but not to the point of runoff.

Aerial Foliar Application to Floating and Emergent Weeds
Apply ProcellaCOR EC in a spray volume of 15 gallons per acre (GPA) or more when making a post-emergence application by air. Apply with coarse to coarser droplet category per S-572 ASABE standard; see NAAA, USDA or nozzle manufacturer guidelines. Follow guidelines and restrictions in the *Spray Drift Management and Aerial Drift Reduction Advisory* sections to minimize potential drift to off-target vegetation. Aircraft should be patterned per Operation Safe/PAASS program for calibration and uniformity to provide sufficient coverage and control.

Boat or Ground Foliar Application to Floating and Emergent Weeds
When applying ProcellaCOR EC by boat or with ground equipment to emergent or floating-leaved vegetation, use boom-type, backpack or hydraulic handgun equipment. Apply ProcellaCOR EC in a sufficient spray volume (e.g. 20 to 100 gpa) to provide accurate and uniform distribution of spray particles over the treated vegetation while minimizing runoff. Use higher spray volumes for medium to high density vegetation. For boom spraying, use coarse or coarser nozzle spray quality per S-572 ASABE standard; see USDA literature or nozzle manufacturer guidelines. Follow nozzle manufacturer's recommendations for nozzle pressure, spacing and boom height to provide a uniform spray pattern. Follow appropriate spray drift management information where drift potential is a concern.

TANK MIXES WITH OTHER AQUATIC HERBICIDES
DO NOT TANK MIX ANY PESTICIDE PRODUCT WITH THIS PRODUCT without first referring to the following website for the specific product: www.3206tankmix.com. This website contains a list of active ingredients that are currently prohibited from use in tank mixture with this product.

Only use products in tank mixture with this product that: 1) are registered for the intended use site, application method and timing; 2) are not prohibited for tank mixing by the label of the tank mix product; and 3) do not contain one of the prohibited active ingredients listed on www.3206tankmix.com website.

Applicators and other handlers (mixers) who plan to tank-mix must access the website within one week prior to application in order to comply with the most up-to-date information on tank mix partners.

Do not exceed specified application rates for respective products or maximum allowable application rates for any active ingredient in the tank mix.

Read carefully and follow all applicable use directions, precautions, and limitations on the respective product labels. It is the pesticide user's responsibility to ensure that all products in the mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

Always perform a (jar) test to ensure the compatibility of products to be used in tank mixture.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Pesticide Storage: Store in original container only. Keep container closed when not in use. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with vermiculite, earth, or synthetic absorbent.

Pesticide Disposal: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

Container Handling

Non-refillable Container. DO NOT reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.

Triple rinse containers small enough to shake (capacity ≤ 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

Triple rinse containers too large to shake (capacity > 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank, or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Warranty Disclaimer: SePRO Corporation warrants that this product conforms to the chemical description on the product label. Testing and research have also determined that this product is reasonably fit for the uses described on the product label. To the extent consistent with applicable law, SePRO Corporation makes no other express or implied warranty of fitness or merchantability nor any other express or implied warranty and any such warranties are expressly disclaimed.

Misuse: Federal law prohibits the use of this product in a manner inconsistent with its label directions. To the extent consistent with applicable law, the buyer assumes responsibility for any adverse consequences if this product is not used according to its label directions. In no case shall SePRO Corporation be liable for any losses or damages resulting from the use, handling or application of this product in a manner inconsistent with its label.

For additional important labeling information regarding SePRO Corporation's Terms and Conditions of Use, Inherent Risks of Use and Limitation of Remedies, please visit *http://seprolabels.com/terms* or scan the image below.

ProcellaCOR™ EC

1103.240

SePRO

A selective systemic herbicide for management of freshwater aquatic vegetation in slow-moving/quiescent waters with little or no continuous outflow: ponds, lakes, reservoirs, freshwater marshes, wetlands, bayous, drainage ditches, and non-irrigation canals, including shoreline and riparian areas in or adjacent to these sites. Also for management of invasive freshwater aquatic vegetation in slow-moving/quiescent areas of rivers (coves, oxbows or similar sites).

Active Ingredient:
Florpyrauxifen-benzyl: 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-, phenyl methyl ester: 2.7%
Other Ingredients: 97.3%
Total: 100.0%

Contains 0.0052 lb florpyrauxifen-benzyl per Prescription Dose Unit (PDU) or 0.21 lb florpyrauxifen-benzyl /gallon. 1 PDU is equal to 3.2 fl. oz. of product.

Keep Out of Reach of Children
CAUTION

PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals

Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

FIRST AID	
If in eyes	• Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. • Remove contact lenses, if present, after the first 5 minutes; then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
HOTLINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In case of emergency endangering health or the environment involving this product, call **INFOTRAC at 1-800-535-5053.**	

8 11055 01187 9

FLORPYRAUXIFEN-BENZYL | GROUP 4 HERBICIDE

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.
Pesticide Storage: Store in original container only. Keep container closed when not in use. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with vermiculite, earth, or synthetic absorbent.
Pesticide Disposal: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.
Container Handling
Non-refillable Container. DO NOT reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.
See attached booklet for complete container disposal directions including triple rinsing and pressure rinsing instructions.

Refer to the inside of label booklet for additional precautionary information including directions for use.

Notice: Read the entire label before using. Use only according to label directions. **Before buying or using this product, read *Warranty Disclaimer* and *Misuse* statements inside label booklet. If terms are not acceptable, return at once unopened.**

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

EPA Reg. No. 67690-80
EPA Est. No. 067690-NC-002

FPL20180226
170306

™ ProcellaCOR is a trademark of SePRO Corporation

Produced for
SePRO Corporation
11550 N. Meridian Street, Suite 600 • Carmel, IN 46032, U.S.A.

Aquatic Herbicide

Net contents 40 PDU (Non-refillable)

Lake Luzerne Aquatic Pesticide Permit Application

Submitted to the Adirondack Park Agency

MArch 2, 2023

Transmittal Form

	Email
APA General Information Request form	1
Attachment B - List of Riparian owners	1
Tax parcel maps	1
Letter of Notification	1
NYSPRHP Letter re: Historic Resources	1
Lake Luzerne APA Wetland map	1
Attachment E Local Government Notice Form	1
Town of Lake Luzerne Resolution	1
2020 LAke Luzerne Management Plan	1
Mailing list in label format	1
APA Supplemental Information Request Form	2
NYSDEC Aquatic Pesticide Permit Application	2
Application area map	2
2021 Eichler Plant survey report	2
2022 Solitude Milfoil Survey report	2
dilution models	2
Sampling Plan and map	2
ProcellaCOR EC Labels - Primary and SLN	2
2022 Lake Luzerne harvest report	2

Lake Luzerne Aquatic Pesticide Permit Application

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dilution models	2
Sampling Plan and map	2
ProcellaCOR EC Labels - Primary and SLN	2
2022 Lake Luzerne harvest report	2

From: Glenn Sullivan
To: Ziemann, Aaron C (APA)
Subject: Luzerne
Date: Monday, March 20, 2023 8:36:58 AM
Attachments: Luzerne23_Milfoil_ProtectSusc_V2.pdf
Luzerne23_OtherSpecies_ProtectSusc_V2.pdf
Luzerne23_TA_V4.pdf

Good morning Aaron,

I'm thinking about the Wednesday deadline for submission of NIPA responses, and worried about Luzerne. I don't recall an email from Stephanie with the NIPA, but want to try and meet the 3/22 deadline. Attached are revised maps showing the dilution area.

Thanks,

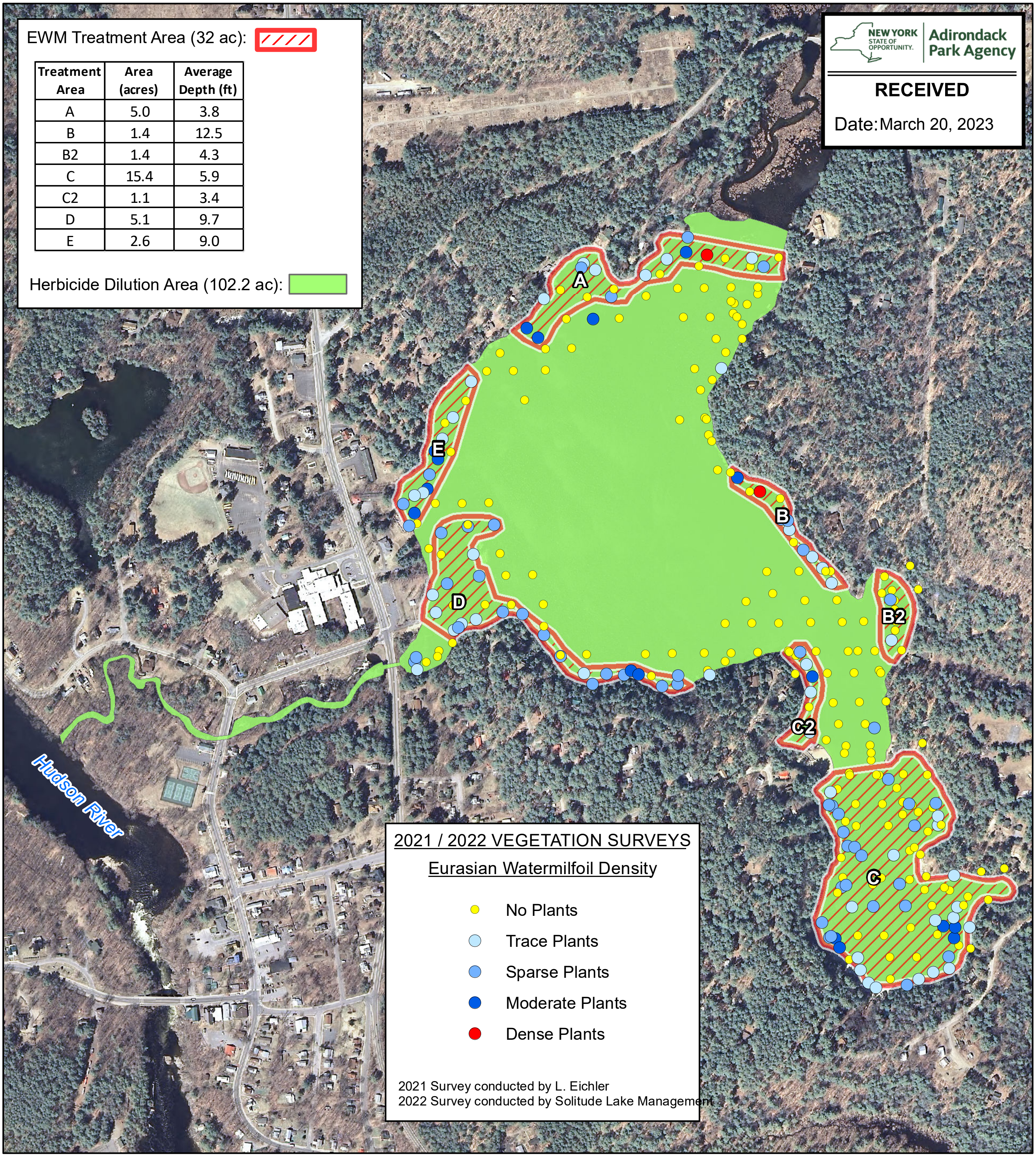
Glenn Sullivan
Certified Lake Manager
Project Manager

M: 908-310-8775

solitudelakemanagement.com

2023 EURASIAN WATERMILFOIL TREATMENT AREAS

SŌLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Treatment Area	Area (acres)	Average Depth (ft)
A	5.0	3.8
B	1.4	12.5
B2	1.4	4.3
C	15.4	5.9
C2	1.1	3.4
D	5.1	9.7
E	2.6	9.0

Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°

LAKE LUZERNE

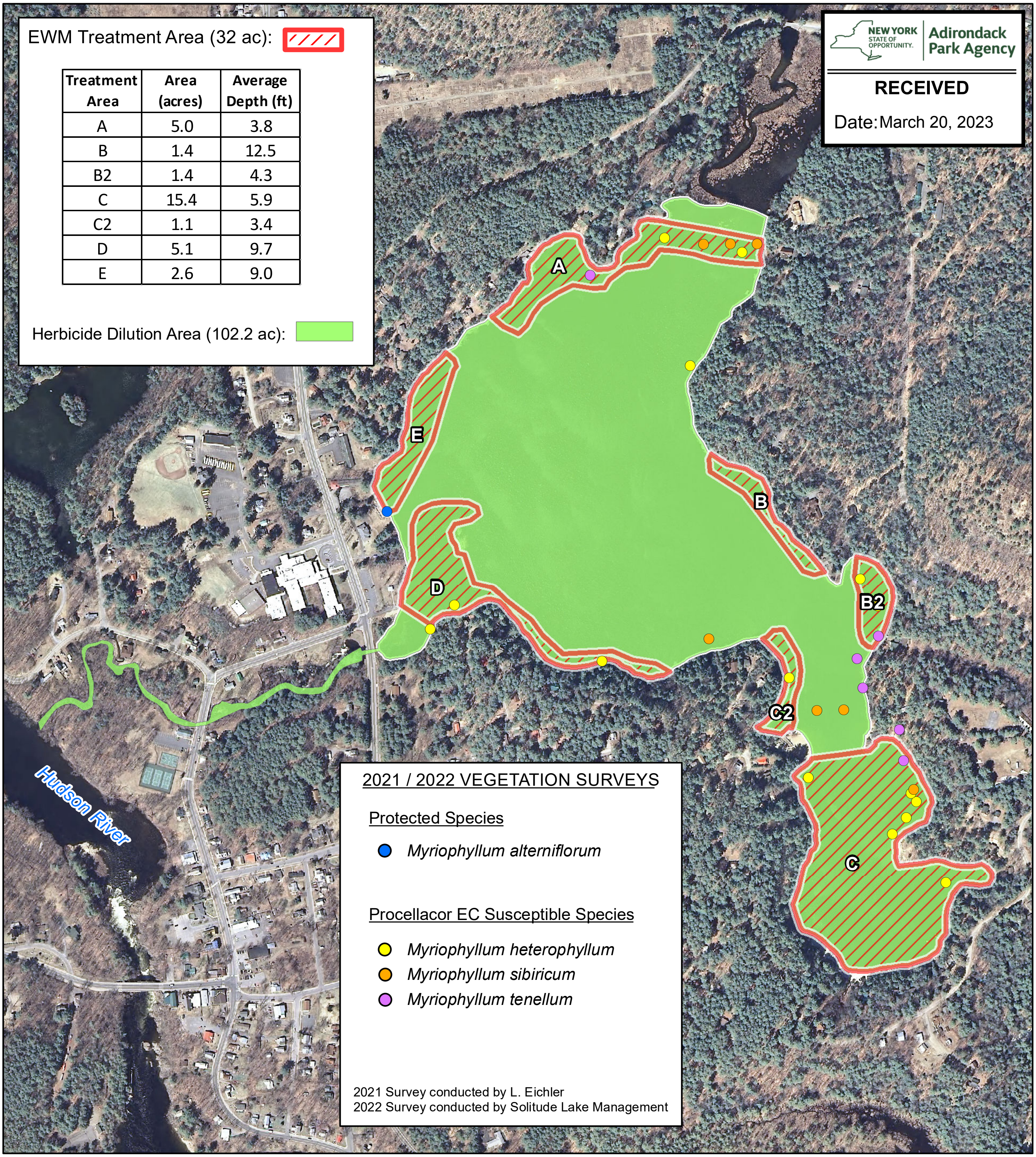
1:8,000

0 155 310 620 Feet

Date Saved: 3/13/2023
File: Luzerne23_TA
Prepared by: KM
Office: Washington, NJ

2023 EURASIAN WATERMILFOIL TREATMENT AREAS
Protected and Procellacor EC Susceptible Watermilfoil Species

SŌLITUDE
LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Treatment Area	Area (acres)	Average Depth (ft)
A	5.0	3.8
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Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°

LAKE LUZERNE

1:8,000

0 155 310 620 Feet

Date Saved: 3/13/2023

File: Luzerne23_Milfoil_ProtectSusc

Prepared by: KM

Office: Washington, NJ

2023 EURASIAN WATERMILFOIL TREATMENT AREAS
Procellacor EC Susceptible NON-Watermilfoil Species

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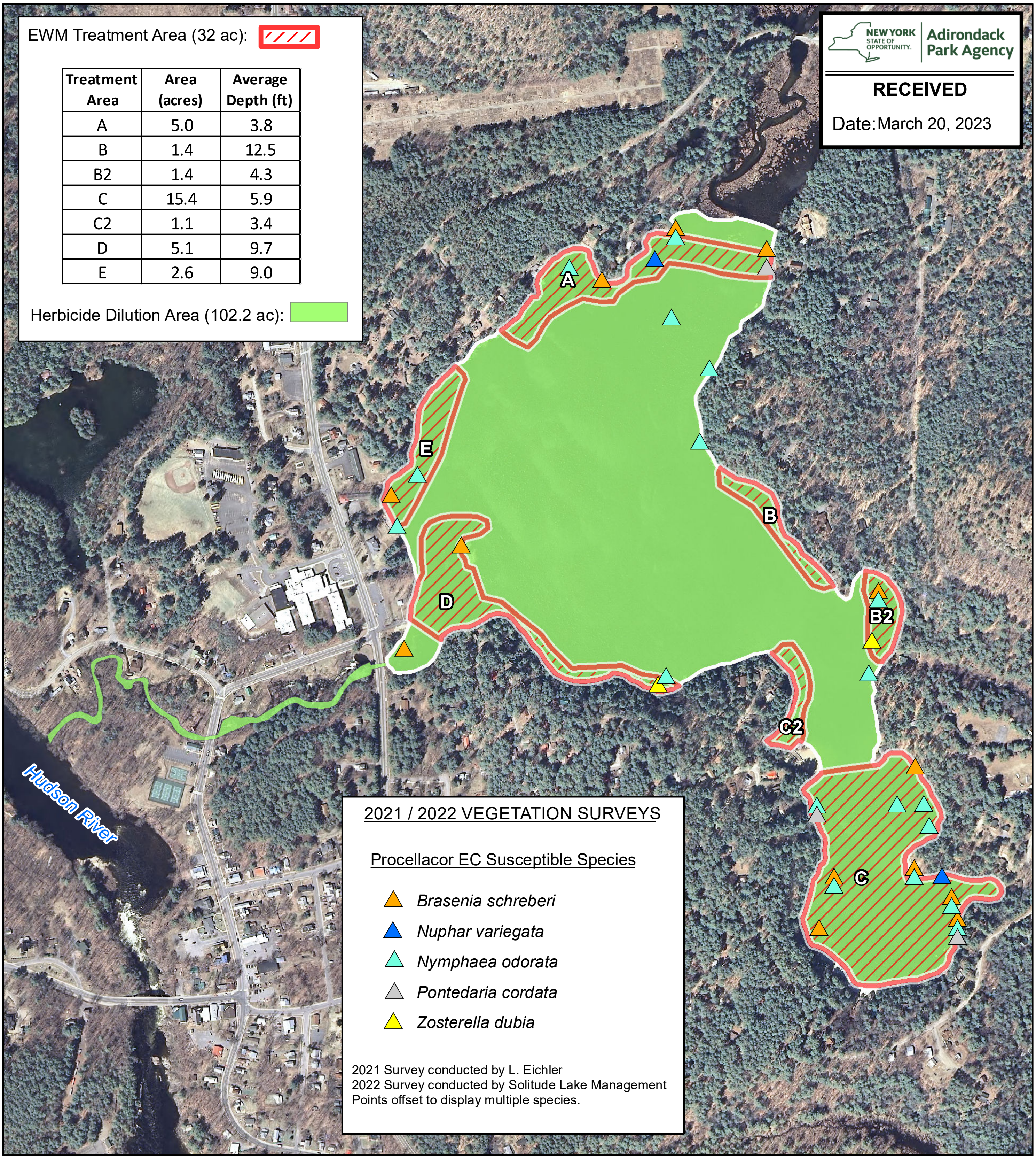
888.480.5253
solitudelakemanagement.com



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RECEIVED
Date: March 20, 2023

EWM Treatment Area (32 ac):

Treatment Area	Area (acres)	Average Depth (ft)
A	5.0	3.8
B	1.4	12.5
B2	1.4	4.3
C	15.4	5.9
C2	1.1	3.4
D	5.1	9.7
E	2.6	9.0

Herbicide Dilution Area (102.2 ac):

2021 / 2022 VEGETATION SURVEYS

Procellacor EC Susceptible Species

- *Brasenia schreberi*
- *Nuphar variegata*
- *Nymphaea odorata*
- *Pontedaria cordata*
- *Zosterella dubia*

2021 Survey conducted by L. Eichler
2022 Survey conducted by Solitude Lake Management
Points offset to display multiple species.

Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°

LAKE LUZERNE

1:8,000

0 155 310 620 Feet

N

Date Saved: 3/13/2023
File: Luzerne23_OtherSpecies_ProtectSusc
Prepared by: KM
Office: Washington, NJ

Lake Luzerne 2023 Herbicide Application
NOTICE OF INCOMPLETE PERMIT APPLICATION APA Project No.: 2023-0045
Responses

1. **GIR Item 14c – New York State Department of Environmental Conservation (NYSDEC)**
   Any approvals received from NYSDEC will be forwarded to the APA staff, as requested.

2. **SIR Item 2 - Plant Survey**
   The plant survey conducted by Larry Eichler in August, 2021 documented one location of Little Watermilfoil (*Myriophyllum alterniflorum*) in the lake, at the beach area of the Lake Luzerne Motel. This site is typical of the sandy shoreline area preferred by this plant. In addition, Dean Long reported to Larry Eichler that Little Watermilfoil was also found in the Lake Luzerne inlet stream during that same 2021 survey, which Dean Long was assisting on.

   Little watermilfoil in the inlet stream poses no risk of control due to the continual movement of water into the lake, preventing movement of the herbicide upstream, and also preventing any significant contact time if it had. The Little Watermilfoil found at the hotel beach area is likely to be impacted by the herbicide as it is located on the edge of one treatment area, and close to a second treatment area. In an effort to protect that plant, an open-top, 30 gallon drum with the bottom cut out will be placed over the plant, and sunk into the sand, in an effort to keep the herbicide from reaching the plant but still allowing the plant water and sunlight. Condition of the plant and relative water temperature will be checked at the 1-2 hour, 10-12 hour, and the 24 hour sampling periods. If the water temperature remains reasonably consistent with the ambient water temperature, the drum will be left in place until the 3 day samping period and then removed. The drum cannot guarantee that the herbicide won't reach the plant via porewater, but this is a reasonable effort to protect the plant.

3. **SIR Item 2 (D)(2) – Plant Survey Maps**
   The survey points used by Eichler in the 2021 survey were previously established in his earlier surveys of the lake, and based spatially on the requirements outlined in the NYSDEC Tier III Survey requirements.

   The survey conducted by Solitude Lake Management in 2022 was not designed to employ a typical point-intercept survey, as was conducted by Eichler in 2021 or by Allied Biological in 2011. Instead, the purpose of the 2022 survey was to specifically scout for Little Watermilfoil. Therefore, the field team used a zigzag survey path along the lake shoreline to look for and collect plant samples. The Eurasian Watermilfoil sample points shown on the treatment maps are the combination of both data sets, since it was determined that both surveys were valid and performed by personnel knowledgeable in aquatic plant identification. Both survey point data sets were used to delineate the proposed treatment areas.

R. Craig & Sabine Nicholson
2997 Lake Shore Dr.
Lake George, N.Y. 12845

Mr. Lawrence Bennett
81 Gage Hill Rd.
Lake Luzerne, N.Y. 12846

Eugene & Linda Merlino
P.O. Box 130
Lake Luzerne, N.Y. 12846

Historical Society Hadley-Lake Luzerne
P.O. Box 275
Lake Luzerne, N.Y. 12846

Michael & Laurie Worth
12 Wall St.
Lake Luzerne, N.Y. 12846

Gary Kellison
11 River Rd.
Lake Luzerne, N.Y. 12846

Anthony & Betty McCutcheon
P.O. Box 293
Lake Luzerne, N.Y. 12846

Bruce Croissant
15 River Rd.
Lake Luzerne, N.Y. 12846

Brittany White
P.O. Box 664
Lake Luzerne, N.Y. 12846

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner	Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.11-2-12.2	Albert & Nancy Miller Living Tı 163 Denton Rd				Saratoga Springs, NY 12866
298.11-2-3	Susan Higginbotham 4305 Mission Ct				Alexandria, VA 22310
298.11-2-4	Trustees Reiter,Edward & Virç		615		Lake Luzerne, NY 12846-0615
298.11-2-11	Jointly Owned/Pine Hill Assoc 70 Standish Dr			c/o Acquardo	Ridgefield, CT 06877
298.11-2-13	Robert B. McCutcheon 17 Tomahawk Dr	Lori A. McCutcheon			Lake Luzerne, NY 12846
298.11-2-14	Albert & Nancy Miller Living Tı 163 Denton Rd				Saratoga Springs, NY 12866
298.11-2-40	Brendan & Theresa Whelan		153		Slate Hill, NY 10973
298.11-2-41	Hadley-Luzerne CSD		200		Lake Luzerne, NY 12846
298.11-2-43	Town of Lake Luzerne		370		Lake Luzerne, NY 12846
298.11-2-44	Town of Lake Luzerne		370		Lake Luzerne, NY 12846
298.15-3-69	Halpern Family Trust 333 East Broadway Apt 1J			c/o M. & E. Halpern	Long Beach, NY 11561

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Date: March 10, 2023

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.15-3-70	Elizabeth Seber 2028 Clifton Park Rd	John, Thomas & Christopher '		Niskayuna, NY 12309
298.15-3-71	Rawlin & Anna Luther	399		Lake Luzerne, NY 12846
298.16-1-59	Dunning,Benjamin Davis,Robi	214		Lake Luzerne, NY 12846
298.16-1-60	James & Elizabeth Tilton 57 Earl Dr			North Merrick, NY 11566-1706
298.16-1-62	Joseph & Eileen Williams 215 Broad St		Margaret Williams-Tine	Scotia, NY 12302
298.16-1-63	Mark & Pamela Tebbano	213		Lake Luzerne, NY 12846
298.16-1-64	Francis Keane 14 Fairway Ln	Mary Judith Caldwell		Schenectady, NY 12304
298.16-1-65	Kathryn Opdyke 1442 Valencia Rd			Niskayuna, NY 12309
298.16-1-66	Mason & Cynthia Chessler 46 Fisher Ave			Princeton, NJ 08540
298.16-1-67	E. Neil & Julie Courtney 2227 Bainbridge St			Philadelphia, PA 19146
298.16-1-68	E. Neil & Julie Courtney 2227 Bainbridge St			Philadelphia, PA 19146

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.16-1-69	E. Neil & Julie Courtney 2227 Bainbridge St			Philadelphia, PA 19146
298.16-1-70	Philip W. Mueller 665 Pangburn Rd	Mary K. Morris		Schenectady, NY 12306
298.16-1-71	Valerie Hoebel	Lane, C. Hoebel, B & 192		Lake Luzerne, NY 12846
298.16-1-73	Betty & Audrey Jaros 2118 Rosendale Rd			Niskayuna, NY 12309
298.16-1-74	John Juliano 39 Doyle Ct			East Northport, NY 11731
298.16-1-75	Robin A. Finn	17295		South Lake Tahoe, CA 96151
298.16-1-76	Adriana Schaffer 44 Carstead Dr		Wendy & Howard Schaffer	Slingerlands, NY 12159
298.16-1-77	David & Suzanne Sodergren 35 Eileen Ln			Glenmont, NY 12077
298.15-3-22	Town of Lake Luzerne	370		Lake Luzerne, NY 12846
298.15-3-23	Town of Lake Luzerne	370		Lake Luzerne, NY 12846
298.15-3-65	Michael Seber	206		Lake Luzerne, NY 12846

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.15-3-67	Melissa LaBelle 686 N Creek Rd			Greenfild Center, NY 12833
298.15-3-68	Victor Gagliardi,Trustee Sr 240 Osborne Rd			Albany, NY 12205
298.16-3-1	Mark & Kirby Grabowski 17 Palmer Ln			Riverside, CT 06878
298.16-3-2	Courtney McGuinn 15 W 73rd St Apt 1			New York, NY 10023
298.16-3-3	Trisha & Natalie Campbell 4703 Jockey St	John Hanrahan Jr.		Ballston Spa, NY 12020
298.16-3-4	Neil & Janet Shanahan,Truste 525 Heritage Ct			St. Charles, IL 60175
298.16-3-5	Brian Skorney 322 W 72nd St Apt 13B	Catherine McGuinn		New York, NY 10023
298.16-3-6	David & Pamela Tisch	232		Lake Luzerne, NY 12846-0232
298.16-3-9	Max M. Mandle 409 Wellman Ave			North Chelmsford, MA 01863
298.16-3-10	Max M. Mandle 409 Wellman Ave			North Chelmsford, MA 01863
298.16-3-11	David Heil 49 Helms Hill Rd	Sherri Heil		Washingtonville, NY 10922

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.16-3-12	David Heil 49 Helms Hill Rd	Sherri Heil		Washingtonville, NY 10922
298.16-3-13	Frederick & Diane Corcoran 5 Gold Blvd			Basking Ridge, NJ 07920
298.16-3-14	Patricia Soper 63 Lincoln Ave	Paige Johnson		Colonia, NJ 07067
298.16-3-15	Craig Soper 53 Little Philadelphia Rd	Rance Soper		Washington, NJ 07882
298.16-3-16	Thomas & Vincenza Mennella 70 Mayfair Ave			West Hempstead, NY 11552
298.16-3-17	Stephanie Norton 99 Sagamore Dr			Lake Luzerne, NY 12846
298.16-3-18	Willliam Samuel Capuano 105 Sagamore Dr			Lake Luzerne, NY 12846
298.16-3-19	Denise Merrill 107 Sagamore Dr	Stephen J. Leach		Lake Luzerne, NY 12846
298.16-3-20	William Klein 203 College St	Elizabeth Klein		Round Rock, TX 78664
298.16-3-21	Janet Ayers 109 Sagamore Dr			Lake Luzerne, NY 12846
298.16-3-22	Lawrence & Birgit Danziger Irr 118 Gladstone Ave			West Islip, NY 11795

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner	Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.16-3-23	Richard Kirkwood, Estate 298 N Sharon Way	Dorothy L. Thomas			Monroe Township, NJ 08831
298.16-3-24	Stephanie Norton 99 Sagamore Dr				Lake Luzerne, NY 12846
298.16-3-25	Michael Woodell 121 Sagamore Dr				Lake Luzerne, NY 12846
298.16-3-27	Philip,Trustee Beard 135 Main St	Peter Beard			Glen Rock, NJ 07452
298.16-3-30	Mark Schaffer 27 Horseshoe Dr	Sara Masri-Zappi			Saratoga Springs, NY 12866
298.16-3-31	Eric D. & Gilah Moses		9266		Schenectady, NY 12309
298.16-3-32	Francis & Nancy Wickham 297 Elsmere Ave				Delmar, NY 12054
298.16-3-33	Francis Wickham 297 Elsmere Ave	Nancy Wickham			Delmar, NY 12054
298.16-1-79	Matthew & Nancy Chura		361		Lake Luzerne, NY 12846
298.16-1-80	Town of Lake Luzerne		370		Lake Luzerne, NY 12846
298.16-1-82	Cary Gravagno 407 Pastell Ln	Daniel Gravagno			Conshohocken, PA 19428

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner	Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.16-1-83	Michael & Patricia Mahoney 20 Edgewood Dr				Burnt Hills, NY 12027
298.16-1-84	Josephine, Trustee Wolk 2573 Heather Cir				East Lansing, MI 48823
298.16-1-85	Mark Robert Grabowski 27 Broadway				Lake Luzerne, NY 12846
298.16-3-34	Francis Wickham 297 Elsmere Ave	Nancy Wickham			Delmar, NY 12054
298.16-3-35	Kurt & Barbara Tekolste 406 Peters Way				Phoenixville, PA 19460
298.16-3-36	Barbara Oropallo		11283		Loudonville, NY 12211
298.16-3-37	William & Paul Toran	Davis,L. Johnson,L.	268		Lake Luzerne, NY 12846
298.16-1-86	Paul Horwedel 16 Myrtle Ave	James & Bonnie Horwedel			Schenectady, NY 12304
298.15-3-66.1	Colleen C. Felske 109 Westchester Dr N				Delmar, NY 12054
298.16-3-50.2	Luzerne Woods, LLC		9266		Schenectady, NY 12309
298.16-1-72.1	Jay & Robin Blumenthal 484 West 43rd St Apt 24M				New York, NY 10036

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.11-2-2	Marsena P. Campbell Rev. Trı 611 Old Toll Rd	Marsena & Barb Campbell, Tr		Madison, CT 06443
298.11-2-38	302 Island, LLC 1025C Maple St			Hudson Falls, NY 12839
298.11-2-39	Seabar, LLC	307	c/o LL Motel	Lake Luzerne, NY 12846
298.8-1-11	Lynne Golonka, Trustee	433		Lake Luzerne, NY 12846
298.8-1-12	Joseph Alteri 45 Valeria Dr	Deanna Deeb Daniel DeBonis		Lake Luzerne, NY 12846
298.8-1-13	Ellen Miraglia 257 High Point Court W Apt A			Delray Beach, FL 33445
298.8-1-1	James & Kerry Crossen 50 Erdmann Ln			Wilton, CT 06897
298.8-1-2	Kim Petry 7 Fenimore Ave			Garden City, NY 11530
298.8-1-3	Peniel Bible Conference Inc	369		Lake Luzerne, NY 12846
298.8-1-9	M&M Camp, LLC 1582 McAllilster Rd			Genoa, NY 13071
298.8-1-10	DeLollo,Andrea Sabatino,Scc 15 Parkland Ct			Clifton Park, NY 12065

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.12-1-1	Michael Conway 19 Phillips Dr			Lake Luzerne, NY 12846
298.12-1-2	Luzerne Family LLC 16 Diamond Pl		c/o Kara Conway Love	Saratoga Springs, NY 12866
298.12-1-3	Luzerne Family LLC 16 Diamond Pl		c/o K. Conway Love	Saratoga Springs, NY 12866
298.12-1-4	Douglas & Kathleen Moench	508		Lake Luzerne, NY 12846
298.12-1-5	Kathy Moench Taylor 15 Tower Hgts			Loudonville, NY 12211
298.12-1-6	Lake Tour LLC 140 West 87th St		c/o David Moench	New York, NY 10024
298.12-1-7	James & Donna Hanson 11 Lindenwood Ct			Washington Township, NJ 07676
298.12-1-8	Family Trust Todd O. & Ellen I 28 Furlong St			Saratoga Springs, NY 12866
298.12-1-9	Lynne S. Dintrone 163 Townsend Ave	Edward J. Dintrone		Pelham, NY 10803
298.12-1-10	Sean & Lindsey Dreelan Banchory-Devenick		c/o Drumduan House	Aberdeenshire, Scotland AB125YL
298.16-3-48	Blue Lagoon LLC 16 Diamond Pl		c/o K. Conway - Love	Saratoga Springs, NY 12866

SBL Printkey	Own Owner Name / Own Street Address	Own Addl Owner / Own PO Box	Own Attention To	Own Addl Address / Own City State Zip
298.16-3-49	John & Terri Cerveny 15 Phillips Dr			 Lake Luzerne, NY 12846

NYS - Real Property System
County of Warren
Town of Lake Luzerne
SWIS Code - 523200

Utility Label Summary Listing - 2023 - Current Year File
Parcel ID Sequence

RPS320/V04/L001

Mill Creek

All Selected Parcels

Parcel Id	Owner Name	Parcel Address	Account Number	School Code	R S	Land Av	Total Av	Prop Class	Acres	Tax Code	Bank Code
298.15-1-16	Town of Lake Luzerne	41 Main St		523201	8	95,000	258,000	963	8.60		
298.15-1-19	Town of Lake Luzerne	51 Main St		523201	8	25,000	254,000	652	0.59		
298.15-1-20	Town of Lake Luzerne	Main St		523201	8	14,000	19,000	963	1.62		
298.15-1-22	Nicholson, R. Craig & Sabine	Wall St		523201	1	2,000	2,000	311	0.11		
298.15-1-23	Worth, Michael & Laurie	12 Wall St		523201	1	17,000	134,000	210	0.41		82
298.15-1-24	McCutcheon, Anthony & Betty	6 Wall St		523201	1	25,000	325,000	210	0.55		
298.15-1-27	Bennett, Lawrence	7 River Rd		523201	1	17,000	20,500	312	0.38		
298.15-1-28	Kellison, Gary	11 River Rd		523201	1	16,500	31,000	270	0.45		
298.15-1-29	Croissant, Bruce	15 River Rd		523201	1	19,000	96,000	270	0.47		
298.15-2-35	Merlino, Eugene & Linda	247 Lake Ave		523201	1	68,000	172,000	210	6.49		
298.15-2-36	Town of Lake Luzerne	28 Mill St		523201	8	34,000	194,000	963	1.44		
298.15-2-37	Town of Lake Luzerne	Mill St		523201	8	12,000	12,000	963	0.49		
298.15-2-38	Town of Lake Luzerne	Mill St		523201	8	3,000	3,000	963	0.07		
298.15-2-39	Town of Lake Luzerne	Mill St		523201	8	21,000	21,000	963	0.22		
298.15-2-40	White, Brittany	4 Mill St		523201	1	27,000	121,000	210	0.84		140
298.15-2-41	Hadley-Lake Luzerne , Historical Socie	Main St		523201	8	21,500	21,500	330	1.10		
298.15-2-42	Hadley-Lake Luzerne, Historical Societ	52 Main St		523201	8	25,500	117,000	681	0.65		

Town Totals	**Parcels -**	17	**Land -**	442,500
	Acres -	24.48	**Total -**	1,801,000
Town Grand Totals	**Parcels -**	17	**Land -**	442,500
	Acres -	24.48	**Total -**	1,801,000
Report Totals	**Parcels -**	17	**Land -**	442,500
	Acres -	24.48	**Total -**	1,801,000

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Brittany White

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PNF sent 3/22/23
PNF2 snt 3/29/23

New York State Department of Environmental Conservation
Division of Materials Management / Region 5 / Bureau of Pesticides Management
232 Golf Course Road, Warrensburg, NY 12885
(518) 623-1200

TITLE 6 NEW YORK CODE OF RULES AND REGULATIONS PART 327
PERMIT TO USE A PESTICIDE FOR THE CONTROL OR ELIMINATION OF AQUATIC VEGETATION

PERMIT NUMBER: **AV-5-23-10**	TARGET SPECIES TO BE CONTROLLED: **Eurasian Watermilfoil (Myriophyllum spicatum)**
PERMITTEE: **Town of Lake Luzerne**	WATER TO BE TREATED: **Lake Luzerne**
TOWN: **Lake Luzerne**	COUNTY: **Warren**
ADDRESS OF PERMITTEE: **539 Lake Avenue, Lake Luzerne, NY 12846**	

Pursuant to the Rules and Regulations governing the use of pesticides for controlling or eliminating aquatic vegetation adopted by the New York State Department of Environmental Conservation, permission is granted to the permittee or his/her agent(s) pursuant to the provisions of Article 15 of the Environmental Conservation Law to apply the listed pesticide(s) to the waters identified above located in the town and county identified above in conformance with all statements and agreements set forth in the application .

I. THIS AQUATIC PESTICIDE PERMIT IS ISSUED SUBJECT TO THE FOLLOWING CONDITIONS:

1. DATE(S) OF TREATMENT: **May 1, 2023 – June 30, 2023**
2. AUTHORIZED CHEMICAL (Product & EPA Reg. No.): **ProcellaCOR EC (EPA Reg. No. 67690-80, SLN NY-190001)**
3. % OR WEIGHT OF ACTIVE INGREDIENT (A.I.): **Florpyrauxifen-benzyl, 2.7%**
4. MAXIMUM AMOUNT OF CHEMICAL AUTHORIZED: **10.4 Gallons**
5. MAXIMUM NUMBER OF ACRES TO BE TREATED: **32 Acres**
6. NOT TO EXCEED PERMISSIBLE DOSAGE: **6.34 fl. oz. ProcellaCOR EC per acre foot**
7. METHOD OF APPLICATION: **Subsurface injection**
8. AREAS TO BE TREATED WILL BE ONLY THOSE DESIGNATED ON MAPS PROVIDED AS PART OF THE APPLICATION.
9. NAME OF REGISTERED BUSINESS/AGENCY: **Solitude Lake Management, LLC**
10. BUSINESS/AGENCY REGISTRATION NO.: **17886**
11. NAME OF CERTIFIED APPLICATOR: **Glenn Sullivan**
12. CERTIFIED APPLICATOR ID NO.: **C0680740**
13. THIS PERMIT IS VALID FOR ONLY ONE TREATMENT.

II. USE OF THE TREATED WATERS AND THOSE WATERS AFFECTED BY THE TREATMENT WILL BE PROHIBITED OR RESTRICTED AS FOLLOWS:

1. Do not allow others to enter the treatment area until the application is complete.
2. Do not use treated water to: water livestock; irrigate agricultural crops, greenhouses or nurseries; or for hydroponic irrigation until the concentration of active ingredient is less than 1 part per billion (ppb).

III. SAMPLING REQUIREMENTS:

1. Water sampling and analysis for Florpyrauxifen-benzyl concentrations are required so the water use restrictions can be lifted. The water use restrictions cannot be lifted until the Florpyrauxifen-benzyl concentration is less than 1 part per billion (ppb), as proven/determined by laboratory analysis. Water sampling using laboratory analysis must be conducted in accordance with the attached sampling plan. Results of the water sample analysis must be provided to the DEC Pesticide Control Specialist, identified in Section IV. #4 of this permit, immediately upon receipt. Water use restrictions must not be lifted without prior written consent from the DEC.

IV. NOTIFICATION AND POSTING REQUIREMENTS:

1. **Riparian Owner and User Notification:** Prior notice of the actual date(s) of treatment and water use restrictions must be given to any party likely to be adversely affected.

2. **Posting of Warning Signs Prior to Treatment:** All public access sites on Lake Luzerne and on the affected outlet waters shall be posted with warning signs at a distance of no more than 100 feet per sign. Each sign shall be greater than 6" x 8" in size and posted at a minimum height of thirty inches (30") above the ground to the top of the sign. The signs shall be yellow in color with black lettering and constructed of weather-resistant material. Warning signs shall be posted immediately prior to the application and shall remain posted for the duration of the water use restrictions. All warning signs must be removed no later than 5 days after the water use restrictions have expired as determined by sample results (when required) and agreed upon in writing by the DEC. Information on the warning signs and posting locations may only be modified when agreed upon in writing by the Pesticide Control Specialist identified in Section IV. #4 of this permit.

3. **The signs placed prior to the treatment shall include the following information:**

NOTICE

THIS LAKE IS BEING / HAS BEEN TREATED WITH HERBICIDES FOR AQUATIC VEGETATION CONTROL.

DO NOT ENTER THE TREATMENT AREA UNTIL THE APPLICATION IS COMPLETE.
LIVESTOCK WATERING AND IRRIGATION ARE PROHIBITED UNTIL THE CONCENTRATION OF FLORPYRAUXIFEN-BENZYL IS LESS THAN 1 PART PER BILLION (PPB).

DATE AND TIME OF TREATMENT: ______________

For more information contact: __________________ Phone: ____________

4. **Agency Notifications:** The following must be notified at least (7) seven days before the time of the pesticide treatment:

Brian Primeau, Pesticide Control Specialist 2, NYS DEC Bureau of Pesticides Management, 232 Golf Course Road, Warrensburg, NY 12885, (518) 623-1267. Email: brian.primeau@dec.ny.gov

a.) In the event conditions necessitate rescheduling the pesticide treatment, the following must be notified 24 hours prior to the date the rescheduled treatment will occur: Brian Primeau, Pesticide Control Specialist 2, NYS DEC, 232 Golf Course Road, Warrensburg, NY 12885, (518) 623-1267, Email: brian.primeau@dec.ny.gov

b.) If no treatment is made, and the permit is not used, the following must be notified: Brian Primeau, Pesticide Control Specialist 2, NYS DEC, 232 Golf Course Road, Warrensburg, NY 12885, (518) 623-1267, Email: brian.primeau@dec.ny.gov

V. REPORTING

1. **Final Report Required:** The permittee shall submit a Final Report to the Department no later than December 1, 2023. The Final Report shall contain the following information for each application site: product name; active ingredient; EPA registration number; the total quantity of each pesticide used; number of acres or acre feet treated; targeted concentration; application rate; target organism; and date of application(s). The Final Report shall be submitted to Brian Primeau, Pesticide Control Specialist 2, NYS DEC, 232 Golf Course Road, Warrensburg, NY 12885, (518) 623-1267, Email: brian.primeau@dec.ny.gov .

This permit requirement does not preclude the statutory obligation of the permittee, or other pesticide applicator registered agency or registered business to comply with Annual Reporting requirements expressed at Section 33-1205 of the ECL.

VI. ADDITIONAL CONDITIONS OR RESTRICTIONS:

1. **No Right to Treat Lands and Waters under Department Control** This permit grants no right to treatment of lands under control of the Department nor relieves the permittee of the responsibility to obtain permission from the Department for any treatment of waters lying under their control, unless a specific signed authorization appears on this permit.

2. **No Right to Treat Non-Target Areas** Issuance of the permit does not authorize the treatment or the drift of pesticides to non-target water or water lying on or passing through the property of others without their consent, nor relieve the permittee/applicator of any legal necessity to obtain such consent before treatment, nor relieve them of responsibility for damages to riparian owners or others.

3. **Follow Product Label Directions** The applicator must follow all product label directions. A copy of the product labeling, including any applicable Special Local Need (SLN) or supplemental labeling, must be on site during all treatments. The applicator, and all others handling the product, must wear appropriate personal protective clothing as required by label directions.

4. **Possession of a Valid Commercial Pesticide Applicator Certification** The applicator must possess valid Commercial Pesticide Applicator Certification in Category 5A with the permit issuing agency. The certified applicator must be on site during all treatments. The use of individuals now referred to as "Pesticide Technician" and/or "Pesticide Apprentice" in current regulation, is permitted as described in Title 6 NYCRR Part 325.7. In addition, the applicator, if contracted to complete the treatment, must possess valid registration as a Pesticide Application Business with the Bureau of Pesticides Management.

5. **State Not Liable for Damage** The State of New York shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the State for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

6. **Precautions Against Contamination of Waters** All necessary precautions shall be taken to preclude contamination of any wetland or waterway by suspended solids, sediments, fuels, solvents, lubricants, epoxy coatings, paints, concrete, leachate or any other environmentally deleterious materials associated with the project. Spill recovery materials shall be maintained at the temporary pesticide storage area.

7. **No Interference with Navigation** There shall be no unreasonable interference with navigation by the work herein authorized.

VII. GENERAL CONDITIONS – APPLY TO ALL AUTHORIZED PERMITS:

1. **Facility Inspection by the Department** The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71-0301and SAPA 401(3).
   The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.
   A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of the permit upon request by a Department representative is a violation of this permit.

2. **Relationship of this Permit to Other Department Orders and Determinations** Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.

3. **Applications for Permit Renewals, Modifications or Transfers** The permittee must submit a separate written application to the Department for permit renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing. Submission of applications for permit renewal, modification or transfer is to be submitted to: NYS DEC, Bureau of Pesticides Management, 232 Golf Course Road, Warrensburg, NY 12885, (518) 623-1200.

4. **Permit Modifications, Suspensions and Revocation by the Department** The Department reserves the right to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

   a. materially false or inaccurate statements in the permit application or supporting papers;

   b. failure by the permittee to comply with any terms or conditions of the permit;

   c. exceeding the scope of the project as described in the permit application;

   d. newly discovered material information or a material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of the existing permit;

   e. noncompliance with previously issued permit conditions, orders of the commissioner, any provisions of the Environmental Conservation Law or regulations of the Department related to the permitted activity.

5. **Permit Transfer** Permits are transferrable unless specifically prohibited by statute, regulation or another permit condition. Applications for permit transfer should be submitted prior to actual transfer of ownership.

VIII. NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification
The permittee expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, and agents ("DEC") for all claims, suits, actions, and damages, to the extent attributable to the permittee's acts or omissions in connection with the permittee's undertaking of activities in connection with, or operation and maintenance of, the facility or facilities authorized by the permit whether in compliance or not in compliance with the terms and conditions of the permit. This indemnification does not extend to any claims, suits, actions, or damages to the extent attributable to DEC's own negligent or intentional acts or omissions, or to any claims, suites, or actions naming the DEC and arising under Article 78 of the New York Civil Practice Laws and Rules or any citizen suit or civil rights provision under federal or state laws.

Item B: Permittee's Contractors to Comply with Permit
The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits
The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights
This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.

By acceptance of this permit, the permittee agrees that failure to comply with the permit terms and all New York State Department of Environmental Laws, Rules and Regulations subjects the permittee to prosecution under these laws, and will be deemed sufficient reason for denial of future permit applications.

Issuing Officer's Signature: B. P.
Brian Primeau
Pesticide Control Specialist 2

Issue Date: **April 20, 2023**

Expiration Date: **December 31, 2023**

2023 EURASIAN WATERMILFOIL TREATMENT AREAS

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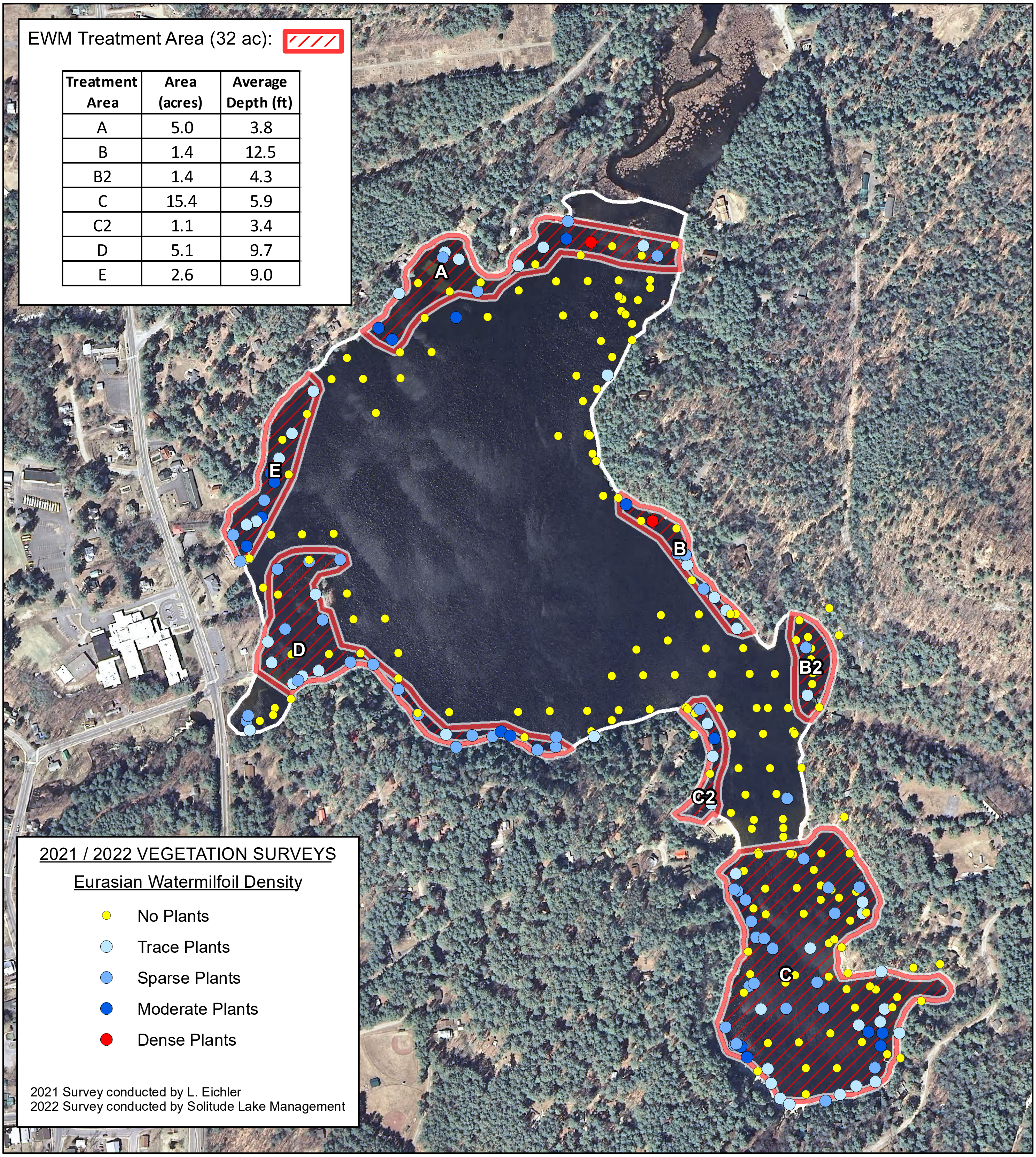
solitudelakemanagement.com



EWM Treatment Area (32 ac):

Treatment Area	Area (acres)	Average Depth (ft)
A	5.0	3.8
B	1.4	12.5
B2	1.4	4.3
C	15.4	5.9
C2	1.1	3.4
D	5.1	9.7
E	2.6	9.0

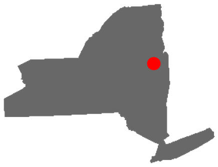
2021 / 2022 VEGETATION SURVEYS

Eurasian Watermilfoil Density

- No Plants
- Trace Plants
- Sparse Plants
- Moderate Plants
- Dense Plants

2021 Survey conducted by L. Eichler
2022 Survey conducted by Solitude Lake Management

Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°



LAKE LUZERNE

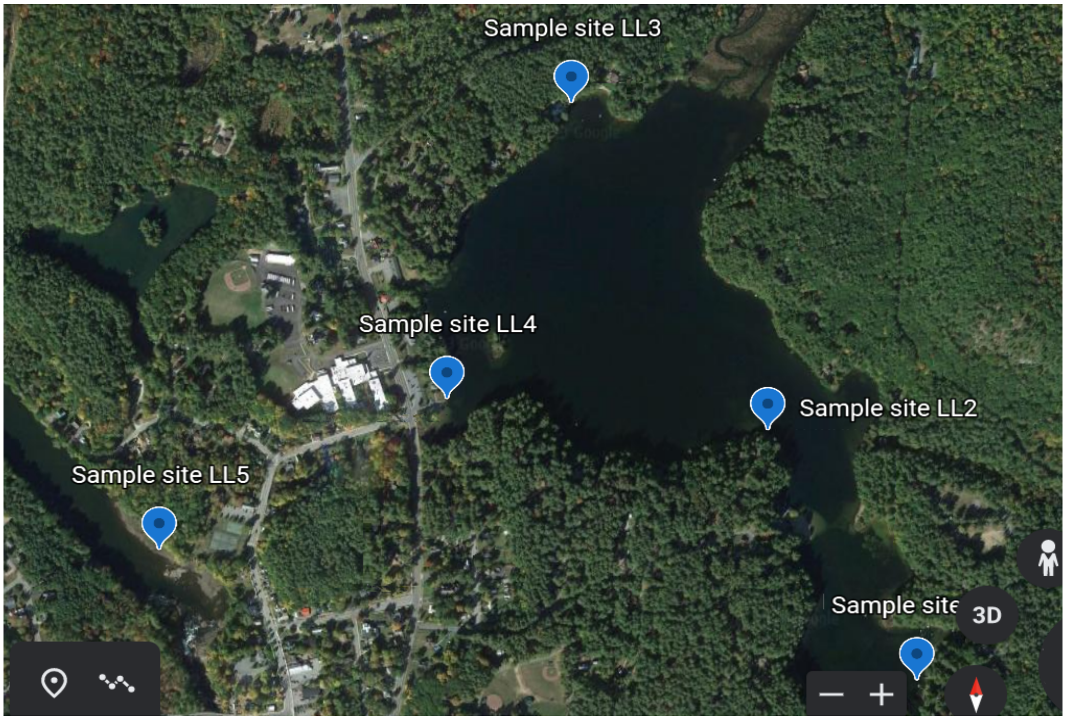
1:6,800

0 130 260 520 Feet

Date Saved: 1/17/2023
File: Luzerne23_TA
Prepared by: KM
Office: Washington, NJ

Lake Luzerne 2023 ProcellaCOR EC Sampling Plan

Sample sites
The location of the sample sites are shown on the map below.



Sample Site coordinates

Site 1 - 43°19’03”N, 73°49’39”W
Site 2 - 43°19’18”N, 73°49’50”W
Site 3 - 43°19’37”N, 73°50’05”W
Site 4 - 43°19’19”N, 73°50’14”W
Site 5 - 43°19’12”N, 73°50’36”W

Collection schedule
After application, samples will be collected at each site on the following schedule:

1-3 hours,10-12 hours,~24 hours ,3 days and 7 days

Samples at each site will continue to be collected every 7-14 days until lab analysis confirms that the ProcellaCOR EC concentration is below 1 ppb in all of the samples collected during a single sampling event. If results from all samples collected 3 days after application are below 1ppb, sampling will not be conducted 7 days after application.

Sampling protocol
The following manufacturer sampling protocol will be followed: For ProcellaCOR FasTEST use the clear glass vial to collect the sample. Submerge the bottle upside down until elbow deep. Cap the clear glass vial underwater. The contents of the clear vial should be transferred to the amber glass vial until completely filled to preserve the sample. Place the amber vial in bubble wrap sleeve to protect the glass vial during shipping, and overnight all samples to SePRO’s SRTC lab in Whitakers, NC. If samples are collected on a Friday, store samples in a refrigerated area, and ship samples on Monday.

Cross-contamination prevention
Each sample collected contains two bottles - one unpreserved bottle for collection and one preserved bottle for transfer and shipping. Once used, collection bottles are not reused for other sample sites.

2021 / 2022 AQUATIC VEGETATION RICHNESS

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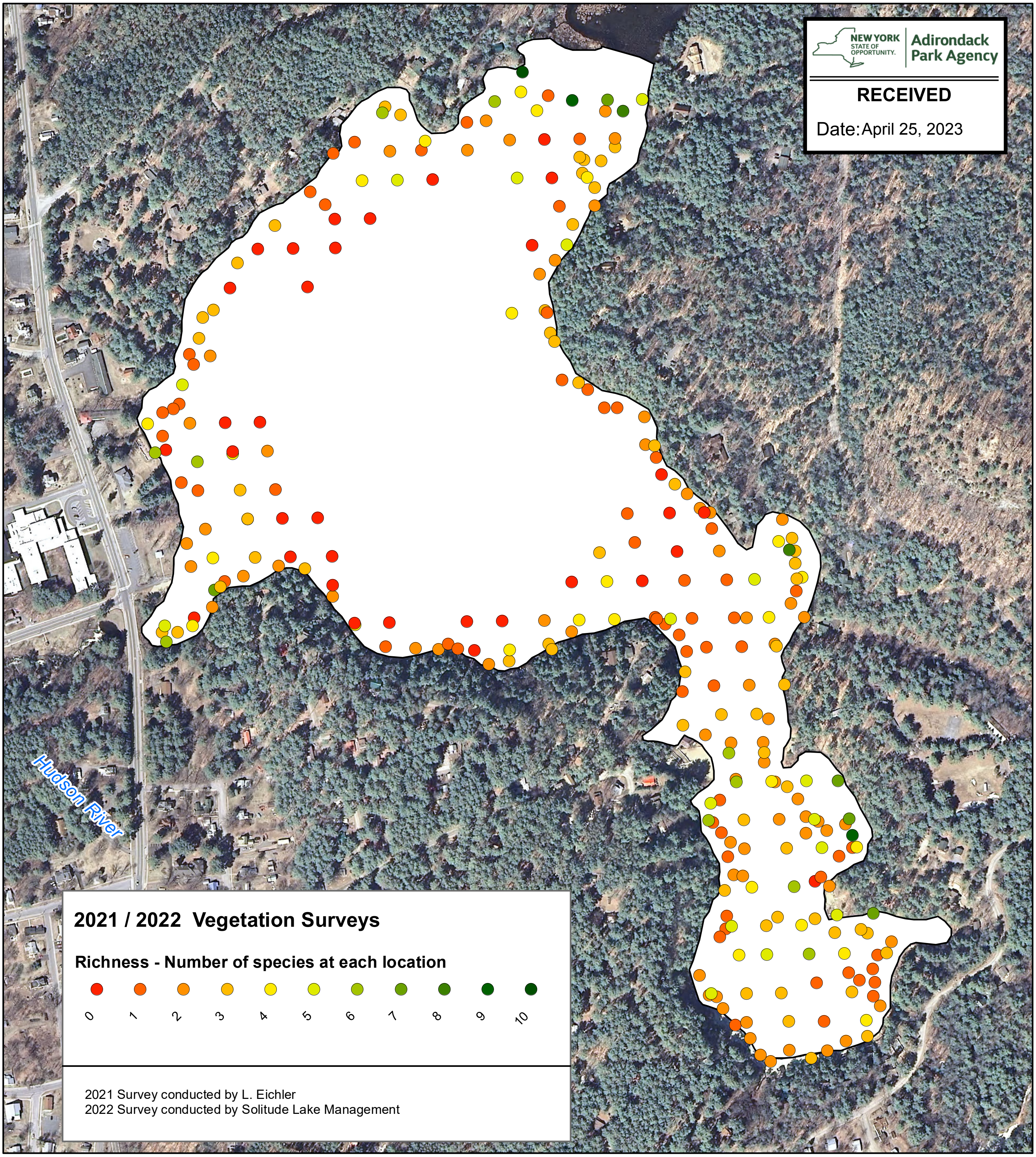
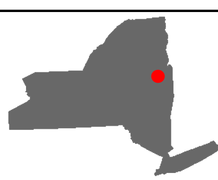


Lake Luzerne
Town of Lake Luzerne
[Warren County]
43.323048°, -73.833281°



LAKE LUZERNE

1:6,070

0 115 230 460 Feet

Date Saved: 4/25/2023
File: Luzerne23_Richness
Prepared by: KM
Office: Washington, NJ

Lake Luzerne Milfoil

	Date	LBS	Date	LBS	Date	LBS	Date	LBS
	7/5/2017	380	6/21/2018	680	6/17/2019	1960	6/2/2020	45
	7/11/2017	300	6/28/2018	960	6/25/2019	1380	6/22/2020	1220
	7/13/2017	340	7/9/2018	580	7/9/2019	1860	7/1/2020	1760
	7/18/2017	100	7/16/2018	1280	7/12/2019	1300	7/13/2020	1800
	7/19/2017	200	7/23/2018	1120	7/22/2019	1900	7/26/2020	1740
	7/21/2017	40	7/30/2018	1200	7/27/2019	1700	8/11/2020	1680
	7/27/2017	260	8/6/2018	1240	8/6/2019	1880	10/13/2020	1960
	7/29/2017	400	8/13/2018	1260	8/12/2019	1440		
	8/1/2017	320	8/19/2018	1120	8/21/2019	1620		
	8/2/2017	360	8/29/2018	1180	8/27/2019	1260		
	8/3/2017	140	9/6/2018	1300				
****	8/5/2017	620	9/18/2018	1300				
	8/10/2017	2280	9/21/2018	1500				
	8/16/2017	2300	9/26/2018	1040				
	8/18/2017	1020						
	8/19/2017	900						
	8/22/2017	980						
	8/24/2017	860						
	8/27/2017	280						
	8/29/2017	1360						
	8/30/2017	1600						
	8/31/2017	1340						
	9/1/2017	420						
	9/14/2017	1940						
	9/15/2017	2680						
	9/20/2017	980						
	9/22/2017	2000						
	9/26/2017	1320						
Totals		25720		15760		16300		

Lake Luzerne Milfoil

	Date	LBS	Date	LBS	Date	LBS	Date	LBS
	7/5/2017	380	6/21/2018	680	6/17/2019	1960	6/2/2020	45
	7/11/2017	300	6/28/2018	960	6/25/2019	1380	6/22/2020	1220
	7/13/2017	340	7/9/2018	580	7/9/2019	1860	7/1/2020	1760
	7/18/2017	100	7/16/2018	1280	7/12/2019	1300	7/13/2020	1800
	7/19/2017	200	7/23/2018	1120	7/22/2019	1900	7/26/2020	1740
	7/21/2017	40	7/30/2018	1200	7/27/2019	1700	8/11/2020	1680
	7/27/2017	260	8/6/2018	1240	8/6/2019	1880	10/13/2020	1960
	7/29/2017	400	8/13/2018	1260	8/12/2019	1440		
	8/1/2017	320	8/19/2018	1120	8/21/2019	1620		
	8/2/2017	360	8/29/2018	1180	8/27/2019	1260		
	8/3/2017	140	9/6/2018	1300				
****	8/5/2017	620	9/18/2018	1300				
	8/10/2017	2280	9/21/2018	1500				
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	8/19/2017	900						
	8/22/2017	980						
	8/24/2017	860						
	8/27/2017	280						
	8/29/2017	1360						
	8/30/2017	1600						
	8/31/2017	1340						
	9/1/2017	420						
	9/14/2017	1940						
	9/15/2017	2680						
	9/20/2017	980						
	9/22/2017	2000						
	9/26/2017	1320						
Totals		25720		15760		16300		

SŌLITUDE
LAKE MANAGEMENT

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency
RECEIVED
Date: May 1, 2023

Minerva Lake
2022 Vegetation Survey and Mapping

Photo taken on 08/11/2021

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Introduction

Since 2019, Minerva Lake, located in Minerva, New York, has contracted SOLitude Lake Management for aquatic plant management purposes. In 2019, a preliminary survey was conducted to inform 2020 management primarily of Eurasian watermilfoil (*Myriophyllum spicatum*), an invasive species. Subsequently, in 2020, a 41-acre treatment of Procellacor™ EC was applied to select sections of Minerva Lake. Both the fall 2020 and summer 2021 surveys concluded the treatments were effective, in which complete control of the species was achieved with 0% species abundance. Due to the 2020 success, no treatments were scheduled for 2022.

In addition to management efforts, SOLitude Lake Management has performed annual vegetation surveys and subsequent distribution and abundance mapping. Surveys aim to determine both the species and amount of species present. Mapping is a visualization tool used to spatially reference these two factors in relation to treatment areas and/or the extent of the lake. Because Eurasian watermilfoil is no longer a concern, the results of the surveys and the maps now primarily serve as measures of healthy, native species assemblages and their locations within Minerva Lake.

Vegetation Survey

Summary of Results

- Only small amounts of Eurasian watermilfoil observed
    - Located in the eastern outlet end of the lake.
- 2 invasive species observed
    - Brittle Naiad (*Najas minor*) at four points at trace to sparse densities
    - Eurasian watermilfoil only trace amounts in a few scattered locations
- Vegetation found at every sample point
    - Waterweed (*Elodea spp.*) most abundant - 71%
    - Southern naiad (*Najas guadalupensis*) second most abundant - 68%
- 48% of vegetation had trace or sparse abundance; 52% had moderate to dense abundance

Survey Methodology

A Point-Intercept survey was conducted on August 9, 2022.

The Point-Intercept Method (PIM) of macrophyte sampling is designed to determine the extent of aquatic growth within an area of concern. The total number of sample locations is typically based on the total acreage of the lake, where one sample location per acre is surveyed at a given site.

Generally, deeper water areas (total depth greater than 20 feet) are not surveyed due to the lack of aquatic macrophyte growth caused by poor light penetration. A total of 82 established sample locations have been repeated annually since 2019. Both a handheld and Lowrance GPS unit were used to geo-reference each data point in the field.

During the survey, each predetermined georeferenced point was accessed by a 14 foot flat-bottomed boat in a feasible locational order. At each point, a single rake toss was executed at each site. The following data was collected for each rake toss: overall submersed aquatic plant abundance, overall floating-leaf species abundance, relative submersed and floating-leaf plant abundance for each species per sample site, and any other pertinent field notes regarding the sample location.

The Rake Toss Methodology, developed by the US Army Corps of Engineers and modified by Cornell University has been consistently used for this survey since its conception in 2019. The abundance scale defined by this methodology was used to categorize the observed macrophyte growth for each rake toss. Overall cover is also assessed at each sample location, which is defined as the percentage of bottom sediments obscured by vegetation. In general, an area in which no sediments are visible is classified at 100% cover and so on.[1]

Notation	Description	Overall Abundance
Z	*Zero*: no plants on rake	*0%*
T	*Trace*: fingerful on rake	*1-25%*
S	*Sparse*: handful on rake	*26-50%*
M	*Moderate*: rakeful of plants	*51-75%*
D	*Dense*: difficult to bring into boat	*76-100%*

Any macrophyte specimen requiring further identification was collected and identified offsite.

Documenting the presence of aquatic plants at species surveyed locations is an unbiased measure of how the aquatic plant assemblage changes from year to year, while also accounting for viability of the environment and limitations of sampling methods available. The records can be used to create a Frequency of Occurrence (FOO) percentage value for the individual

[1] Revised 03/2022

macrophyte species encountered from 2019-2022 (**Table 2**). FOO does not account for changes in abundance, only presence or absence relative to vegetation.

The Project Manager made a few observations during a leisure kayak around the lake and found a few locations with single or only a small amount of Eurasian watermilfoil stems during the week of August 21st, after the Point-Intercept survey was conducted. These findings were consistent with the Point-Intercept survey in that only a few stems of watermilfoil were observed during each event. These sites can be observed in Figure 2, along with the observations from the Point-Intercept survey on August 9th.

Survey Results

Results of each survey are displayed in the following figures and tables. Raw data is located in Appendix 1. In addition, maps of each species documented can be found in Appendix 2. These maps display the distribution and density of each plant at each sample site with spatial reference to the entire lake.

Table 1: Aquatic macrophyte distribution and % Frequency of Occurrence (%FOO) on August 9, 2022.

Aquatic Macrophyte	Total		Trace		Sparse		Moderate		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	82									
SUBMERSED VEGETATION ABUNDANCE	81	99%	10	12%	29	36%	31	38%	11	14%
NODDING NAIAD	35	43%	5	14%	23	66%	7	20%	0	0%
WATERWEED	58	71%	29	50%	18	31%	9	16%	2	3%
FLAT-STEMMED PONDWEED	53	65%	17	32%	33	62%	3	6%	0	0%
LARGE-LEAF PONDWEED	35	43%	3	9%	17	49%	15	43%	0	0%
BERCHTOLD'S PONDWEED	12	15%	10	83%	2	17%	0	0%	0	0%
THIN-LEAF PONDWEED	6	7%	0	0%	2	33%	4	67%	0	0%
RIBBON-LEAF PONDWEED	6	7%	3	50%	1	17%	2	33%	0	0%
MACRO-ALGA	20	24%	2	10%	14	70%	4	20%	0	0%
SOUTHERN NAIAD	56	68%	6	11%	27	48%	23	41%	0	0%
SAGO PONDWEED	9	11%	3	33%	5	56%	1	11%	0	0%

FLOATING-LEAF PONDWEED	3	4%	0	0%	2	67%	0	0%	1	33%
BRITTLE NAIAD	4	5%	2	50%	2	50%	0	0%	0	0%
VASEY'S PONDWEED	11	13%	7	64%	4	36%	0	0%	0	0%
FLAT-STALKED PONDWEED	18	22%	3	17%	14	78%	1	6%	0	0%
GRASSY/VARIABLE-LEAF PONDWEED	1	1%	0	0%	1	100%	0	0%	0	0%
ROBBINS' PONDWEED	4	5%	2	50%	1	25%	0	0%	1	25%
BLUNT-LEAVED/OBTUSE PONDWEED	2	2%	2	100%	0	0%	0	0%	0	0%
EURASIAN WATERMILFOIL	2	2%	2	100%	0	0%	0	0%	0	0%
COMMON BLADDERWORT	2	2%	2	100%	0	0%	0	0%	0	0%
QUILLWORT SPP.	2	2%	2	100%	0	0%	0	0%	0	0%
FILAMENTOUS ALGAE	1	1%	0	0%	0	0%	1	100%	0	0%
FLOATING VEGETATION ABUNDANCE										
WHITE WATERLILY	17	21%	5	29%	9	53%	0	0%	0	0%
WATERSHIELD	17	21%	4	24%	10	59%	3	18%	0	0%
YELLOW WATERLILY	9	11%	5	56%	3	33%	1	11%	0	0%

*Red indicates invasive species

Table 2: 4 Year Change in common species abundance from 2019-2022.

COMMON NAME	SCIENTIFIC NAME	2019	2020	2021	2022	CHANGE
Eurasian watermilfoil	*Myriophyllum spicatum*	66%	0%	0%	2%	Decrease
Common waterweed	*Elodea spp.*	60%	63%	74%	71%	Increase
Flat-stem pondweed	*Potamogeton zosteriformis*	50%	54%	59%	65%	Increase
Southern naiad	*Najas guadalupensis*	41%	60%	10%	68%	Increase

Macro-algae	*Chara/Nitella spp.*	38%	48%	23%	24%	Negligible
Thin-leaf pondweed	*Potamogeton pusillus*	44%	21%	33%	16%	Decrease
Watershield	*Brasenia schreberi*	37%	26%	20%	21%	Decrease
Bassweed/Large-leaf pondweed	*Potamogeton amplifolius*	30%	37%	52%	43%	Increase
Ribbon-leaf pondweed	*Potamogeton epihydrus*	18%	34%	28%	7%	Decrease
Northern naiad (2019) Slender naiad (2020, 2021)	*Najas gracillima*	17%	9%	2%	0%	Decrease
Slender naiad (2019) Nodding naiad (2020, 2021)	*Najas flexilis*	16%	35%	82%	43%	Increase

Survey Discussion

Plant Abundance, Distribution, and Frequency of Occurrence

Macrophytes were well distributed throughout the lake, occurring at all but one sample point. The majority of plant cover comes from submersed macrophytes. Rooted macrophytes are beneficial because they sequester carbon dioxide and nutrients, create habitats, and provide food for aquatic grazers such as fish and aquatic insects.

Only two trace observances of Eurasian watermilfoil were noted during the formal Point-Intercept survey (Figure 2). The location was in between two sample points, and therefore, was not sampled. Given the maturity of the plants, this stem likely emanated from an introduced or pre-existing fragment.

Plant abundance is the number of individual specimens per species, displayed in this report as percentages (**Table 1**). The most abundant species in 2022 was waterweed (*Elodea spp.*)(Figure 4), occurring at 71% (58 sites) of all survey points. While only 66% and 20% of sites had sparse and moderate amounts, respectively, the overall abundance trend indicates that this species will most likely continue to increase in abundance (Figure 2). Southern naiad (*Najas guadalupensis*) (Figure 11) was the second most abundant species, occurring at 68%, or 56 sample points. This was a decrease as compared to 2021 data.

In 2019, another naiad species was identified as slender naiad (*Najas gracillima*) but later corrected to nodding naiad (*Najas flexilis*) in 2020 (Image 1). In 2022, nodding naiad was present in the lake (Figure 14), occurring at 43% overall abundance, and slender naiad was not observed. For this reason, nodding naiad will remain *Najas flexilis* and slender naiad will remain *Najas gracillima*.

Image 1. Nodding Naiad (left) vs. Slender Naiad (right)

For the third year in a row, brittle naiad (*Najas minor*) (Figure 19), an invasive species, was documented. The plant's overall abundance was 5% occurring at 4 sites (**Table 1**). Of the locations, all were classified as trace and sparse abundances. These classifications are considered below nuisance levels. To compare to previous years, in 2020, the two sites where brittle naiad was documented had trace abundance with an overall abundance of 2%. Thus, there was a 4% overall abundance increase in 2021. The amounts have decreased again to 4% total abundance in 2022. See "Macrophyte Documentation" for more information on this and other species.

In 2022, 52% of sites present with submersed aquatic vegetation were designated with potentially nuisance abundances, categorized by moderate or dense. Conversely, 48% of sites were classified as trace or sparse. This designation determines that Minerva Lake does experience areas of abundant vegetation, but it seems to be a good balance between trace and dense areas around the lake. [2]

Despite an overall decrease in the most common macrophytes observed from 2019-2022 (**Table 2**), Southern naiad and waterweed species appear to be outcompeting other native, rooted, aquatic

[2] Revised 03/2022

macrophytes. Healthy, diverse systems typically have all niches filled such that there is no room for invaders, so this does not reflect poor balance.

Species Richness

Species richness, the number of species in a community, was counted at 21 identified species and three macroalgae species (**Table 1**). Within a community, the higher number of rooted aquatic macrophytes correlates to mesotrophic or eutrophic states of a given lake; however, this does not equate to poor health of Minerva Lake. Assigning an average to species richness, allows us to determine a standard number of species that occurred at each sample location. With that said, an average of 4.7 species were present at each sample site. A total of 10 species or more were identified at sample sites 18, 70, and 71. The average species richness indicates that a healthy assemblage of species exists throughout Minerva Lake.

Macrophyte Documentation

The following species are either newly present or were absent from the 2022 survey. Although brittle naiad (Najas minor) was reported as a new plant in 2020, it is included in the following text due to its substantiality as an invasive species.

Invasive species

New Macrophyte Species

No new macrophyte species were observed this year, but new species from previous years were once again observed after not being found in 2021.

Flat-stalked pondweed (*Potamogeton friesii),* quillwort (*Isoetes spp.*), and Berchtold's pondweed (*Potamogeton berchtoldii*) were not observed in 2021 but were observed again in 2022. It is not likely that populations were significantly impacted by the Procellacor™ EC treatment. Because they were growing at low density and overall abundance, it is possible the species has been outcompeted.

Plant absence

Alpine pondweed (*Potamogeton alpinus*), water stargrass (*Heteranthera dubia*), duckweed (*Lemna minor*), spikerush (*Eleocharis palustris*) were absent for the third year in a row. Historically, these species had low abundances and densities. It is not likely that populations were significantly impacted by the Procellacor™ EC treatment. It is possible that these species have been outcompeted and/or there are seasonal growth factors impeding observations.

Management Recommendations

It is recommended that Minerva Lake stakeholders remove the observed stems of Eurasian watermilfoil (*Myriophyllum spicatum*) using the hand-pulling method. This must be done with careful consideration that this species spreads by fragmentation.

Brittle naiad is the most concerning species given its spread between 2019-2022. Minerva Lake stakeholders should consider management options preventatively or if the condition progresses. Management is more cost effective and readily achievable if done before impairments to the waterbody begin.

<u>Physical Management</u>
Manual hand removal and mechanical harvesting have been used to remove brittle naiad; however, the species can spread by fragmentation.

<u>Biological Management</u>
No biological control known.

<u>Chemical Management</u>
Common products used to manage brittle naiad- diquat, diquat dibromide, endothall, and fluridone, are not permitted in the Adirondack Park.

Given the increase in Southern naiad (*Najas guadalupensis*) and common waterweed (*Elodea sp.*), Minerva Lake stakeholders should keep watch of the progression of spread and growth of this species. Generally, native growth is indicative of a healthy, balanced waterbody, though under certain conditions, native growth can become a problem from a management standpoint. Because these are both low-growing species, the concern would regard dense monocultures impairing the ecological balance and species richness, and thus function, of the lake. However, given the distribution of overall density rankings, moderate and trace abundance of all vegetation is currently at a self-managing level.

One of the most important aspects of management is educating and engaging in the public. This can be done through informational handouts, boat cleaning stations, mailers, kiosks, signs, and more. It is important that everyone follows the "Clean, Drain, Dry" rule for all watercraft, trailers, motors, and gear. This helps to ensure no species will be introduced or reintroduced into the system. Homeowners, recreational users, and other stakeholders of Lake Minerva should also be aware of common aquatic invaders so that there are more boots on the ground for early detection. Stories of success often come from lake associations that facilitate these efforts. It is recommended that Lake Minerva considers reenacting their lake association, as educating and engaging the public is the best way to prevent the invasion and spread of future aquatic invasive species.

Mapping

The following pages, Figures 1-22, contain depth, distribution, density and abundance maps for each species documented. Data was obtained from the GPS used on the Point-Intercept survey and processed using ArcPro GIS software.

Appendix A: Raw Data

Sample Point	Depth (ft)	Biovolume	%Cvr All	%CvrFlt	MS	PAMP	PROB	BFA	PBER	NMIN	ECAN	PVAS	PZOS	PFRIE	PNAT	LMIN	CH/NITE	POBT	NFLEX	ISO	PEPI	SPEC	NGRAC	NGUAD	PPUS	PGRAM	BS	NODO	NVAR	UMAC	Richness
1	9.0	3.0	40	0						S									S			T									
2	6.0	3.0	45	0		S					M							T													
3	11.0	2.0	60	0							T		T						M												
4	10.0	2.0	60	0							T								M												
5	4.5	3.0	75	0		M				S	S		S						M					M	S						
6	3.5	4.0	80	0				M			S						S		M					M		S					
7	11.0	3.0	35	0							M		T				S														
8	12.0	2.0	25	0							S		T				S							T							
9	6.5	2.0	30	0					T		S						S		T					S							
10	11.5	2.0	20	0							S		T				S							S							
11	11.0	2.0	35	0							S		S				S							S							
12	5.5	3.0	65	5					T		T	T												M				T			
13	8.5	3.0	65	0							T	T												M							
14	12.0	2.0	60	0									T				M														
15	11.0	2.0	35	0									T				S														
16	9.0	4.0	55	0		S							T											M							
17	13.0	3.0	55	0							S	S	T											M							
18	4.0	4.0	75	15	T	S	T			T	M	T	S				T			T				M							
19	13.0	3.0	55	0									M				S											T			
20	3.0	4.0	80	15		S					S		T				S		S					M			T	T			
21	11.0	1.0	15	0							T													T							
22	12.0	2.0	25	0							T		S																		
23	11.0	2.0	30	0							T		T											M							
24	11.5	2.0	50	0	T						T		T						S					M							
25	10.5	1.0	20	0							S						S														
26	6.5	4.0	45	15					T			T	S											M			S				
27	4.0	4.0	80	0		M						T	S											M							
28	2.0	NA																													
29	3.0	4.0	100	15							D		S														S	S			
30	3.0	4.0	100	30		M	S				S		S		D						S	M		M			M				
31	6.0	3.0	25	0							S		T											T							
32	9.0	2.0	20	0							T						S							S							
33	11.0	2.0	25	0							S		S						S					T							
34	11.0	2.0	25	0							T		T						T					T							
35	8.0	3.0	50	0							T		S						S					M							
36	7.0	3.0	60	0							S		S											M							
37	5.0	4.0	80	30								T	S									S		M			S	T			
38	9.0	3.0	40	0							T	T		S										S							
39	10.0	3.0	50	0							T								M					S							
40	5.0	4.0	55	5							S	S							S					M			T				
41	6.0	1.0	70	0													M														
42	6.0	3.0	65	0							M		T								T										
43	5.0	4.0	80	0		M					M	S	S											M							
44	7.0	4.0	70	0		M											S														
45	7.0	3.0	55	0															T					M							
46	8.0	2.0	35	0					T		T		T											S							
47	8.5	2.0	30	0							T		T						S					S							
48	8.0	2.0	30	0															S					S							
49	5.0	4.0	90	30															S					M	M		M	T			
50	6.0	3.0	75	0		S			S		T		S	T					T					S							
51	7.5	4.0	65	20							T		S	S					S			S		M			S	S			
52	7.5	3.0	30	0							T		S	S										S							
53	8.0	3.0	25	0							T		S	S																	
54	8.0	3.0	35	0					T		T		M	M										S							
55	5.5	4.0	65	0		M							T																		
56	5.0	4.0	70	0		M							S						S					S							
57	4.0	4.0	65	15		M							S											S	M				S		
58	4.0	4.0	70	10		M					S													S	M				S		
59	2.5	4.0	30	10		S																			S		S				
60	4.5	3.0	50	0		M					T		S											S							
61	5.0	3.0	30	0		S								T				T													
62	7.0	3.0	50	0		T					T		S	S					T					S							
63	3.0	2.0	40	0									S	S					S					M							
64	4.0	4.0	50	10		T			T		T		S	S					S			T		S				S			
65	3.5	4.0	60	40		T				T	S		S						S	T				S				S			
66	7.0	3.0	65	0													M														
67	6.0	4.0	65	30		S					S		S	S					S					M			T	S	T		

Sample Point	Depth (ft)	Biovolume	%Cvr All	%CvrFlt	MS	PAMP	PROB	BFA	PBER	NMIN	ECAN	PVAS	PZOS	PFRIE	PNAT	LMIN	CH/NITE	POBT	NFLEX	ISO	PEPI	SPEC	NGRAC	NGUAD	PPUS	PGRAM	BS	NODO	NVAR	UMAC	Richness
68	5.0	4.0	70	20					T		M		S	S										S			S	T			
69	5.0	4.0	35	10									S				S				T						T	S			
70	5.5	4.0	75	40		M			S		M			S	S		S		S		M			S			S	S			
71	3.0	4.0	100	40		S			T		D		M		S				S		T	T					S	S	T	T	
72	4.5	4.0	30	10		S					T						T												T		
73	6.0	3.0	35	0		S					T		S	S					S					S							
74	4.0	3.0	55	0		M			T		T			T					S					S							
75	3.0	2.0	65	0		S					T						M		M		M										
76	1.5	4.0	40	60		S							S						S			S					S		M		
77	1.5	4.0	40	40		S	T				M		S									S					M		S		
78	5.5	3.0	35	0		M					S			S					S					T							
79	6.0	3.0	65	0		S			T		T		S	S					S					S						T	
80	6.5	4.0	100	25		S	D																	S			S	S	T		
81	2.5	4.0	55	10		S					T	S	S	S					S					S				T			
82	2.5	4.0	100	45		M					M		S						M			S		S	M			T	T		

Appendix B: Vegetation Maps

FIGURE 1: Data Points and Depth

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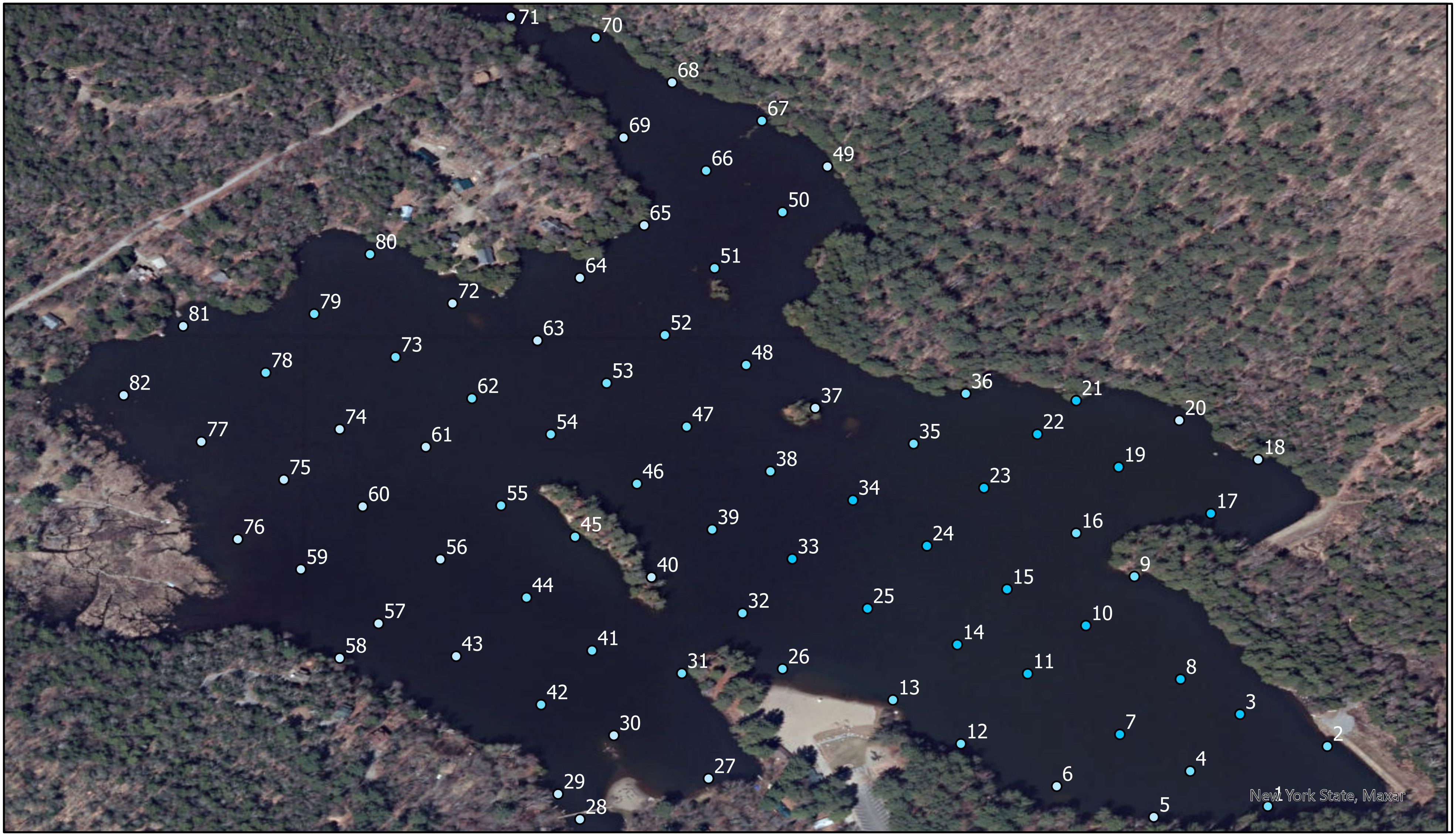
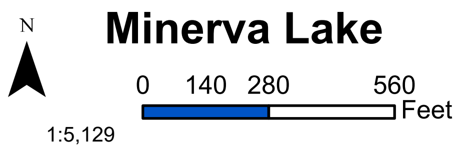


Minerva Lake
Minerva, NY
Essex County

Minerva Lake



Legend

Depth (ft)

- 0-5
- 5-10
- 10+

Map Date: 12/30/2022
File: Minerva22
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 2: Eurasian watermilfoil (*Myriophyllum spicatum*)
Distribution, Density, and Abundance

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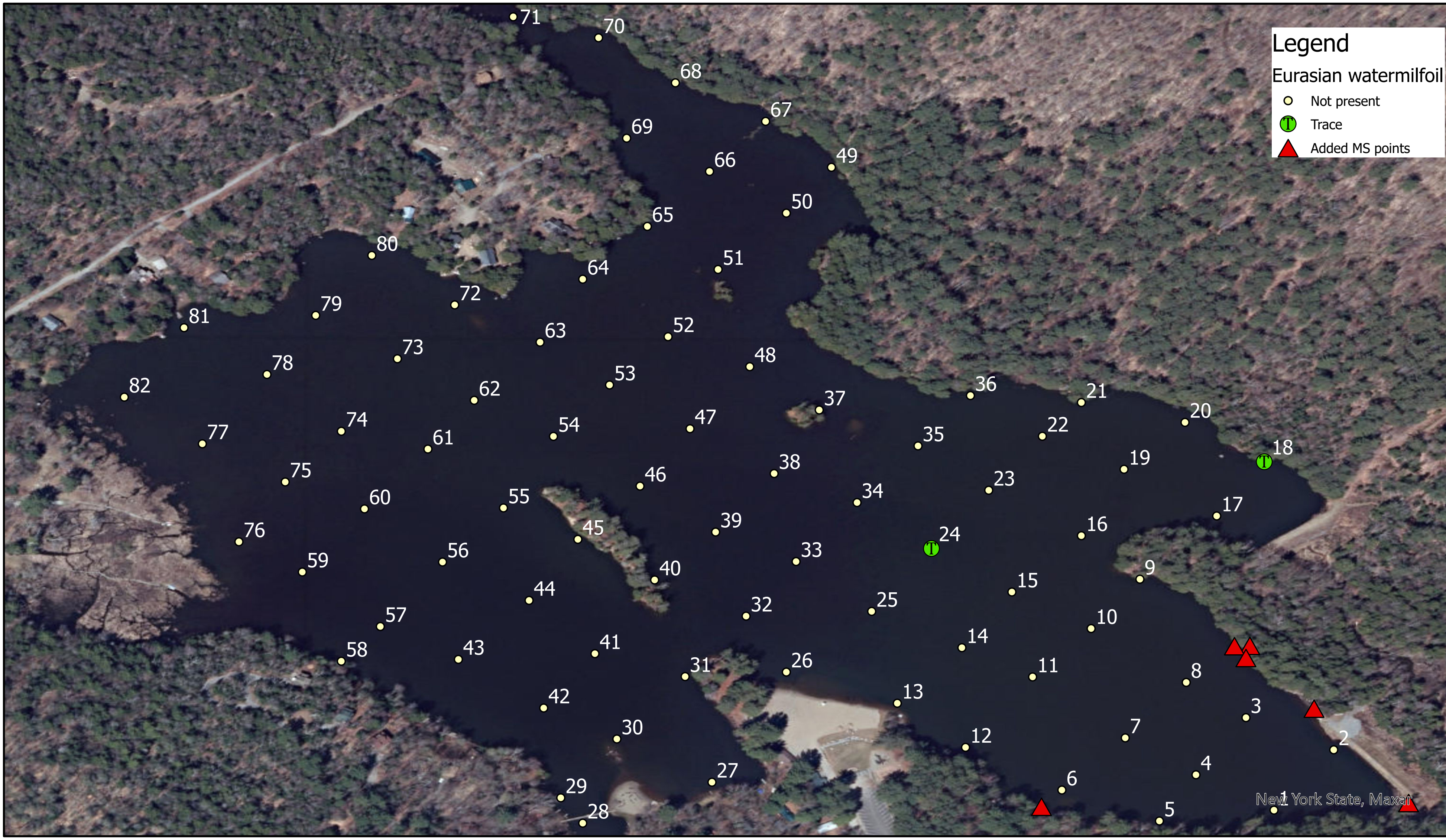

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/5/2023
File: Minerva22_2
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 3: Watershield (*Brasenia schreberi*) Distribution, Density, and Abundance

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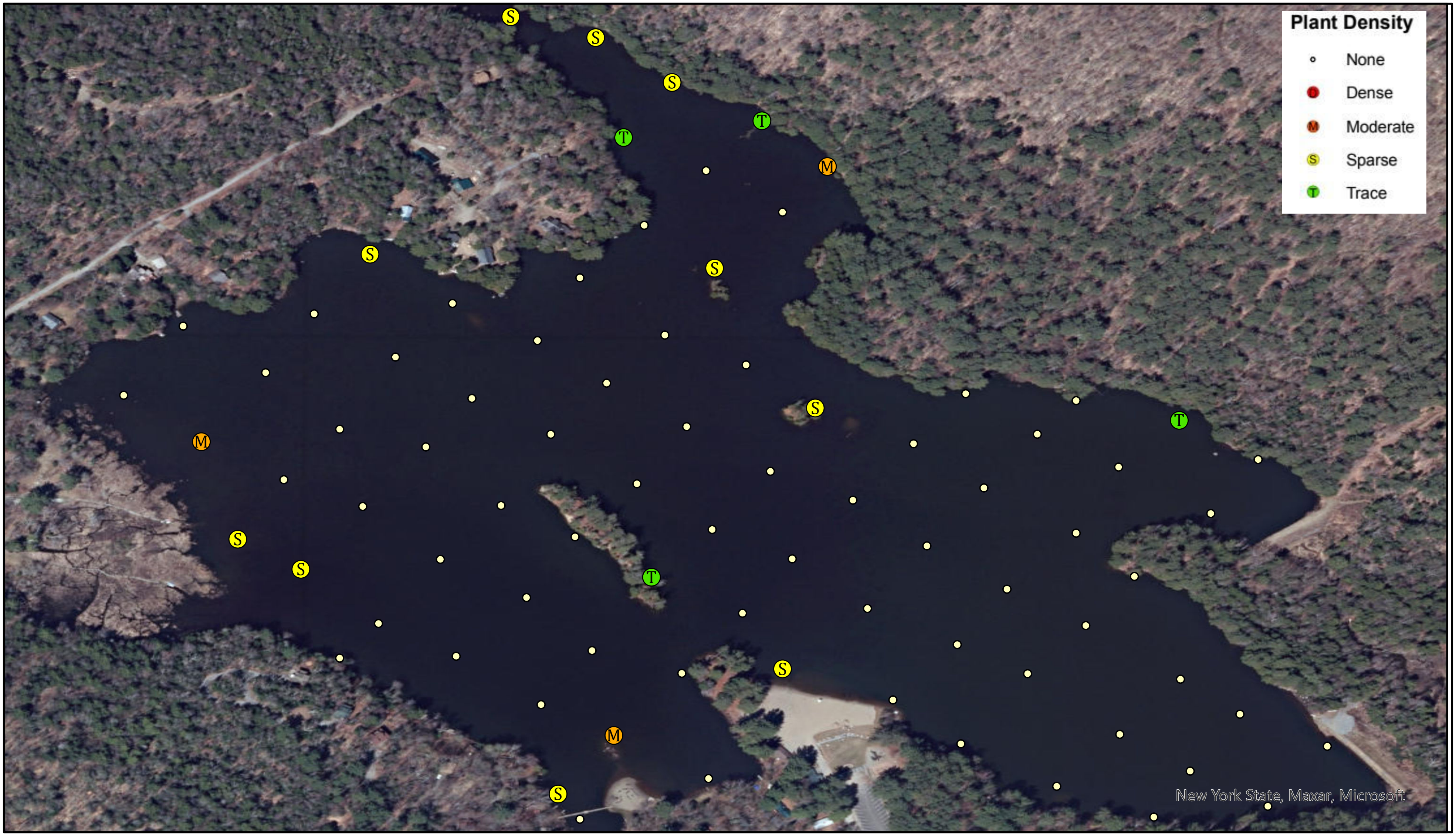

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 12/30/2022
File: Minerva22_3
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 4: Common waterweed (*Elodea canadensis*)
Distribution, Density, and Abundance

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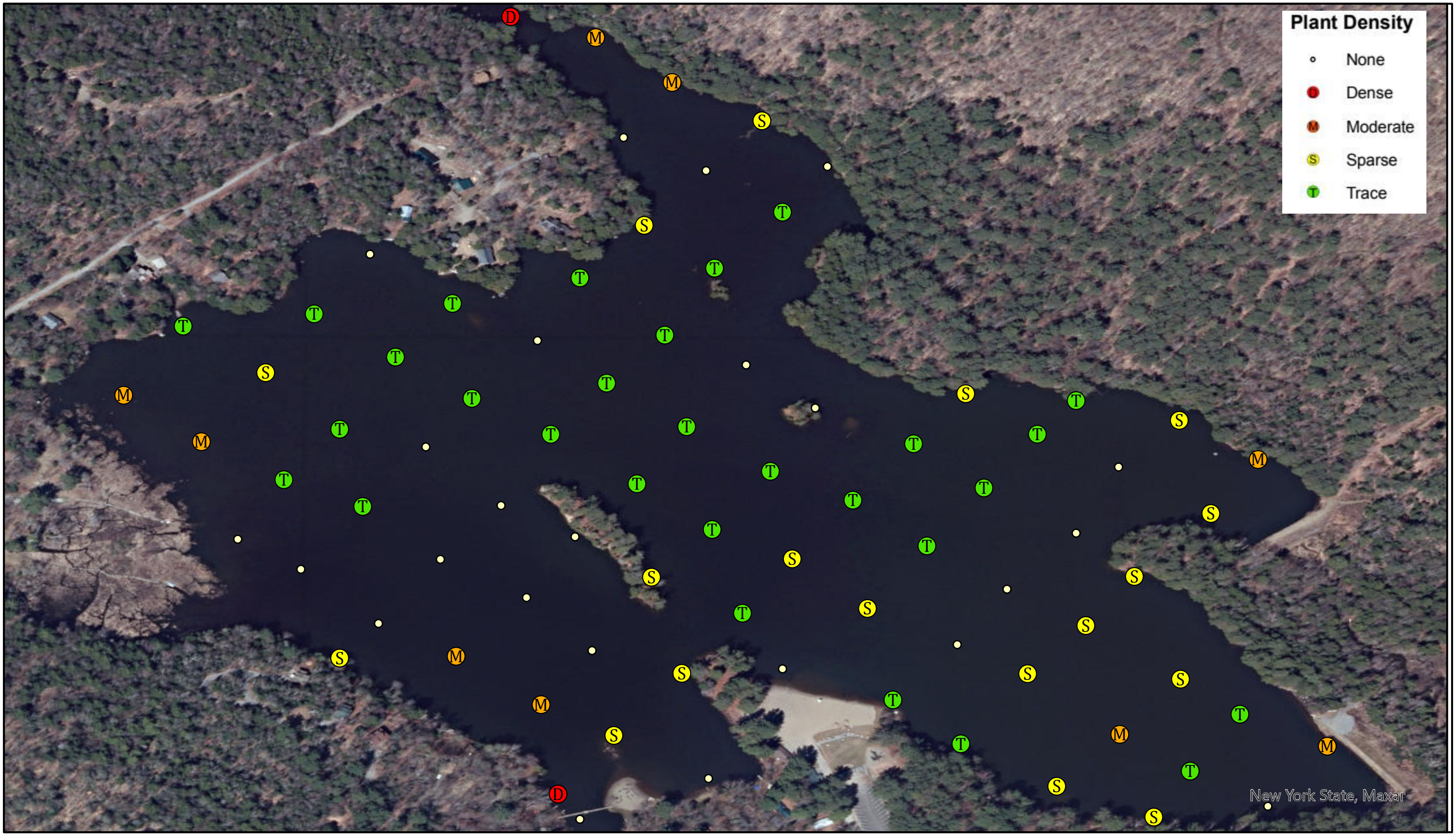

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 12/30/2022
File: Minerva22_4
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 5: Flat-stemmed pondweed(*Potamogeton zosteriformis*)
Distribution, Density, and Abundance

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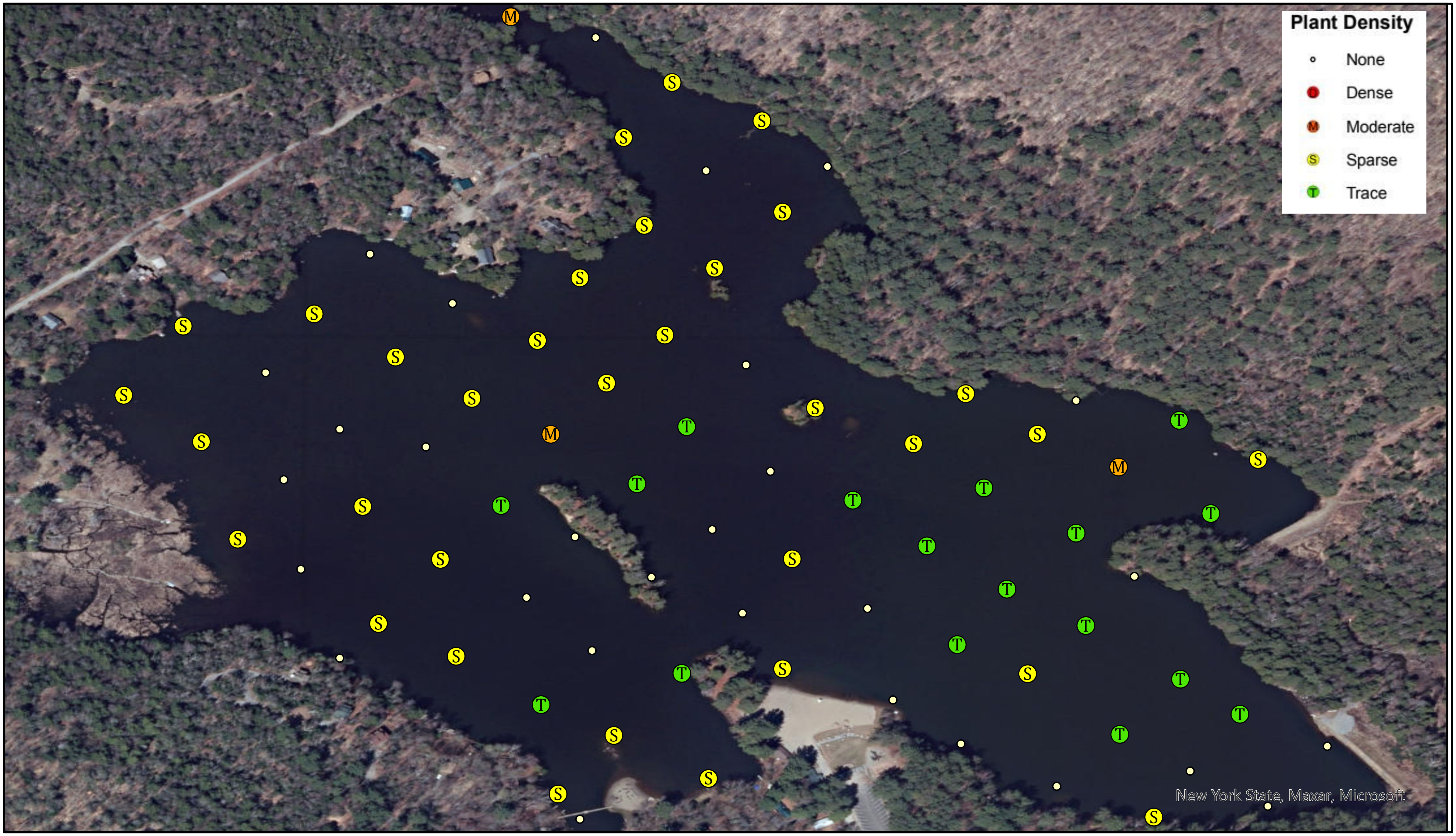

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560
Feet

Map Date: 12/30/2022
File: Minerva22_5
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 6: Slender naiad (*Najas gracillima*)
Distribution, Density, and Abundance

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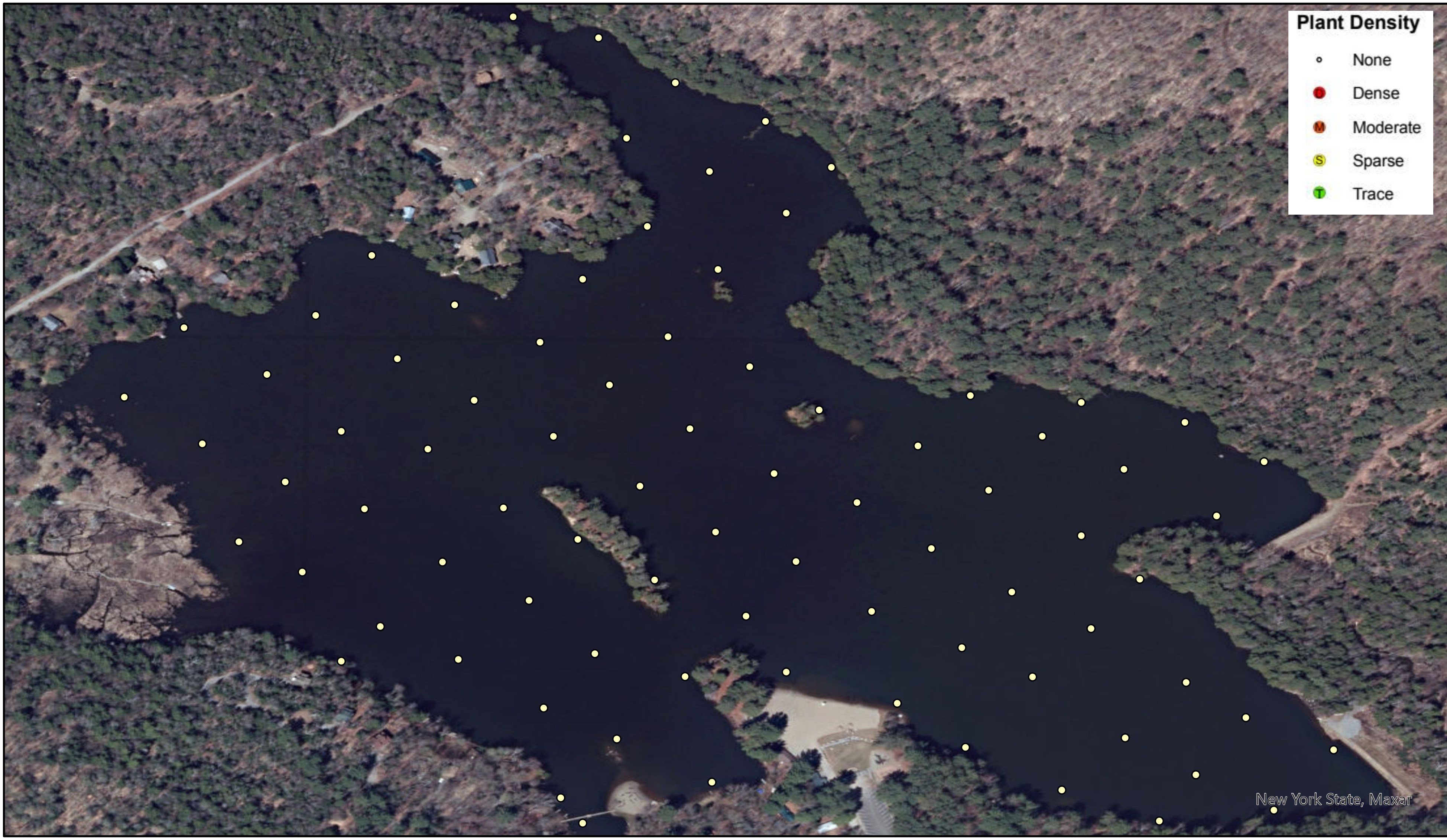

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 12/30/2022
File: Minerva22_6
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 7: Macroalgae (*Chara/Nitella spp.*)
Distribution, Density, and Abundance

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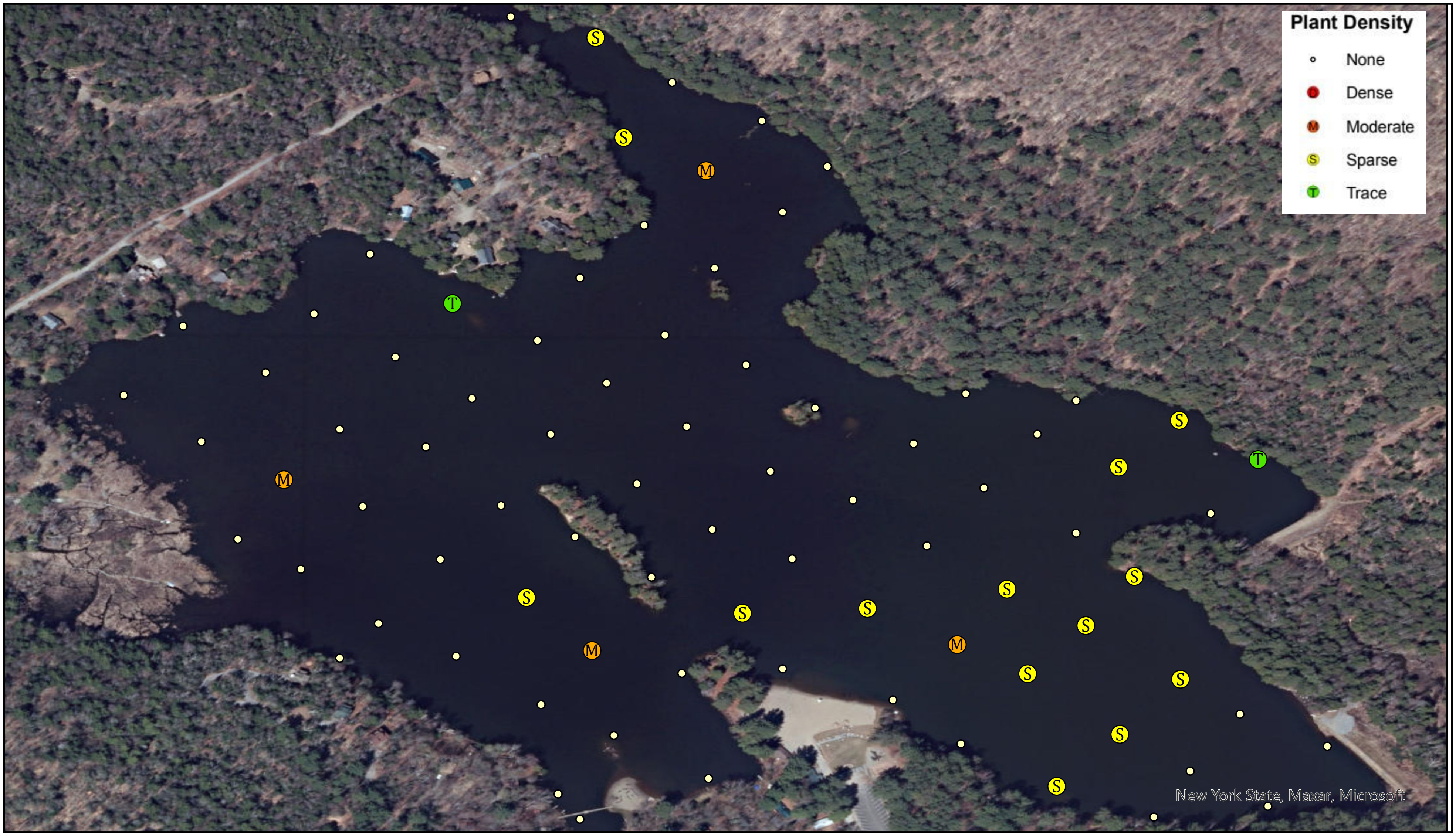
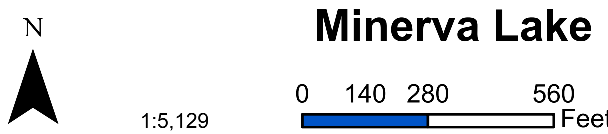


Minerva Lake
Minerva, NY
Essex County

Minerva Lake



Map Date: 12/30/2022
File: Minerva22_7
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 8: Big-leaf pondweed (*Potamogeton amplifolius*)
Distribution, Density, and Abundance

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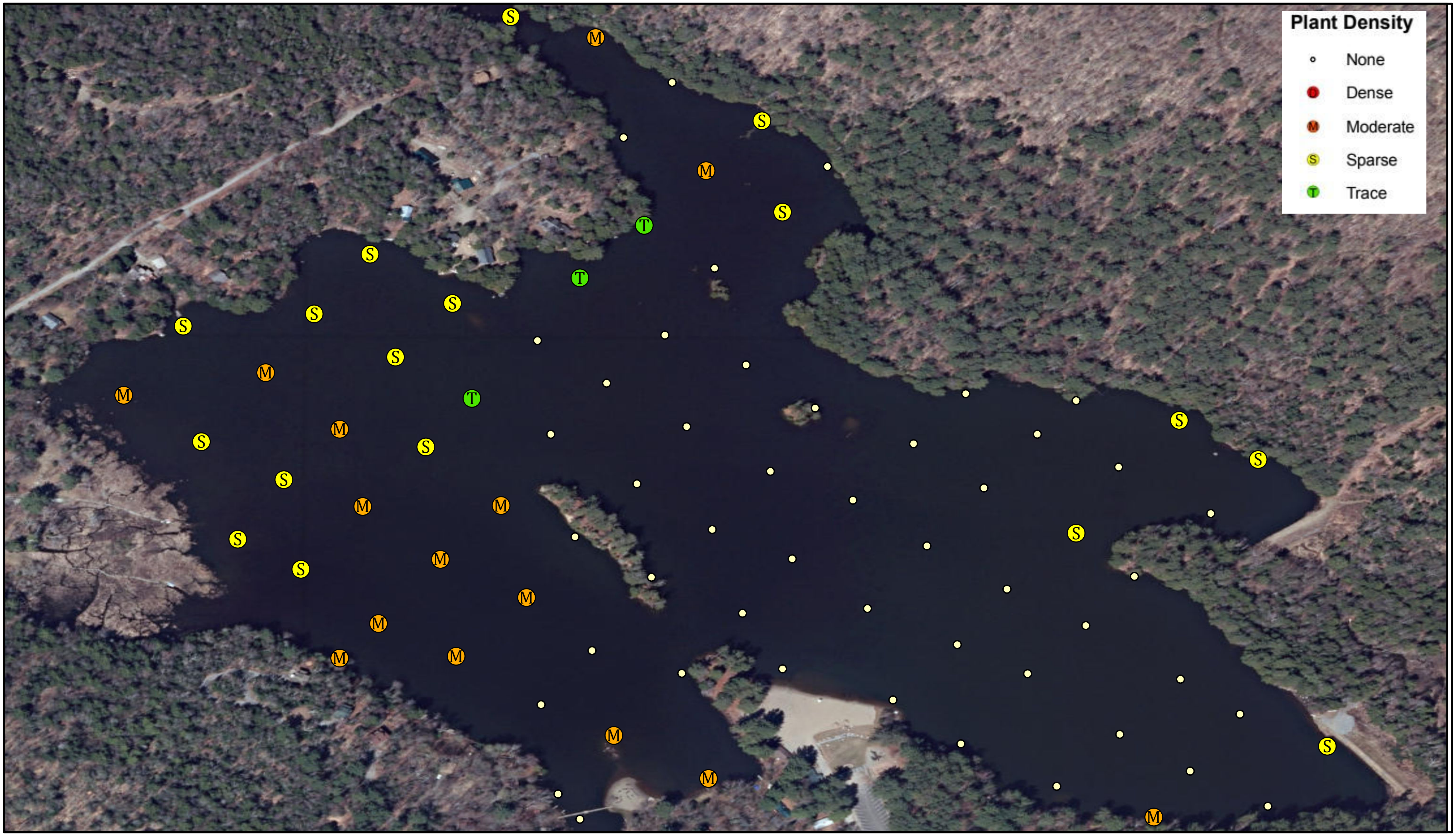

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 12/30/2022
File: Minerva22_8
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 9: White water-lily (*Nymphaea odorata*)
Distribution, Density, and Abundance

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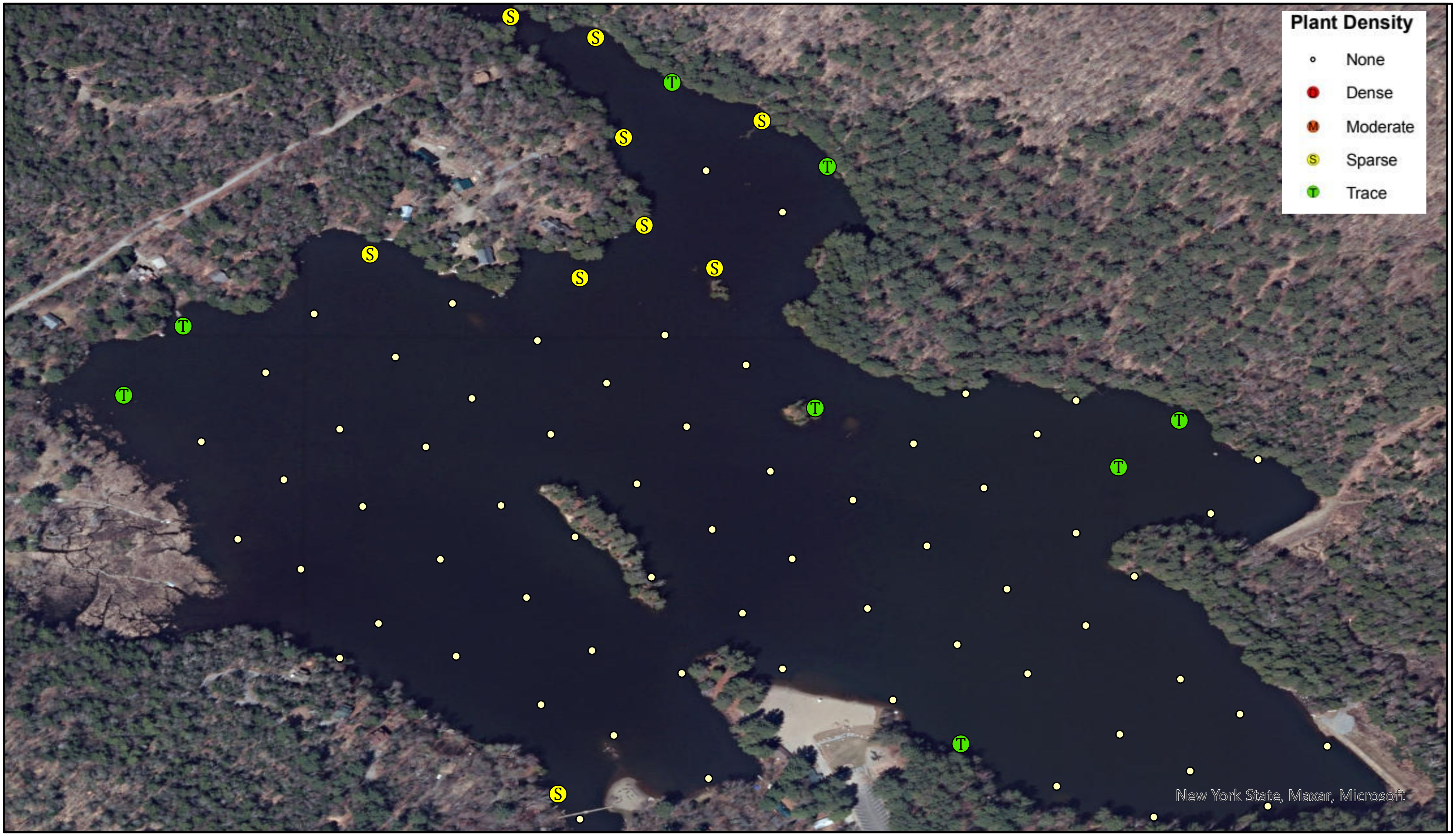

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560
Feet

Map Date: 12/30/2022
File: Minerva22_9
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 10: Variable-leaf pondweed (*Potamogeton gramineus*)
Distribution, Density, and Abundance

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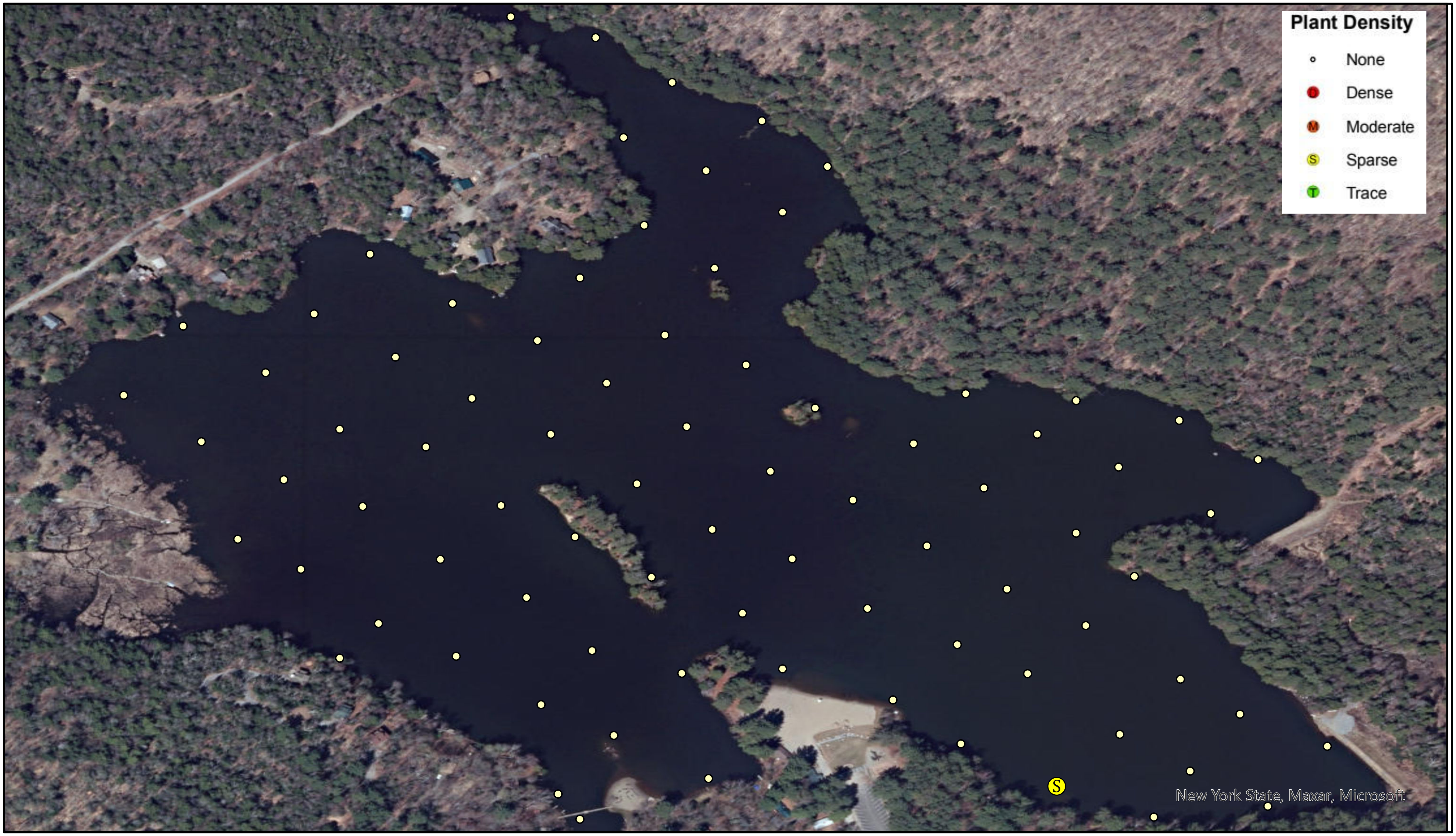

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 12/30/2022
File: Minerva22_10
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 11: Southern naiad (*Najas guadalupensis*)
Distribution, Density, and Abundance

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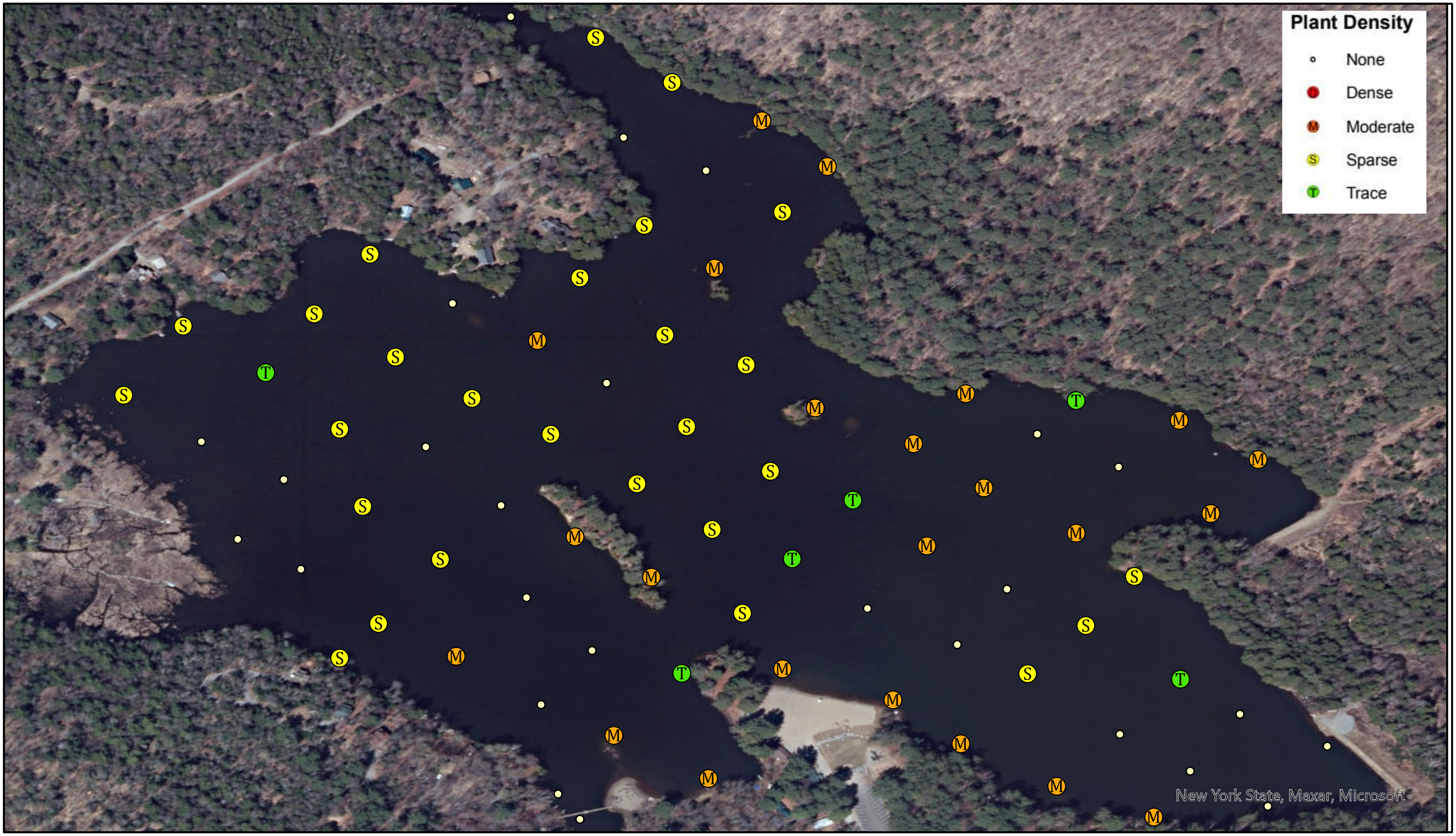

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_11
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 12: Ribbon-leaf pondweed (*Potamogeton epihydrus*)
Distribution, Density, and Abundance

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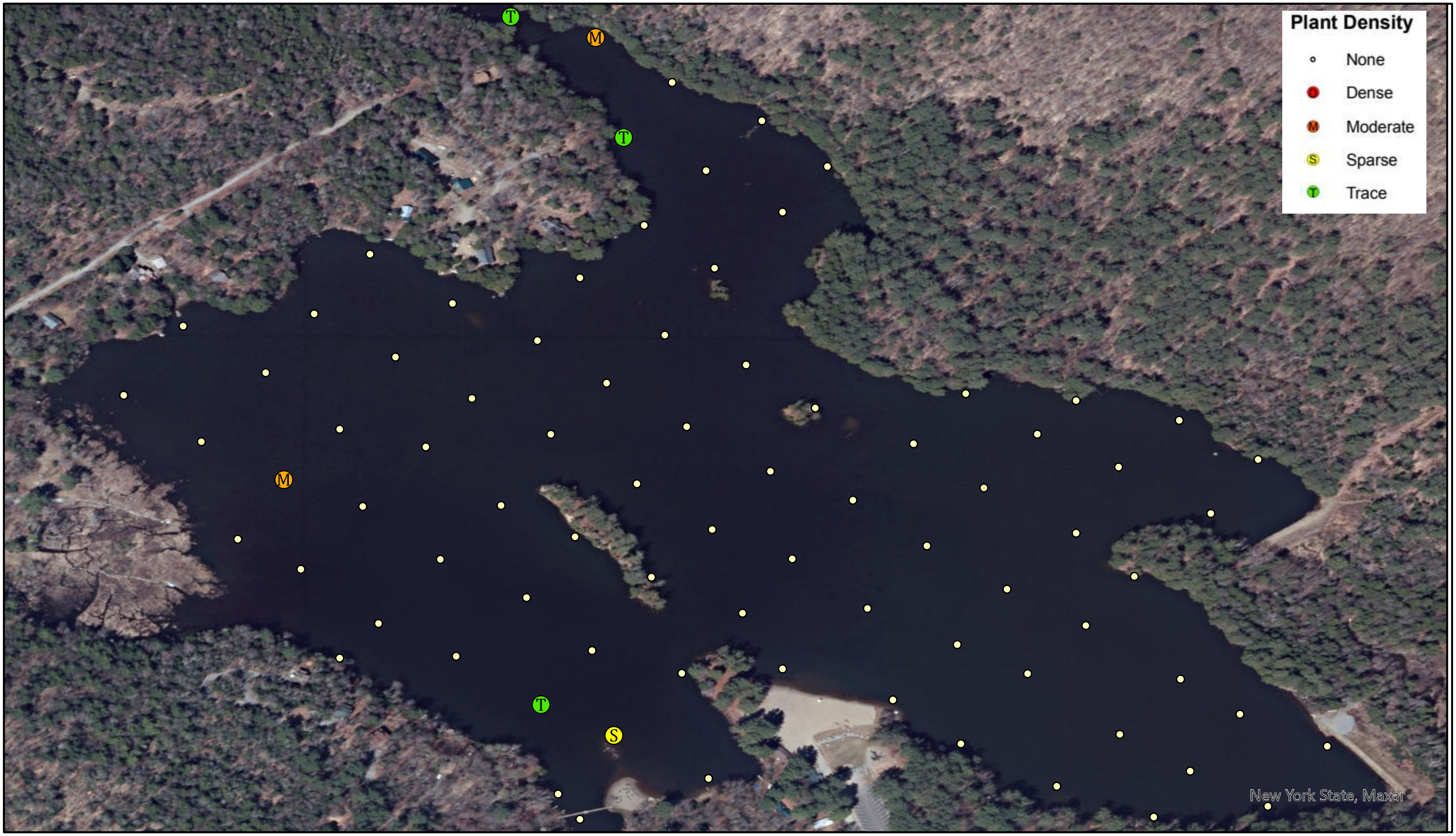

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_12
Prepared by: KV
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FIGURE 13: Robbins' pondweed (*Potamogeton robbinsii*)
Distribution, Density, and Abundance

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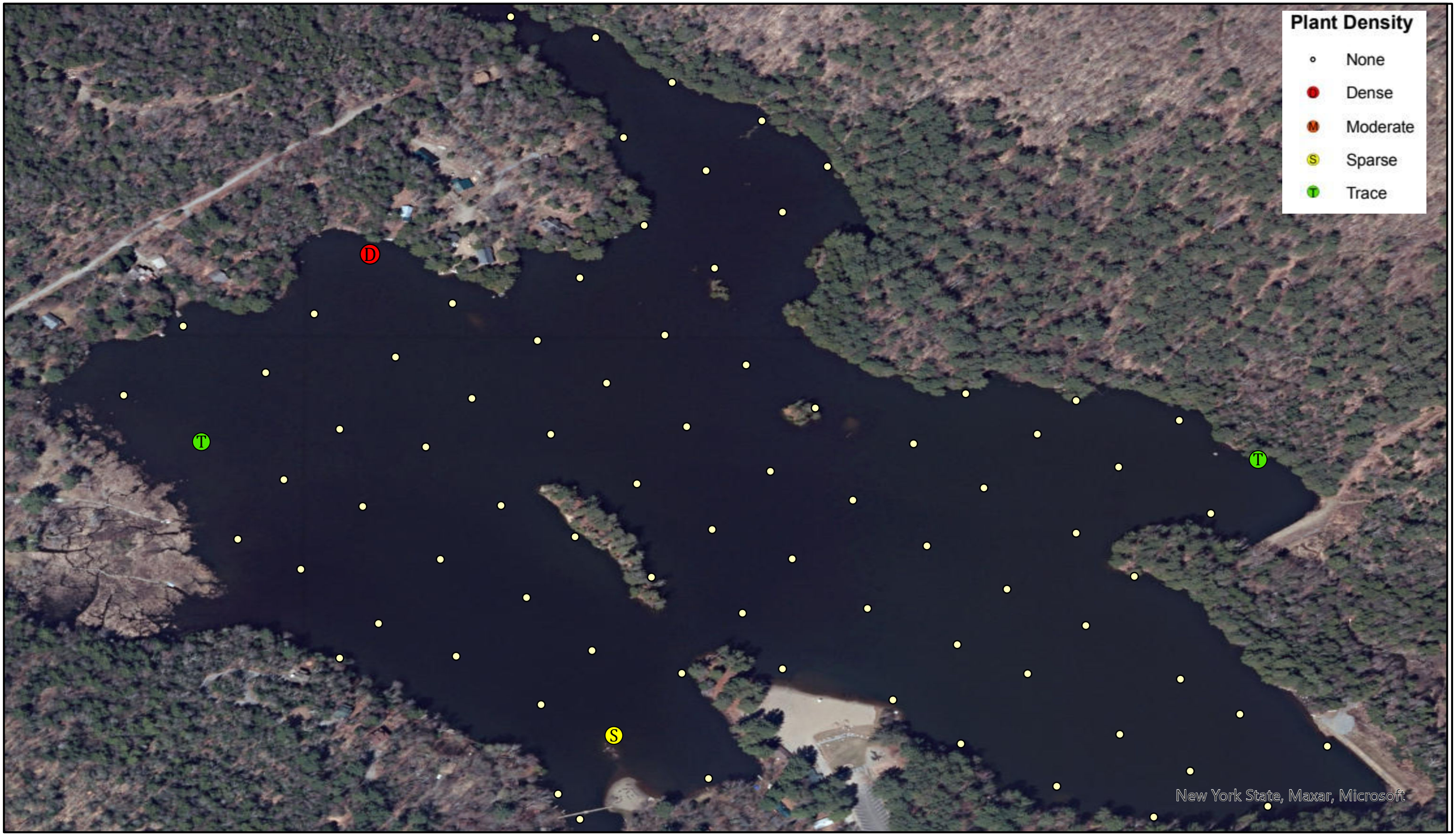

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_13
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 14: Nodding naiad (*Najas flexilis*)
Distribution, Density, and Abundance

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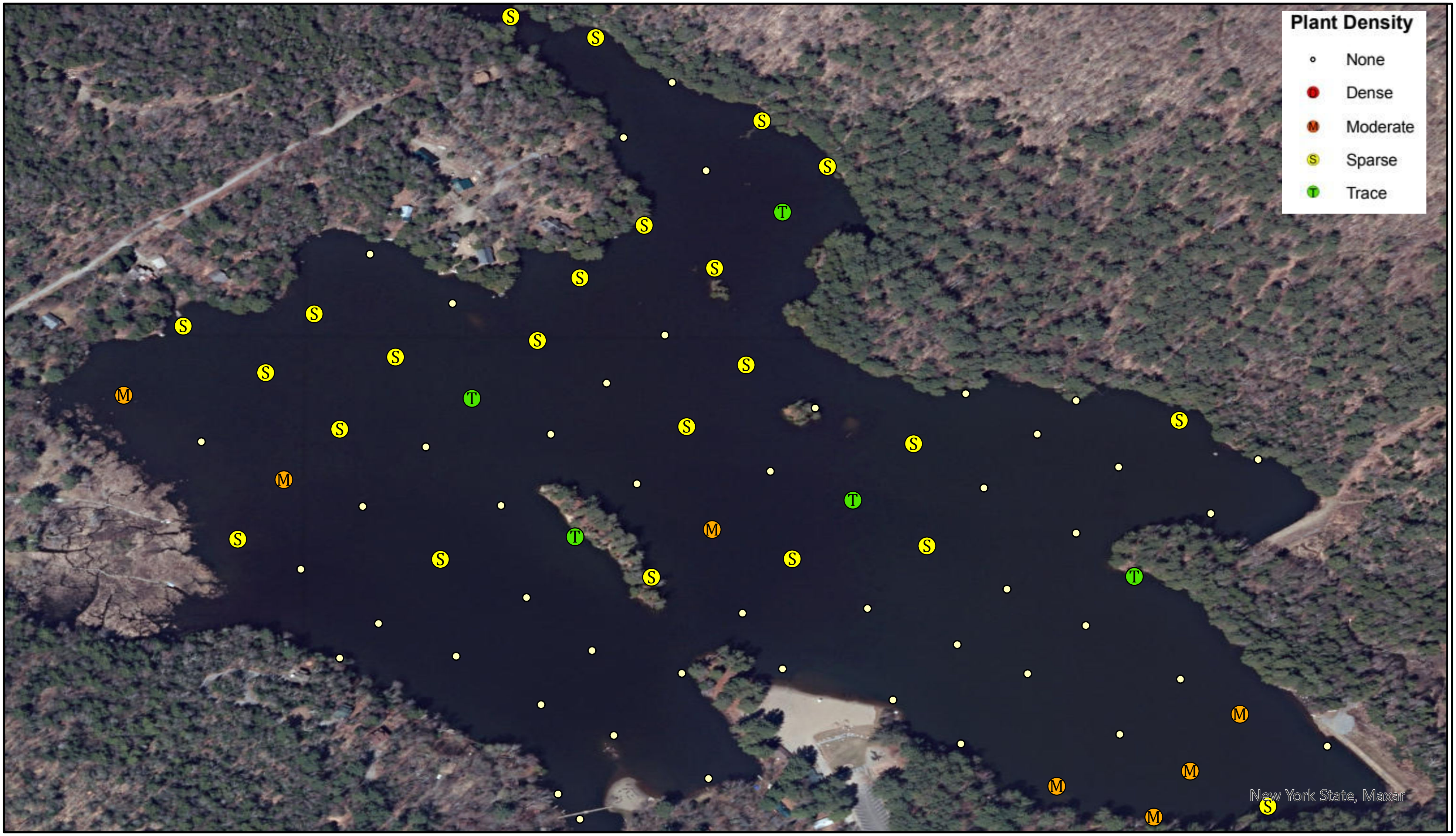

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560
Feet

Map Date: 1/3/2023
File: Minerva22_14
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 15: Sago pondweed (*Potamogeton pectinata*)
Distribution, Density, and Abundance

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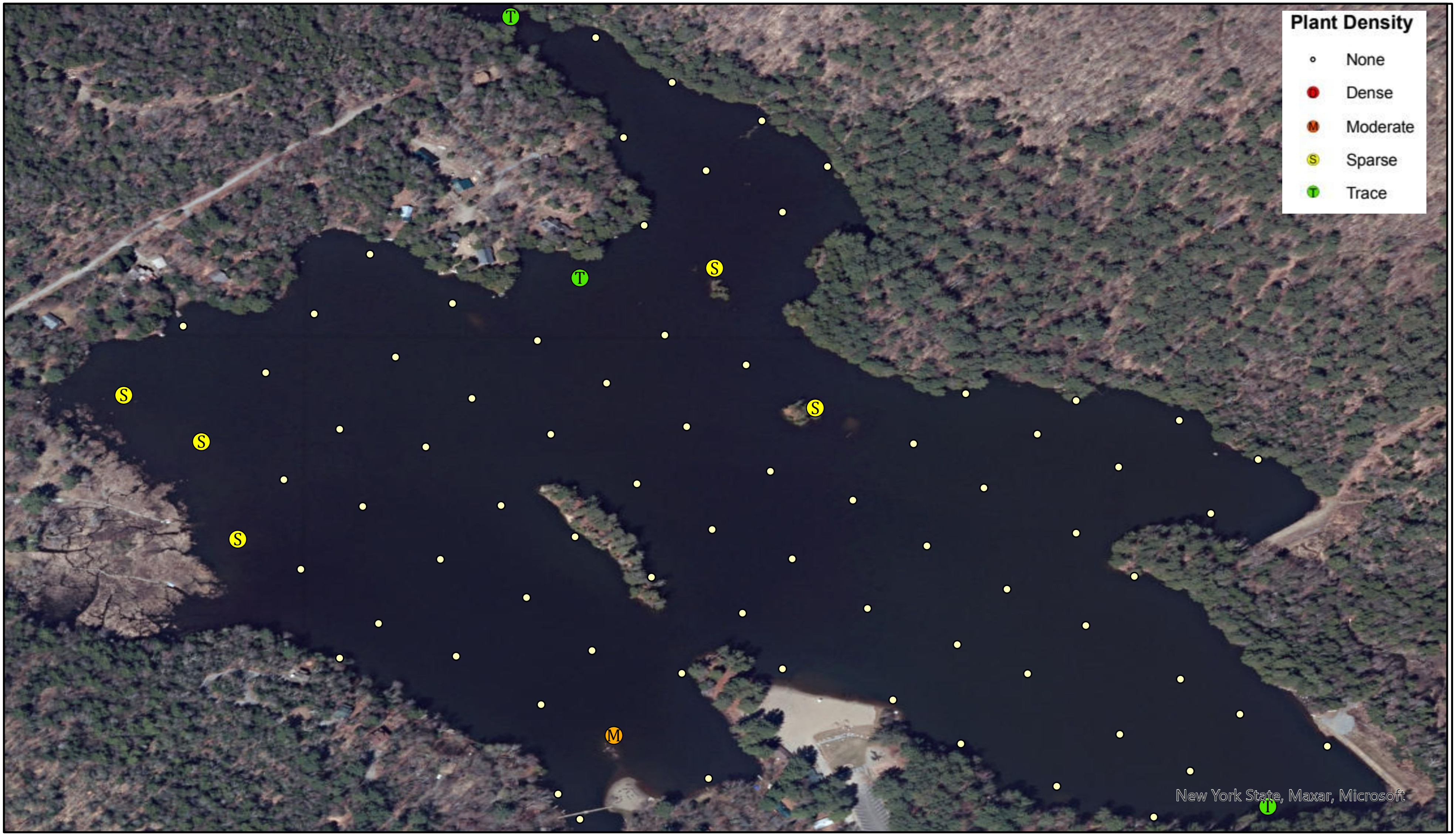
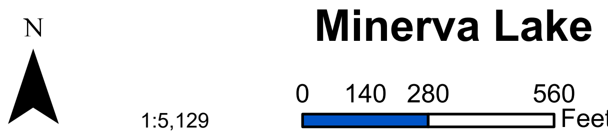


Minerva Lake
Minerva, NY
Essex County

Minerva Lake

1:5,129



Map Date: 1/3/2023
File: Minerva22_15
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 16: Thin-leaf pondweed (*Potamogeton pusillus*)
Distribution, Density, and Abundance

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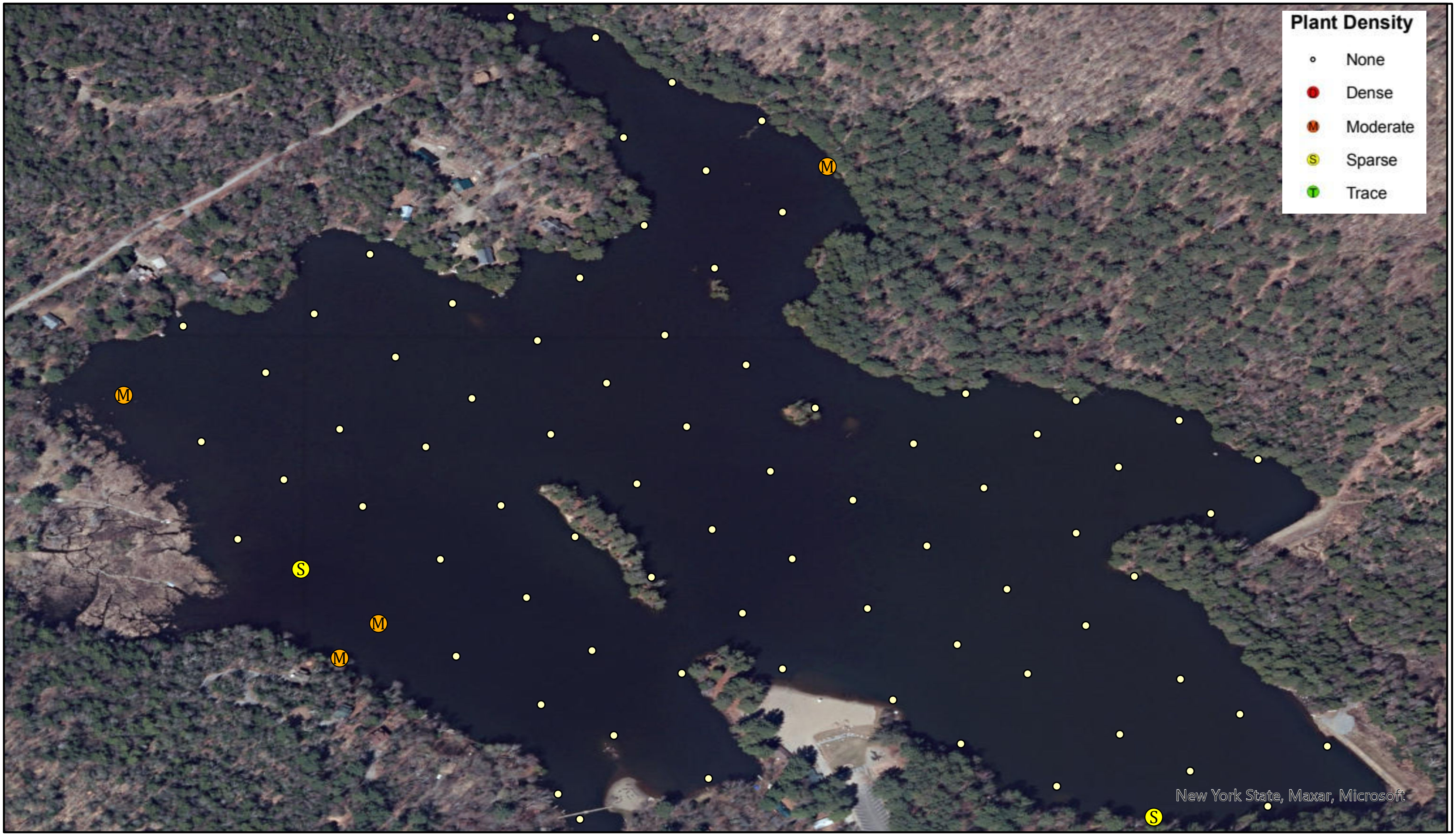

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_16
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 17: Yellow water-lily (*Nuphar variegata*)
Distribution, Density, and Abundance

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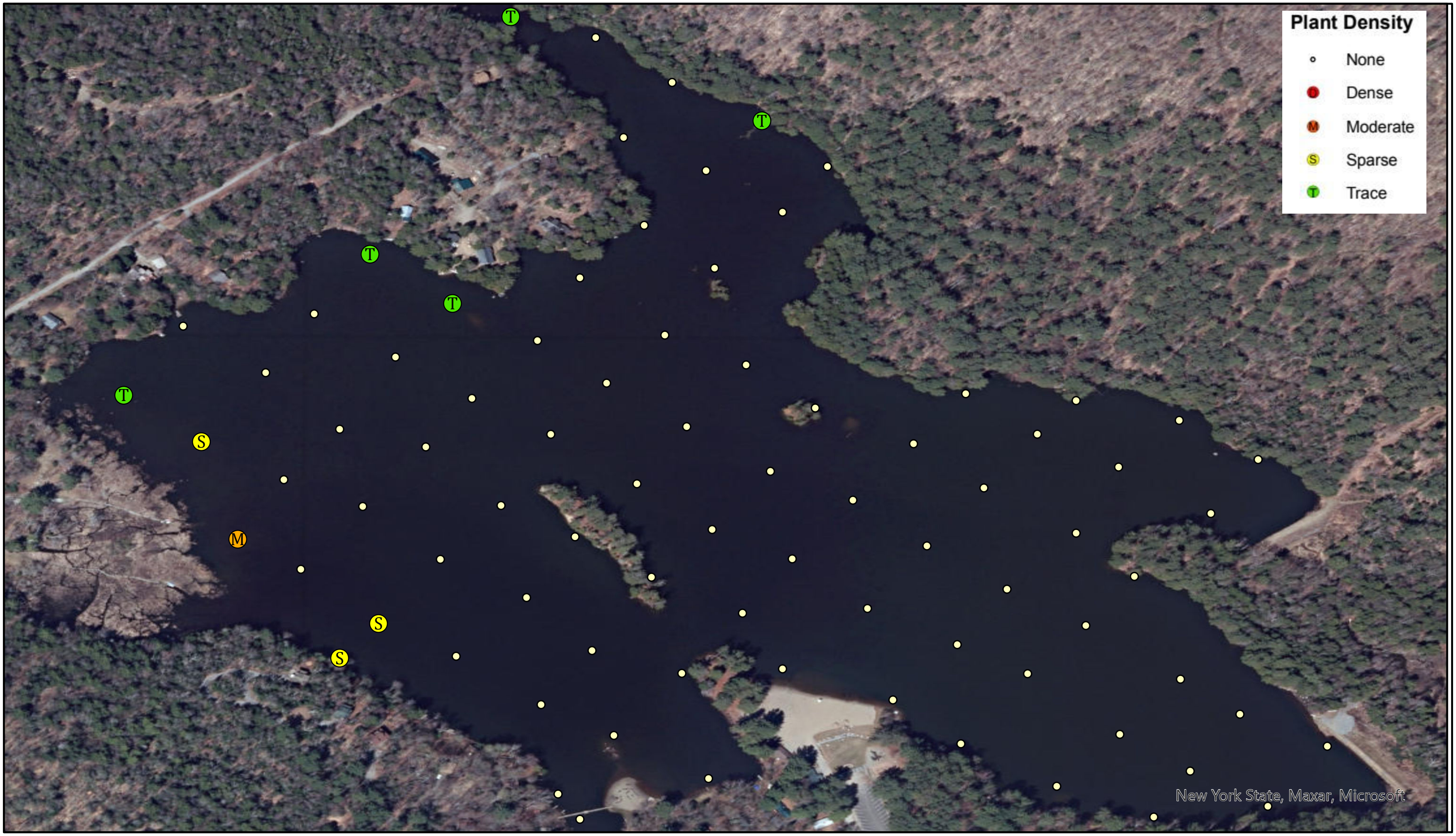
solitudelakemanagement.com



Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_17
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 18: Floating-leaf pondweed (*Potamogeton natans*)
Distribution, Density, and Abundance

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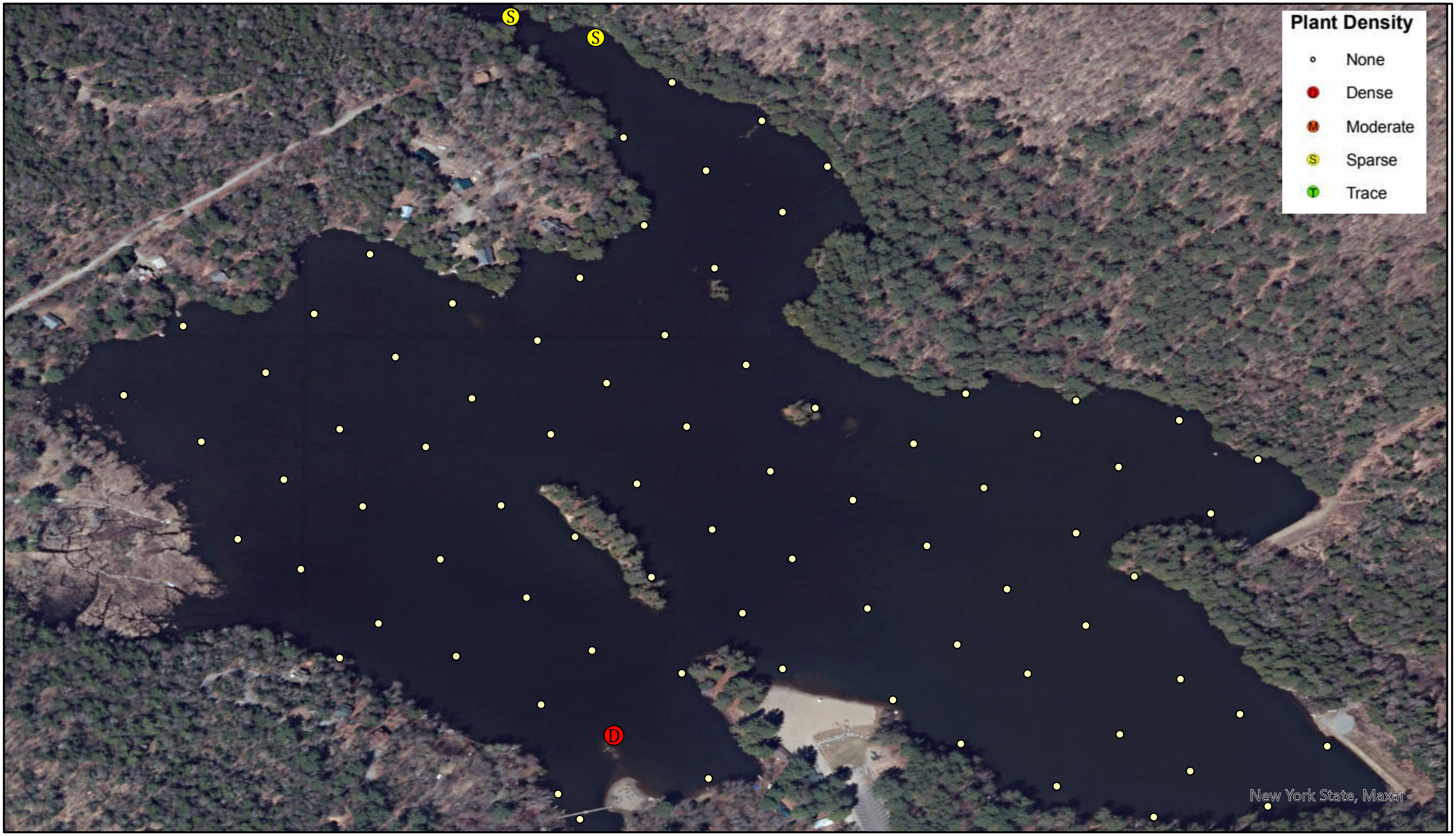

Minerva Lake
Minerva, NY
Essex County

Minerva Lake

N

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_18
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 19: Brittle naiad (*Najas minor*) Distribution, Density, and Abundance

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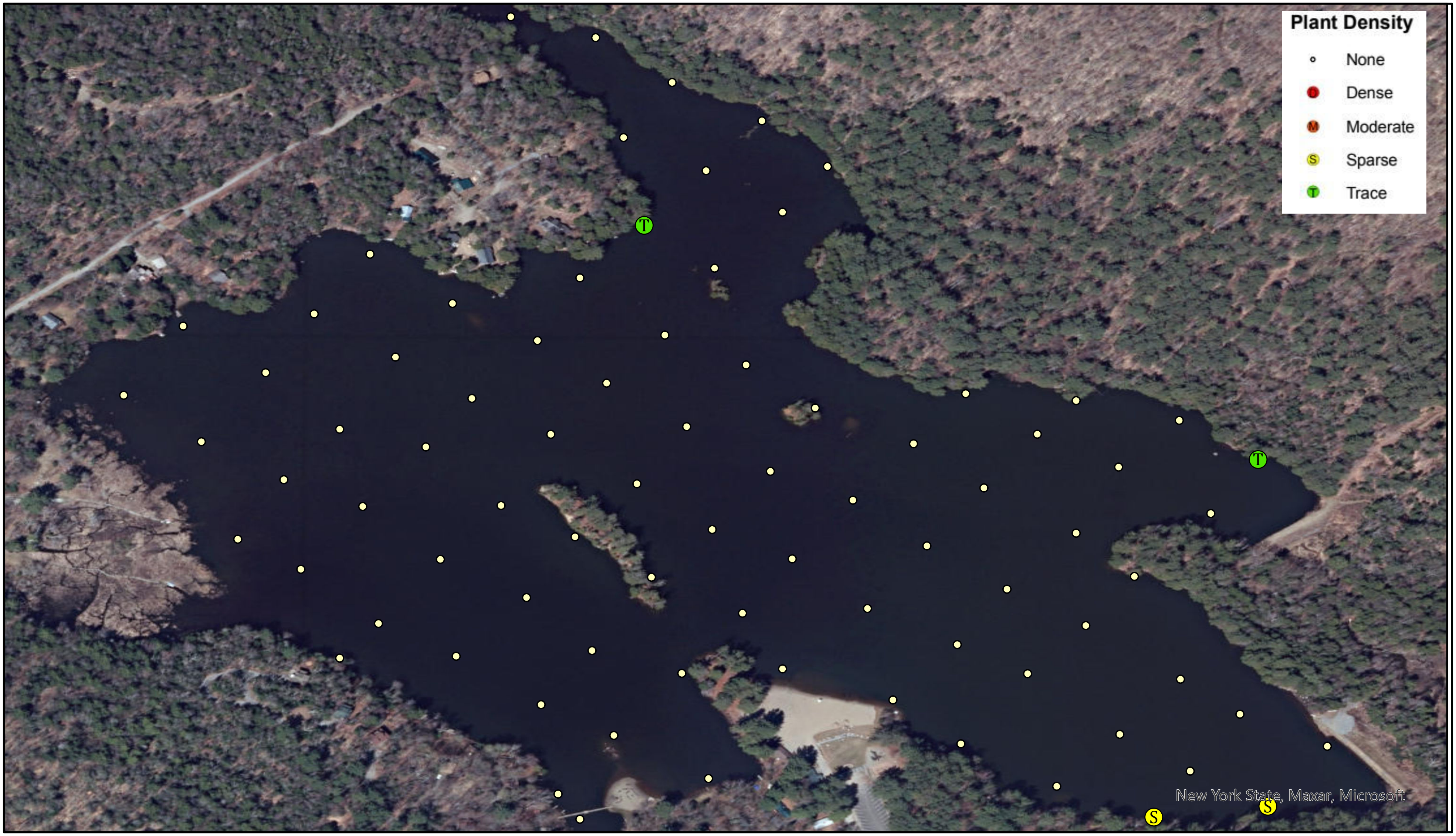

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/3/2023
File: Minerva22_19
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 20: Vasey's pondweed (*Potamogeton vaseyii*)
Distribution, Density, and Abundance

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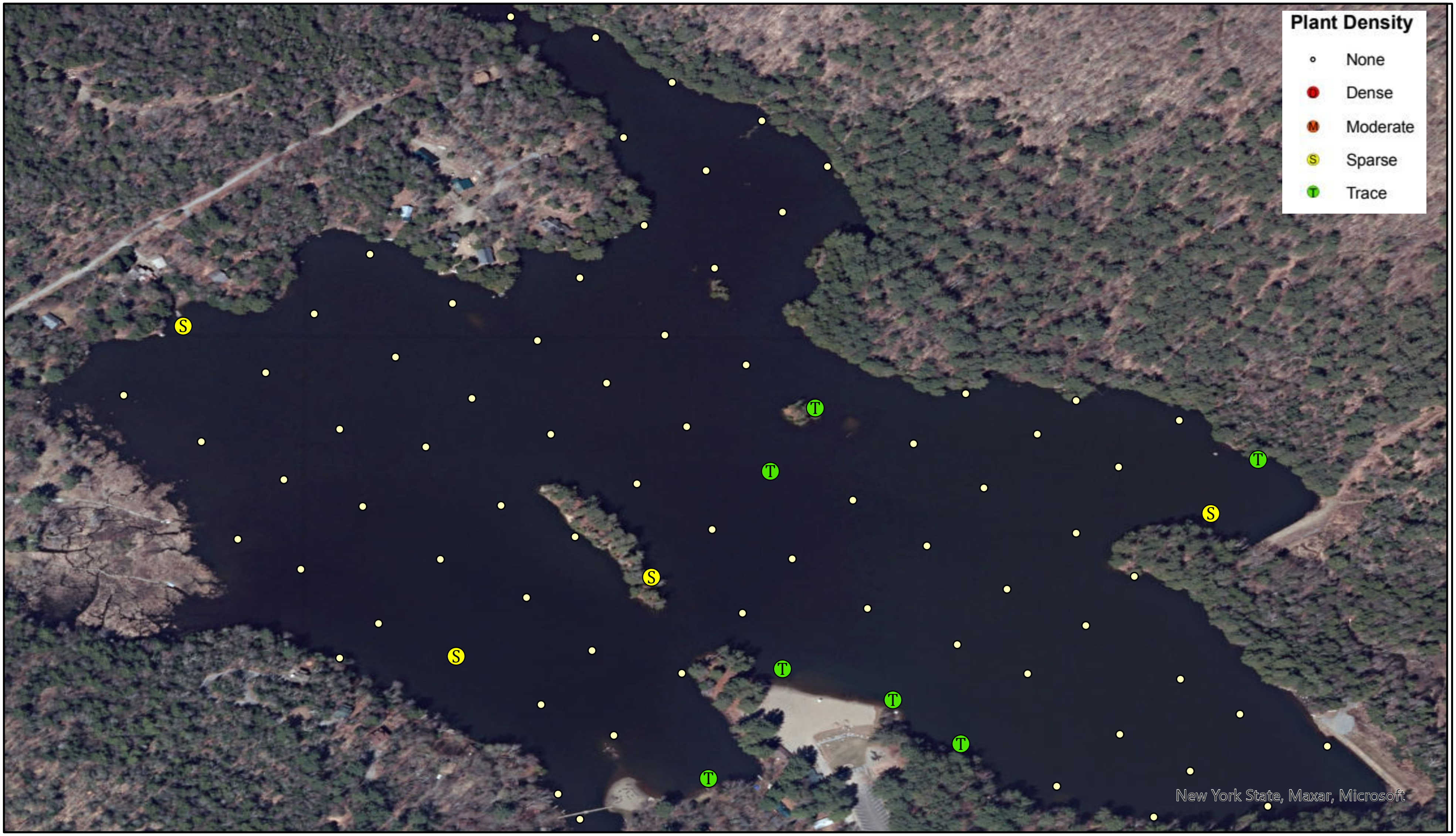

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560
Feet

Map Date: 1/3/2023
File: Minerva22_20
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 21: Blunt-leaved pondweed (*Potamogeton obtusifolius*)
Distribution, Density, and Abundance

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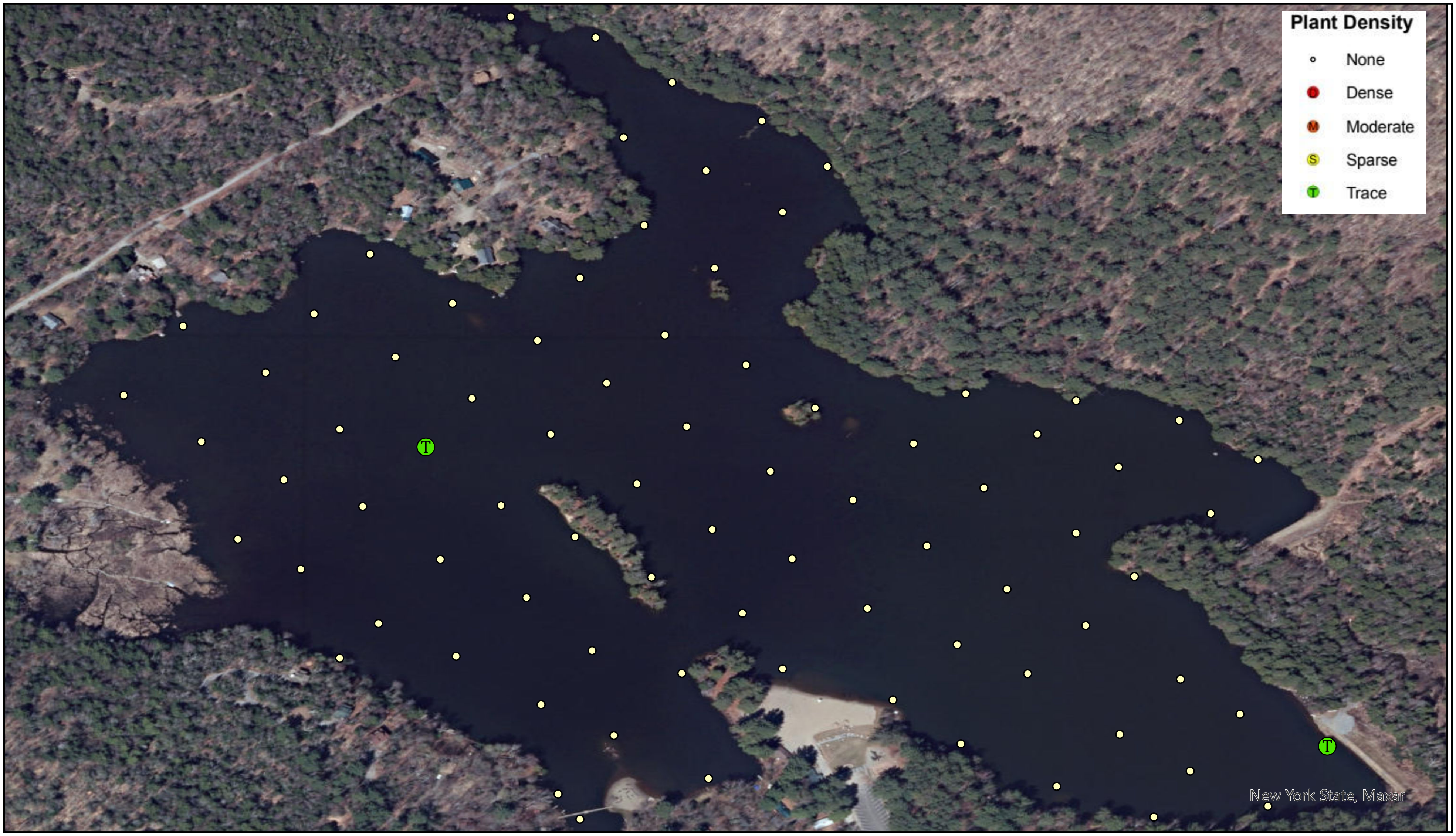

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560
Feet

Map Date: 1/3/2023
File: Minerva22_21
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 22: Bur-reed (*Sparganium spp.*)
Distribution, Density, and Abundance

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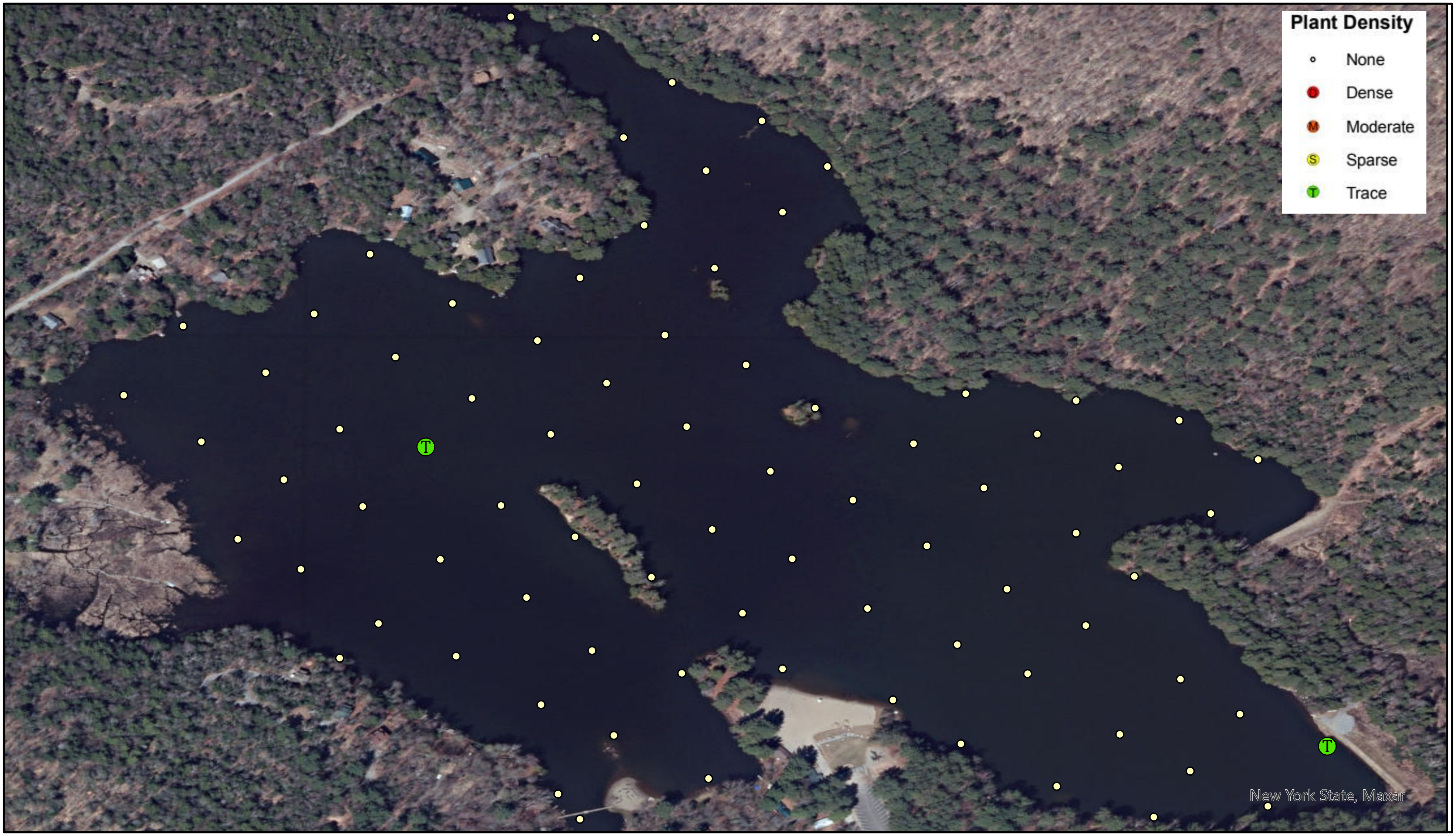

Minerva Lake
Minerva, NY
Essex County

N

Minerva Lake

1:5,129

0 140 280 560 Feet

Map Date: 1/4/2023
File: Minerva22_22
Prepared by: KV
Office: Shrewsbury, MA

From: Glenn Sullivan
To: Ziemann, Aaron C (APA)
Subject: Re: Minerva Lake Updates?
Date: Monday, May 1, 2023 10:46:14 AM

ATTENTION: This email came from an external source. Do not open attachments or click on links from unknown senders or unexpected emails.

You're correct, that is a typo, and it should read “This will not eliminate the need for spot suction harvesting…”.

Thanks!

Glenn Sullivan
Certified Lake Manager
Project Manager

M: 908-310-8775

solitudelakemanagement.com

On Mon, May 1, 2023 at 10:30 AM Ziemann, Aaron C (APA) <Aaron.Ziemann@apa.ny.gov> wrote:

> Thank you Glenn.
>
> Hey, can you confirm for me that the last sentence of this paragraph (from the SIR submission) should read “This will not eliminate the need for spot suction harvesting…”
>
> Want to make sure I get it right.
>
> Thanks,
>
> Aaron
>
> The expected level of control from the ProcellaCor treatment is to completely control the milfoil in

the highest density areas that have traditionally been difficult to control. It is anticipated that the

herbicide treatment will dramatically reduce the amount of suction harvesting for a period of 3 or

more years. This will eliminate the need for spot suction harvesting around the lake but it will

reduce the overall costs of the entire AIS management program.

From: Glenn Sullivan <gsullivan@solitudelake.com>
Sent: Sunday, April 30, 2023 7:04 PM
To: Ziemann, Aaron C (APA) <Aaron.Ziemann@apa.ny.gov>
Subject: Re: Minerva Lake Updates?

Good morning Aaron,

See attached surveys from 2021 and 2022.

Glenn Sullivan
Certified Lake Manager
Project Manager

M: 908-310-8775

solitudelakemanagement.com

On Fri, Apr 28, 2023 at 8:51 AM Ziemann, Aaron C (APA) <Aaron.Ziemann@apa.ny.gov> wrote:

> Thank you Glenn. And thank you for your timely responses to my ongoing questions! I'm sure I'll have some more in the next week or so.
>
> Best,
> Aaron
>
> ---
>
> **From:** Glenn Sullivan <gsullivan@solitudelake.com>
> **Sent:** Friday, April 28, 2023 8:48 AM
> **To:** Ziemann, Aaron C (APA) <Aaron.Ziemann@apa.ny.gov>
> **Subject:** Re: Minerva Lake Updates?
>
>
>
> Hi Aaron,
>
> We performed plant surveys each year since treatment. I will forward these Monday when I get back to my computer.
>
> On Fri, Apr 28, 2023 at 8:31 AM Ziemann, Aaron C (APA) <Aaron.Ziemann@apa.ny.gov> wrote:
>
>> Hi Glenn,
>>
>> Last summer (8/11/2022), I met with some Solitude technicians for a site visit at Daggett Lake in the Town of Thurman. I don't recall their names, but I remember we chatted about the 2020 Minerva Lake treatment, and one of them mentioned anecdotally that some sort of survey had been recently conducted, or was underway. They said no EWM, but plenty of native milfoils were observed.

The APA permit didn't require submission of any additional reporting after the post treatment survey, but I know the lack of long term post treatment monitoring has been brought up in the comment letters for Lake Luzerne, and will inevitably come up at the board meeting. Can you substantiate these comments? Is there a report available somewhere?

Thanks,

Aaron

--

Glenn Sullivan
Certified Lake Manager
Business Development Consultant
SOLitude Lake Management
908-310-8775
gsullivan@solitudelake.com

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