FINAL REPORT

NEIWPCC Job Cost Code:	0357-003-001
Project Code:	LS-2022-081
Contractor:	University of Vermont
Prepared By:	Stepenuck, Extension Associate Professor
Contract Execution Date:	10/03/2022
Contract End Date:	02/28/2026
Date Submitted:	02/28/2026
Date Approved:	03/06/2026

LAKE CHAMPLAIN AQUATIC NONINDIGENOUS SPECIES INFORMATION SYSTEM (LCANSIS) CREATION

CONTACT INFORMATION

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This is
a U.S. Environmental Protection Agency funded project.

This project was funded by an agreement awarded by U.S. Environmental Protection Agency to NEIWPCC in partnership with the Lake Champlain Basin Program

Although the information in this document may have been funded wholly or in part by the United States Environmental Protection Agency (under agreement LC00A00707), it has not undergone the Agency's publications review process and therefore, may not necessarily reflect the views of the Agency and no official endorsement should be inferred.

PROJECT SUMMARY

This project encompassed all aspects of the development of the Lake Champlain Aquatic Nonindigenous Species Information System (LCANSIS). This project initially involved researching and writing aquatic nonindigenous species' profiles that described the identification, ecology, status, means of introduction, impacts, management strategies, regulations, and records for 51 high priority species. These targeted species were known to exist within the Lake Champlain Basin or were identified to be a priority concern to negatively impact Lake Champlain or other waterbodies within its basin if introduced. The project also involved conducting a peer-reviewed literature search to inform the development of the species profiles. A report summarizing this search was prepared. Once the 51 species profiles were written, they were reviewed and edited internally, and revised. Separately, two external reviewers with appropriate species expertise were identified and confirmed for each of the 51 profiles. In total, 61 individuals served as external reviewers. Once profiles were written and revised, and reviewers identified, the profiles were distributed to the external reviewers by email. Upon receipt of completed reviews, we compiled reviews together by species and updated each profile to reflect reviewer input. Response to reviewer files were created for each of the 51 species. Final profiles were sent to our USGS partners for their review. Concurrently, newly identified species records (found during the research process that were not yet in the NAS database) were input to the USGS NAS database as were references and images identified during the profile development phase. Finally, a website for LCANSIS (https://www.lcbp.org/our-goals/healthy-ecosystems/aquatic-invasive-species/ais-in-the-lake/lcansis/), a LCANSIS logo, and a search tool were developed in cooperation with USGS and LCBP. The USGS NAS database houses the profiles, species records, and quality control records (e.g., photo permissions, reference files) for all 51 species. When users search using the search tool on the LCANSIS website, information is pulled from the USGS NAS database and results are presented to users.

CONTENTS

1. PROJECT INTRODUCTION

The Lake Champlain Aquatic Nonindigenous Species Information System (LCANSIS) was developed as a tool to enable more informed management, research, and prevention of the spread of aquatic non-indigenous and potentially invasive species within the Lake Champlain Basin. Invasive species management is of high concern in the Lake Champlain Basin due to the considerable economic and environmental impacts invasive species have caused here and in other locations worldwide (Lake Champlain Basin Program, 2005; Lake Champlain Committee 2026; Lake Champlain Basin Program, 2026a; Vermont Fish and Wildlife Department, 2026; Miller and Watzin, 2007; Smeltzer et al., 2012. Wilcove et al., 1998; Pimentel et al., 2001; Dudgeon et al., 2006). As management of invasive species is most effective in preventative stages or when populations are very low, by focusing effort to understand the pathways, presence, impacts, management strategies and regulations of aquatic non-indigenous species in the Basin, stronger potential exists to be able to effectively manage such species to minimize negative impacts.

In 2005, the Lake Champlain Basin Program developed a Basin-wide management plan for aquatic invasive species and designated 13 of those species to be of priority concern. Those priority species that existed in the Basin at that time included purple loosestrife (*Lythrum salicaria*), water chestnut (*Trapa natans*), Eurasian watermilfoil (*Myriophyllum spicatum*), Japanese knotweed (*Reynoutria japonica* Houtt), zebra mussel (*Dreissena polymorpha*), Sea Lamprey[1] (*Petromyzon marinus*), and Alewife (*Alosa pseudoharengus*). Those that had yet to be reported in the Basin included hydrilla (*Hydrilla verticillata*), quagga mussel (*Dreissena bugensis*), Eurasian Ruffe (*Gymnocephalus cernua*), Round Goby (*Neogobius melanostomus*), fishhook waterflea (*Cercopagis pengoi*), and spiny waterflea (*Bythotrephes longimanus;* Lake Champlain Basin Program, 2005). Since then, both waterflea species have established populations in Lake Champlain (Cutter et al., 2023), and Round Goby became established in the Champlain Canal (George et al., 2021), which connects Lake Champlain to the Hudson River.

[1] Throughout this paper, we use the naming convention for fish common names currently recommended by the American Fisheries Society, which is to capitalize all words within the name and not just proper nouns (Page et al., 2013), as is the convention for other types of organisms. For other types of organisms, we follow standard convention.

In December 2018, the U.S. Congress passed the Vessel Incidental Discharge Act, which authorized establishment of the Great Lakes and Lake Champlain Aquatic Invasive Species Program (Vessel Incidental Discharge Act of 2018). Development of such a program was intended to support monitoring to collect data related to the introduction and spread of aquatic invasive species, to inform and assist with management and response actions to prevent or stop such species from becoming established or from spreading, to establish a watch list of species with potential to become invasive in aquatic ecosystems, to work across governmental levels to develop criteria to prioritize and implement monitoring, to develop ballast management systems to prevent spread of such species, and to facilitate education, inspection and compliance.

Creation of LCANSIS is a necessary step to be able to fully develop the Great Lakes and Lake Champlain Aquatic Invasive Species Program. Content gathered within LCANSIS brings the Lake Champlain Basin into equality with the Great lakes, as LCANSIS parallels the Great Lakes Aquatic Non-indigenous Species Information System (GLANSIS).

This project describes the process to develop species profiles for 51 species thought to be non-indigenous to the Lake Champlain Basin (Table 1) to populate the LCANSIS database.

Table 1. List of species thought to be non-indigenous to the Lake Champlain Basin for which profiles were researched and developed for the LCANSIS database. Those that may potentially be native to the Basin – as identified through our literature searches and communications with experts – are marked with asterisks.

Category	Scientific Name	Common Name
Plants	*Alisma gramineum*	water plantain
Plants	*Butomus umbellatus*	flowering rush
Plants	*Hydrocharis morsus-ranae*	European frogbit
Plants	*Iris pseudacorus*	yellow flag iris
Plants	*Lythrum salicaria*	purple loosestrife
Plants	*Myriophyllum heterophyllum*	variable-leaf milfoil
Plants	*Myriophyllum spicatum*	Eurasian watermilfoil
Plants	*Najas minor*	brittle naiad/slender-leaved naiad
Plants	*Nymphoides peltata*	yellow floating heart
Plants	*Phragmites australis*	common reed
Plants	*Potamogeton crispus*	curly-leaf pondweed
Plants	*Rorippa amphibia*	great yellowcress/great watercress
Plants	*Trapa natans*	water chestnut
Fish	*Alosa aestivalis*	Blueback Herring
Fish	*Alosa pseudoharengus*	Alewife
Fish	*Ameiurus melas**	Black Bullhead Catfish
Fish	*Carassius auratus*	Goldfish
Fish	*Cyprinus carpio*	Common Carp
Fish	*Dorosoma cepedianum*	American Gizzard Shad
Fish	*Labidesthes sicculus**	Brook Silverside
Fish	*Micropterus salmoides*	Largemouth Bass
Fish	*Morone americana*	White Perch
Fish	*Oncorhynchus mykiss*	Rainbow Trout
Fish	*Petromyzon marinus**	Sea Lamprey
Fish	*Pomoxis annularis*	White Crappie
Fish	*Pomoxis nigromaculatus*	Black Crappie
Fish	*Salmo trutta*	Brown Trout
Fish	*Scardinius erythrophthalmus*	European Rudd
Fish	*Tinca tinca*	Tench
Mollusks	*Bithynia tentaculata*	faucet snail
Mollusks	*Callinina georgiana*	banded mystery snail
Mollusks	*Cipangopaludina (Bellamya) chinensis*	Chinese mystery snail
Mollusks	*Dreissena polymorpha*	zebra mussel
Mollusks	*Gillia altilis**	buffalo pebble snail
Mollusks	*Ladislavella catascopium**	woodland pond snail
Mollusks	*Pisidium amnicum*	greater European pea clam
Mollusks	*Pleurocera acuta**	sharp horn snail
Mollusks	*Radix auricularia*	big-ear radix

Category	Scientific Name	Common Name
Mollusks	*Sphaerium corneum*	European fingernail clam
Mollusks	*Valvata piscinalis*	European valve snail
Crayfish	*Cambarus robustus*	big water crayfish
Crayfish	*Faxonius obscurus*	Allegheny crayfish
Crayfish	*Faxonius rusticus*	rusty crayfish
Waterflea	*Bythotrephes longimanus*	spiny waterflea
Waterflea	*Cercopagis pengoi*	fishhook waterflea
Waterflea	*Eubosmina coregoni*	Baltic long-nosed waterflea
Copepod	*Thermocyclops crassus*	copepod
Freshwater jellyfish	*Craspedacusta sowerbii*	freshwater jellyfish
Flatworm	*Schmidtea polychroa*	vortex worm
Pathogen	Esocid lymphosarcoma	Northern Pike and Musky lymphosarcoma
Pathogen	*Ranavirus*	Largemouth Bass virus

2. Tasks Completed

Tasks completed for this project included:

Task 1: Develop QAPP. This was developed at the start of the project before other tasks were initiated. This was finalized in June 2023 (Figure 1 and Appendix A).

Quality Assurance Project Plan:
Lake Champlain Aquatic Nonindigenous Species Information System Creation

NEIWPCC Job Code: 0357-003-001
NEIWPCC Project code: LS-2022-081
QAPP code: Q23-011
EPA Tracking #: 25223
EPA grant #: LC00A00707
Version 1

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June 2023

Kristine Stepenuck — 21 June 2023
Kristine Stepenuck, Project Manager — Date
Extension Associate Professor, Rubenstein School of Environment and Natural Resources, UVM

6/14/23
Jeffrey Schloss, Project QA Officer — Date
Research Associate Professor, Rubenstein School of Environment and Natural Resources, UVM

Meg Modley — June 21, 2023
Meg Modley, Project Officer, LCBP — Date

Maryann Bryan — 06/21/2023
Maryanna Bryan, Quality Assurance Designee, NEIWPCC — Date

Figure 1. Signed QAPP for this project.

Task 2: Conduct literature review and herbarium collection research. In addition to a summary level literature review that sought peer-reviewed literature about the 51 target species (Table 1) for LCANSIS (Appendix B), literature reviews for this task went far beyond seeking peer-reviewed papers for every one of the 51 species profiles. Our research included herbarium visits where we identified new records of targeted species (Appendix C), peer-reviewed searches and grey literature searches including reports, websites, newsletters, news stories, etc. The 51 profiles (Appendix D) collectively include 1478 references, including some that parallel GLANSIS species profiles and others identified specifically for profiles in LCANSIS.

Task 3: Populate LCANSIS database. This task included developing the website home for LCANSIS (https://www.lcbp.org/our-goals/healthy-ecosystems/aquatic-invasive-species/ais-in-the-lake/lcansis/), and also a LCANSIS logo (Figure 2 and supplemental files) and a search tool for website users (Figures 3 and 4). In addition, we not only had to upload the content within the profiles themselves to NAS (Appendix B), but also quality control information including new photos identified to be used within the profiles, proof of permission to use those photos in LCANSIS and references gathered during the profile development process. We also had to provide USGS with all reviewers' feedback and response to reviewer files.

Figure 2. LCANSIS logo for website.

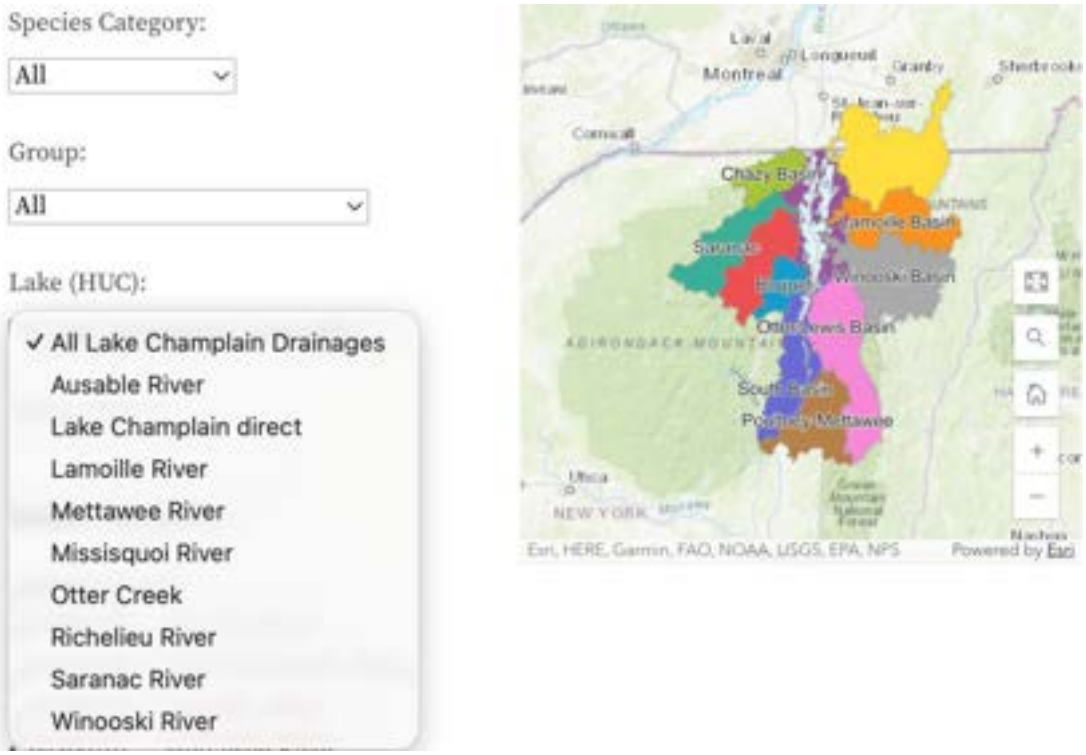

Figure 3. Top half of the LCANSIS search tool, showing one of the dropdown menus by which users can select to search for aquatic non-indigenous species by basin.

Figure 4. Lower half of the search tool in LCANSIS, showing open fields and the submit button.

Task 4: Reporting. We completed all required quarterly reports during the time frame of this project and can provide those again if needed.

3. METHODOLOGY

Task 1: To develop the QAPP, we worked closely with the GLANSIS database coordinator, Dr. Rochelle Sturtevant, Wesley Daniels at USGS, and Meg Modley at LCBP. This required several iterations to ensure we described the work to be done appropriately.

Task 2: To conduct the peer-reviewed literature review, we ran a series of Web of Science searches, as described here (taken from methods within that document): “In April 2023, Web of Science was used to search for publications containing each of the 51 species as a topic and “Champlain” as a topic. Each species was searched by both its scientific and common name as topics, written as “common name*” OR “scientific name.” For species with multiple common names, a second search criteria was added with the “OR” function. The alternate common name was written using the same format; that is, in quotation marks with an asterisk. The same was done for the scientific name search if a taxonomic change was known to have occurred (e.g., *Bellamya chinensis* is now *Cipangopaludina chinensis*). A secondary database query was carried out to analyze trends in publications about aquatic invasive species in Lake Champlain. The following query was input to the Web of Science: ((TS=("Lake Champlain"))) AND (TS=(invasive) OR TS=(exotic) OR TS=(nuisance)).

Resulting papers were reviewed following the search process for each species. Peer-reviewed papers were removed from the pool if Lake Champlain was not part of the study area. Citations and keywords were exported for further analysis.

To analyze author keywords and “keyword plus” keywords (i.e., those generated by the database) and publications were listed and occurrences of species or taxon as keywords were tallied. If a species was listed as a keyword using its common name and its scientific name for the same paper, this was tallied as only one occurrence of the species as a keyword.

The initial searches for peer-reviewed journal articles carried out within the Lake Champlain Basin that related to each species were repeated in February 2026. However, only the scientific name of each of the species and “Champlain” were used as topics within the Web of Science. This provided an opportunity to reassess the final suite of papers (i.e., to ensure all related to the Lake Champlain Basin), to seek recent additions to the peer-reviewed literature relevant to the Basin, and to generate a reference list of peer-reviewed literature focused on aquatic non-indigenous species within the Lake Champlain Basin. Like in 2023, resulting papers were reviewed following the search process for each species. Peer-reviewed papers were removed from the pool if Lake Champlain was not part of the study area. Citations for the remaining papers were exported.”

As previously stated, in addition, we visited the Vermont Department of Environmental Conservation and worked with their staff to sort through all of their pressed plants, seeking any that aligned with the target species for this project. For each we found, we documented it by creating a pdf of the plant. We later uploaded those records into NAS. For the additional peer-reviewed literature and grey literature searches, we used a variety of tools and pathways. Each species’ profile was unique based on its own pathway, time in the Basin, and research that has or has not been done about it. Generally speaking, we used Google Scholar, the University of Vermont’s library system and especially its Interlibrary Loan program to obtain references. We then reviewed each reference, and incorporated information as needed into the species profiles. The initial drafts of the profiles were all placed within a Teams folder and Dr. Kris Stepenuck reviewed each of them, adding content and making suggestions to help create a uniform suite of profiles that were individualized but maintained common structure across them, which followed suite of GLANSIS and NAS. Kris then placed the reviewed files into the appropriate students’/staff person’s folder and revisions were made by that person.

To identify reviewers, we used a snowball approach. Initially, we worked with Meg Modley, Rochelle Sturtevant, and Wesley Daniel to suggest potential reviewers and used a website with taxonomist specialists provided by USGS partners. We used Qualtrics survey software to send a personalized email to each of the individuals we had identified and asked for their confirmation to serve as a reviewer. We went through two to three rounds of invitations and reminders using Qualtrics and still had numerous reviewers to find. As such, we then turned to broader networks including the National Sea Grant Network (who is a funding partner on this project and the home program for Dr. Stepenuck and her students), the Gund Institute for Environment, and Rubenstein Ecosystem Sciences Lab at UVM. We also communicated again with Meg Modley for additional ideas. This enabled us to identify many reviewers, but we still lacked a few, so Dr. Stepenuck turned to searching peer reviewed literature and grey literature to identify experts for each of the remaining species and sent emails to explain LCANSIS and to request their participation as reviewers. In total, 61 individuals served as reviewers for the profiles (Table 2), with a minimum of two reviews per profile required. Many of the species required asking 10 people before two reviewers were identified.

Table 2. Experts (and their affiliations) who assisted the project by reviewing species profiles.

Name	Affiliation
Allison Morrow	SUNY Plattsburgh
Andrew Davinack	Wheaton College Massachusetts
Anna Hardiman	Adirondack Park Invasive Plant Program
Arthur Bogan	North Carolina Museum of Natural Sciences
Aude Lochet	SUNY Plattsburgh
Brian Greene	Adirondack Park Invasive Plant Program
Brock Woods	University of Wisconsin-Madison (retired)
Brook Schryer	OFAH Foundation
C. Ryan Hill	University of New Brunswick
Catherine McGlynn	New York Department of Environmental Conservation
Cheyenne Stratton	Missouri Department of Conservation
Christophe Benjamin	Fisheries and Oceans Canada
D. Bruce Conn	Berry College
Dan Preston	Colorado State University
Denise Mayer	The New York State Museum
Donald Stewart	SUNY College of Environmental Science and Forestry
Donna Perleberg	Minnesota Department of Natural Resources
Doug Facey	Saint Michael's College (emeritus professor)
Dusty Swedberg	University of Illinois Urbana-Champaign
Elizabeth Renner	University of Nebraska–Lincoln
Elizabeth Whitmore-Stolar	New York State Department of Environmental Conservation
Erin Vennie-Vollrath	New York State Department of Environmental Conservation
Gerald Shepard	Environmental Protection Agency
Gina LaLiberte	Wisconsin Department of Natural Resources
Grace Loppnow	Minnesota Department of Natural Resources
Gregory Sass	Wisconsin Department of Natural Resources
Ian Pfingsten	U.S. Geological Survey
Izzy Anderson	Vermont Department of Environmental Conservation
Jeremy Tiemann	University of Illinois Urbana-Champaign
John Cooper	Cooper Environmental Research
Joseph Connolly	Cornell University
Kaira Kamke	Buffalo State University
Kim Jensen	Vermont Department of Environmental Conservation
Kristen Towne	U.S. Fish and Wildlife Service
Lizzy Gallagher	Vermont Department of Environmental Conservation
Margaret Murphy	Vermont Fish & Wildlife Department

Name	Affiliation
Maria Jankowski	SUNY Plattsburgh
Mark Ferguson	Vermont Fish & Wildlife Department
Mark Warman	The Ohio State University
Meg Modley	Lake Champlain Basin Program
Melanie Giangreco	Upstream Consulting & Evaluation
Micah Brett Warren	Auburn University
Miranda Rummell	SUNY Plattsburgh
Nathan Whelan	The Ohio State University
Nicole Balk	New York State Department of Environmental Conservation
Patrick Schmalz	Minnesota Department of Natural Resources
Peder Engelstad	Colorado State University
Přemek Hamr	Trent University
Rob Fiorentino	New York State Department of Environmental Conservation
Roger Thoma	The Ohio State University
Ron Kinnunen	Michigan State University (retired)
Ronald Dermott	Fisheries and Oceans Canada
Ronald Griffiths	U.S. Geological Survey
Sarah Kingsbury	Fisheries and Oceans Canada
Shawn Good	Vermont Fish & Wildlife Department
Steven Pearson	New York State Department of Environmental Conservation
Susan Daniel	Buffalo State University
Thais Bernos	University of Vermont
Tim Mihuc	SUNY Plattsburgh
Timothy Bruce	Auburn University
Zach Cutter	SUNY Plattsburgh

4. QUALITY ASSURANCE TASKS COMPLETED

All species records to be included followed QAPP guidelines, which parallel USGS guidelines. Data are stored within a shared Team with multiple team members from UVM and USGS authorized to access the files.

5. DELIVERABLES SUBMITTED

Task 1: QAPP (Appendix A)

Task 2: Literature Review (Appendix B), herbarium records (Appendix C), 51 species profiles (Appendix D)

6. PROJECT METRICS

Metric	Final value
Category of organization	NGO, academic
Hours of staff time funded by grant	0*
Undergraduate students supported by this grant	0**
Graduate students supported by this grant	1
Resources created	51 species profiles developed
Webpages and/or websites developed	1 webpage developed for LCANSIS on lcbp.org website

*Lake Champlain Sea Grant co-funded this work. As such, while no staff time was charged to the LCBP grant, significant staff time went into developing LCANSIS. Two staff/faculty, Kris Stepenuck (UVM faculty member) and Emma Janson (as a temp hire for UVM) worked on the project. It is estimated that this exceeded 400 hours.***

** While no undergraduates were supported by the LCBP grant, four undergraduates contributed to development of LCANSIS. One student, Noelle Hasan, contributed significantly. She completed a 3-credit independent study working on the project during one semester (estimated at 150 hours). She also worked additional hours on the project across at least 4 other semesters (estimated at an additional 150 hours). Three other undergraduate students, Cayden Marrow, Jasmine Perez, and Henry Motes, contributed a total of about 65 hours of time. Thus, in total, undergraduate hours of commitment towards the project is estimated at 365 hours.***

***Neither time for faculty/staff or students can be counted as match on this grant as all that time was supported with federal funding.

7. CONCLUSIONS

We are thrilled to have developed the LCANSIS database. This project was fascinating to carry out. Those who assisted were phenomenal. UVM students Noelle Hasan and Cayden Marrow and temporary staff person Emma Janson were particularly impactful to the project's success. Jasmine Perez, Henry Motes, and Tess O'Brien also contributed to the project. LCBP, USGS, and GLERL partners including Meg Modley, Matt Neilson, Wesley Daniel, and Rochelle Sturtevant, were incredibly helpful. We are proud to have developed the 51 profiles and feel that they improved with reviewer feedback. We are grateful to the 61 reviewers who contributed their time to the project (Table 2). They were gracious with their time.

Through our research and reviewer input, we identified six species that may be native to the Basin rather than non-indigenous (Table 1). This includes three fish species and three types of mollusks. Specifically, these are Black Bullhead Catfish (*Ameiurus melas*), Brook Silverside (*Labidesthes sicculus*), Sea Lamprey (*Petromyzon marinus*), buffalo pebblesnail (*Gillia altilis*), woodland pondsnail (*Ladislavella catascopium*), and sharp hornsnail (*Pleurocera acuta*). Details of the questions that exist surrounding whether they are native or non-indigenous are included within those species' profiles. Determining how to proceed with this information is something for

LCBP to consider.

Also, as LCBP considers how to build upon this database with watch list species or other lists of species, LCBP should keep in mind that preparing those is a massive undertaking. Such an endeavor – like the one we undertook to establish LCANSIS – will require someone (or multiple people) with significant time to put towards researching, writing, internally reviewing, and editing species' profiles, finding (and gently nudging) reviewers, revising profiles based on reviewer input, seeking new species records, working with USGS on new profiles' review, and uploading new records, photos, photo permissions, references, and the content of species profiles to NAS.

8. References

Cutter, Z. A., Mihuc, T. B., & Myers, L. W. (2023). Invasion of Bythotrephes longimanus and Cercopagis pengoi in Lake Champlain: Impacts on the native zooplankton community. Diversity, 15(11), 1112. https://doi.org/10.3390/d15111112

George, S. D., Baldigo, B. P., Rees, C. B., Bartron, M. L., & Winterhalter, D. (2021). Eastward Expansion of Round Goby in New York: Assessment of Detection Methods and Current Range. Transactions of the American Fisheries Society, 150(2), 258-273. https://doi.org/10.1002/tafs.10290

Hussner, A., Stiers, I., Verhofstad, M., Bakker, E., Grutters, B., Haury, J., Van Valkenburg, J., Brundu, G., Newman, J., & Clayton, J. (2017). Management and control methods of invasive alien freshwater aquatic plants: a review. Aquatic Botany, 136, 112-137.

Lake Champlain Basin Program. (2005). Lake Champlain Basin Aquatic Nuisance Species Management Plan. In (pp. 7-17). https://www.lcbp.org/wp-content/uploads/2012/12/ANS_Mgmt_Plan_2005Final.pdf. Lake Champlain Basin Program Grand Isle, VT.

Lake Champlain Basin Program. (2026a). Aquatic Invasive Species. https://www.lcbp.org/our-goals/healthy-ecosystems/aquatic-invasive-species/

Lake Champlain Committee. (2026). Aquatic Invasive Species. https://www.lakechamplaincommittee.org/lcc-at-work/invasive-species-in-lake Vessel Incidental Discharge Act of 2018, 33 U.S.C. 1322 et seq. (2018).

Miller, E. B., & Watzin, M. C. (2007). The effects of zebra mussels on the lower planktonic foodweb in Lake Champlain. Journal of Great Lakes Research, 33(2), 407-420. https://doi.org/10.3394/0380-1330(2007)33[407:TEOZMO]2.0.CO;2

Wilcove, D. S., Rothstein, D., Dubow, J., Phillips, A., & Losos, E. (1998). Quantifying Threats to Imperiled Species in the United States. Bioscience, 48(8), 607-615. https://doi.org/10.2307/1313420

9. APPENDICES

Appended Documents:

Task 1: QAPP (Appendix A)

Task 2: Literature Review (Appendix B), herbarium records (Appendix C), 51 species profiles (Appendix D)

EPA SUBRECIPIENT FINAL CERTIFICATION

Subrecipient: University of Vermont

Project Title: Lake Champlain Aquatic Nonindigenous Species Information System Creation

Contract End Date: 2/28/2026 Project Code: LS-2022-081 CFDA: 66.481

By the signature below, SUBRECIPIENT certifies it has met all REQUIREMENTS AND RESPONSIBILITIES of this subaward as outlined in its agreement with NEIWPCC, including all additional obligations for Subawards, and has complied with all Environmental Protection Agency terms and regulations as referenced in http://www2.epa.gov/grants/grant-terms-and-conditions#General%20Terms%20and%20Conditions" and http://www2.epa.gov/grants/cybersecurity-grant-condition-other-recipients-including-intertribal-consortia.

AUTHORIZED SIGNATURE

Signature: Jenney Izzo Digitally signed by Jenney Izzo Date: 2026.03.11 11:49:57 -04'00' Date: 3/11/2026

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