



2016-2017 ANNUAL REPORT

FINGER LAKES INSTITUTE in 1



HOBART AND WILLIAM SMITH COLLEGES



fingerlakesinvasives.org

Prepared by Hilary R. Mosher, **FL-PRISM Coordinator**

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Introduction

Letter from the Coordinator Partners,

The Finger Lakes-PRISM saw much growth over the 2016-2017 fiscal year. We trained 110 people in the iMapInvasives mapping system which saw 7,874 observations input into the mapping system for the region. We continued to engage partners to pilot bootbrush stations on their trails and properties; sponsored two AIS billboards across the Finger Lakes which saw 7.06M impressions over the course of their contract; Hydrilla verticillata was confirmed in Tioga and Cayuga Counties; and a host of other invasive species-related projects and programs were undertaken for this season.

Highlights from the 2016-2017 include:

- \$1,019,369 in funding awarded to the Finger Lakes Institute in 2016-2017 and \$1,224,251 in new funding requests in 2017 for invasive species work from state and federal sources
- 68 programs with nearly 5100 community members engaged on invasive species
- Watercraft steward program inspected **28,283** boats, engaged 62,331 people across **125** days with the highest launch seeing an average **90** boats per day
- **17** unique events in honor of NY Invasive Species Awareness Week
- Water chestnut project removed **179 acres** of water chestnut across the region
- Giant hogweed program controlled **24.5 acres** and surveyed **96 acres** in Monroe and Wayne Counties
- Hydrilla verticillata control project in Tinker Nature Park, Monroe County (\$19,865)
- 20 partners spent \$316,389 on invasive species work
- 20 partners reached 2,450 community members with invasive species outreach
- 24 partners calculated 28,161 hours of staff time spent on invasive species work
- 22 partners calculated 4,778 hours of volunteer time for work on invasive species

The Finger Lakes PRISM continues to expand its partnership to engage in invasive species management. We will align with local, state, and national invasive species programs and goals, and are on a strong path to reaching our 5-year strategic plan goals. Collectively, we have many things for which to be proud in our Finger Lakes PRISM region. We have an incredibly strong partnership and advocates working together in our region to forward natural resource conservation and stewardship. I look forward to continuing to work with you all in the 2017-2018 year!

In service,

Hilary R. Mosher, Coordinator, Finger Lakes-PRISM

Acknowledgements

In addition to the countless hours of dedicated service to our region by our partners, I am thankful to our host organization, the Finger Lakes Institute at Hobart and William Smith Colleges, and our New York State (NYS) partners which include the NYS Department of Environmental Conservation (DEC) Invasive Species Coordination Unit, the NYS Invasive Species Council, the NYS Invasive Species Research Institute, the NYS Invasive Species Clearinghouse at Cornell University, and the New York Natural Heritage as host for the iMapInvasives.

I am also very thankful to our Steering Committee and working group members for their perseverance, expertise, and commitment to furthering the mission of the Finger Lakes-PRISM. There is no 'Partnership' without our partners and we are grateful for their service. A full list of partners serving in some capacity for the Finger Lakes-PRISM is listed in Appendix 1.

The Finger Lakes-PRISM is funded by the Environmental Protection Fund, through contract with the NYS Department of Environmental Conservation to the Finger Lakes Institute at Hobart and William Smith Colleges.

Background

In response to the 2005 report to the NYS Invasive Species Task Force, eight Partnerships for Regional Invasive Species Management (PRISMs) were formed statewide to address the economic, ecological, and human health impacts of invasive species within New York (Figure 1). Developed based on the Cooperative Weed Management Areas (CWMA) from the western United States, the PRISMs represent a unified strategy in dealing with invasive species. The Finger Lakes PRISM is hosted by the Finger Lakes Institute at Hobart and William Smith Colleges through a contract with NYSDEC with funds from the Environmental Protection Fund.

The Finger Lakes-PRISM covers the 17 counties of the Finger Lakes and brings together the resources of a diverse range of organizations to prevent, detect, control, and manage invasive species; ultimately reducing their proliferation and impacts. With the cost to control invasive species within the United States at estimated between \$120B and \$137B annually (Pimentel *et al.* 2005, Runyon *et al.* 2012), the Finger Lakes-PRISM allows for sharing and leveraging of limited resources within the partnership while representing a highly-visible program that builds community awareness and



participation.

Figure 1. Partnerships for Regional Invasive Species Management (PRISMs) in New York State

Finger Lakes Region

With breathtaking vistas and a wealth of historical perspectives, the Finger Lakes hosts travelers, recreationists, and avid enthusiasts from across the world who visit the beautiful land and lakes. Native American legend explains that the Creator looked upon this land with special favor and when reaching out to bless it, left an imprint of His hand on the landscape. Hence, the Finger Lakes were created, per legend.

Of course, geological history has a different, more scarring

tale to tell about its origin. During the Pleistocene, a glacial sheet over a mile thick in locations gorged out the land and created enormous holes that filled in to become lakes as the glaciers retreated across the landscape. The incredible gorges, waterfalls, and natural panoramas of the area were born from this incredible geological process. Notably, the Finger Lakes region offers state parks such as Letchworth and Watkins Glen, ranked numbers one and three respectively in the 2015 <u>USA Today's Reader's Choice Award</u> for Best State Park, as well as the Finger Lakes National Forest, and the gorges of Ithaca (Figure 2), among others.

Some other prominent features of the Finger Lakes region include:

- Harriet Tubman Home in Auburn, NY,
- Waterloo, the birthplace of Memorial Day,
- the home of aviation pioneer Glenn Curtiss, in Hammondsport,
- Elmira, home to Mark Twain in his later years
- Corning Museum of Glass
- Hornell, a major railroad center
- Conesus, the oldest producer of pure grape sacramental wine in the Western hemisphere

- Seward House of Auburn, a National Historic Landmark
- Seneca Falls
- Hemlock-Canadice State Forest covers two lakes and has 6,684 acres
- Hemlock is also home to the state's oldest pair of nesting bald eagles dating back to the 1960s
- Montezuma Audubon Center
- Institutions of higher education

Figure 2. Map of the Finger Lakes region.

The Finger Lakes-PRISM region encompasses over 7.3 million acres with the City of Rochester to the west, the City of Syracuse to the east, and Elmira-Corning to the south. According to census data from 2010, 2,351,253 people live in the Finger Lakes region which encompasses Broome, Cayuga, Chemung, Chenango, Tompkins, Tioga, Steuben, Wayne, Yates, Cortland, Livingston, Madison, Monroe, Onondaga, Ontario, Schuyler, and Seneca counties. The mean household income of



the region is \$63,978 and the average individual percent poverty rate is 13.39% (Census Data, 2010). Given the unique features, aesthetic value, and ease of access to major cities, the Finger Lakes region* is reported to be the largest tourism area in New York State, north of the Hudson Valley (Finger Lakes Tourism Alliance, 2014). In fact, in 2014, travelers to the Finger Lakes region added \$2.9B in traveler spending and supported 59,238 jobs, equating to 5% of the total traveler spending within NYS. The amount of traveler spending to the Finger Lakes then is more than any other region outside of the New York City, Long Island, and Hudson Valley tourist locations, which collectively, made up nearly 80% of traveler spending. (Finger Lakes Tourism, 2014).

*Tourism data excludes the financial impact of Madison, Broome, and Chenango counties, which were included in the Central New York tourism data, and equates to an additional 3.8M dollars in traveler spending and increases the contribution of the region by 0.6 % (Central New York Focus Data, 2014).

Fishing also has a major impact in the Finger Lakes region. According to the Economic Contributions of Recreational Fishing per U.S. Congressional Districts report produced by Southwick Associations for the American Sportfishing Association, NY anglers contributed nearly \$4B to the NY economy of which the Finger Lakes region accounted for over 25% of the total angler contributions (\$1.032B).

There are over 40 State Parks and Historic Sites within the region ranging from Hamlin Beach State Park in Monroe County to Green Lakes State Park in Onondaga County. Additionally, the Finger Lakes boast <u>Zurich Bog</u>, a National Natural Landmark with its unique wetland preserve that is home to several threatened and endangered species on 650 acres in the town of Arcadia. The Finger Lakes is also home to the Finger Lakes National Forest in Hector, NY, a beautiful 16,212 acre retreat in the watersheds of Seneca and Cayuga Lakes.

Problem Statement

Invasive species (IS), as defined by the NYS DEC, pose a significant threat to the Finger Lakes region given the multitude of vectors for transmission. Especially of concern to our region is the massive population of giant hogweed, common reed located along almost every major transportation corridor, and actively managed populations of Hydrilla in the Cayuga inlet and Tinker Nature Park. These invasives and others are taking foothold in our region even as other

Prepared by Hilary R. Mosher, Finger Lakes-PRISM Coordinator

populations are poised for invasion via the Erie Canal and other transmission routes. It is imperative that we protect our ecosystems and safeguard our picturesque region from additional outbreaks of new or invading species.

Mission

The mission of the Finger Lakes Partnership for Regional Invasive Species Management (Finger Lakes-PRISM) is to reduce the introduction, spread, and impact of invasive species within the Finger Lakes PRISM region through coordinated education, detection, prevention, and control measures (adopted by the Steering Committee, June 2014).

Vision

The Finger Lakes-PRISM is recognized as the primary organization for invasive species detection, prevention, control, and education and outreach within the 17-county region of the Finger Lakes. The Finger Lakes-PRISM will work collaboratively with its partners and the public to provide education and mitigate the impacts of invasive species within our region.

Finger Lakes-PRISM Steering Committee, Working Groups, and Staff

The Finger Lakes-PRISM consists of multiple partners working together to help stop the invasion of plants, animals, diseases, and vectors of transmission for invasive species. The Finger Lakes-PRISM provides funds for Dr. Lisa Cleckner, Director of the Finger Lakes Institute, Hilary R. Mosher, Finger Lakes -PRISM Coordinator. In addition, funding this season was able to cover time for HWA survey and other invasive species work in the region by a part-time field crew.

The Finger Lakes-PRISM committees are divided among working groups and encourage on-the-ground education & outreach, prevention, and control of invasive species through public forums, trainings, outreach, presentations, and invasive species surveys throughout the region. The Finger Lakes-PRISM has a Steering Committee (SC), Aquatic Working Group (AWG), Education & Outreach Working Group (E&OWG), and a Terrestrial Working Group (TWG) (Appendix A).

Finger Lakes-PRISM Goals and Accomplishments from 2016-2017 Fiscal Year

1. Coordination with Partners

The Finger Lakes-PRISM strategically identifies stakeholders, forms networks, and facilitates sharing of information, resources, and expertise.

The Finger Lakes-PRISM actively recruited partners from the region through networks, use of the Cornell listserve, presentations at various meetings, and networking with stakeholders. The working groups, steering committee, and ad hoc invasive species meetings were held at the Finger Lakes Institute at Hobart and William Smith Colleges over the 2016-2017 fiscal year.

Partnership Meetings

During the 2016-2017 fiscal year, the Finger Lakes-PRISM hosted two full partnership meetings (April 8, and October 4) with over 100 people in attendance across both meetings. Topics for these programs ranged from an update from the NYS Hemlock Initiative, to reports from the subcontract awards for the 2015-2016 season, a field tour of Ganondagan State Historic Site in Victor, NY and update to the USFS GLRI-funded project at Ganondagan to restore the grassland

areas.





Partner Meetings

The Finger Lakes-PRISM attended or hosted programs within the Finger Lakes region. The Finger Lakes -PRISM had presence at 34 meetings including working group meetings for the Finger Lakes -PRISM, Great Lakes Action Agenda, Finger Lakes Regional Watershed Alliance, and EAB taskforces. These meetings had a collective attendance of over 750 people to discuss invasive species programming in the area. Additionally, the Finger



Lakes PRISM served on multiple working

groups and management committees across the region. These include, but are not limited to: Boy Scout Camp Babcock-Hovey Conservation Management Committee, State Hemlock Woolly Adelgid (HWA) Management, Finger Lakes regional HWA Management committees, Hydrilla Task Force, the Upper Susquehanna Conservation Alliance, and the Finger Lakes Regional Watershed Alliance.

Presentations and Tabling

The Finger Lakes-PRISM presented to groups in the region at over 20 programs and to a cumulative audience of 1,550 people. Presentations ranged from conservation field days to the Monroe County chapter of the ADK, to lectures at

institutions of higher education such as Wells and Ithaca Colleges. The Finger Lakes-PRISM had presence at numerous events across the region through tabling for invasive species and reached approximately 2,570 people on invasive species issues.

The Finger Lakes-PRISM awarded nine subcontract awards totaling \$43,435.65 during the 2016-2017 fiscal year (Table 1). The following organizations were recipients of funding for invasive species work in the Finger Lakes. Final reports for each of the subcontract awards are located in Appendix C.



Table 1. Subcontract awards to partners that advance the strategic priorities of the Finger Lakes-PRISM

Proposal Title	Organization	Award Amount (\$)
Early Detection Survey for Hydrilla Verticillata in the Three Rivers System of Onondaga County	Onondaga County Health Department	\$3,080
HWA Monitoring in the Canandaigua Lake Watershed	Canandaigua Lake Watershed Association	\$3,860
Early Detection and range expansion of the invasive bloody-red shrimp, Hemmimysis anomala in the Finger Lakes: A citizen science and survey-based approach	Poughkeepsie Day School	\$5,000
Invasive Plant Management and Outreach Events at Island Cottage Woods Preserve, Genesee Land Trust	Genesee Land Trust	\$2,307
Survey for Hydrilla in inland water bodies of Monroe County	The Research Foundation, SUNY	\$7,078
Control and monitoring of populations of Microstegium vimineum (Trin.) Camus in Ithaca, Tompkins County, NY	City of Ithaca	\$4,438
Baltimore Woods nature Center and Central New York Land Trust Invasive Species Inventory and Management Tracking Using iMapInvasives	Baltimore Woods Nature Center	\$4,998.4
Invasive Species Outreach and Education Assistant based at Morrisville State College.	Morrisville State College	\$12,674.25
	TOTAL AWARDS	\$43,435.65



Coordinator Projects

Finger Lakes Institute (FLI) Watercraft Steward Program

During the summer of 2016, the FLI watercraft steward program provided education and outreach on the significance of New York's aquatic ecosystems and the threat of the spread of invasive species at 13 launch sites. The FLI had watercraft steward coverage for 125 days and inspected 28,283 boats and 62,331 people. The highest launch in the Finger Lakes saw an average of 90 boats per day and had a maximum daily visit of 378 boats in one day. It is important to have this

Listserve:

The Finger Lakes-PRISM listserve contained 245 names for distribution prior to April 2015. As of February 2, 2017, the listserve contains 291 members, representing a 6.2% increase over last year. This was the primary way to communicate with the community about invasive species and events within the Finger Lakes-PRISM. The Finger Lakes-PRISM averages two emails to the list per week to keep the members informed about important invasive species work across the region.

Social media:

The Finger Lakes-PRISM maintains a Facebook, Instagram, and Twitter presence. Facebook has had 281 page likes/followers since its creation who follow the posts specific to invasive species in the region. Twitter has had 299 followers, 373 tweets, and is following 460 twitter-users.

Educational Materials and Media:

The Finger Lakes-PRISM has created brochures for invasives such as mile-a-minute, helped edit factsheets, the Great Lakes Panel on Aquatic Nuisance Species outreach brochure, and our projects have been highlighted in various media outlets including the Rochester Democrat and Chronicle, the Messenger Post, WETM 18 News, Finger Lakes Times, WXXI, and Fox News Rochester.

Website Platform:

The website platform is fully functional and available at fingerlakesinvasives.org. The site went live during the previous fiscal year and the home page has had 2,540 views. The site has had 64 posts, 36 comments on posts and has 80 pages of content.

Coordinated Partnerships- Meetings

<u>County Soil & Water Conservation Districts</u> implement County Water Quality Strategies to address nonpoint source water pollution and other water quality issues through a County Water Quality Coordinating Committee or Water Quality Management Agency. While some committees are more active than others, the Finger Lakes-PRISM has had representation at nearly two-thirds of the active water quality meetings during the year (Table 2).

Table 2. Participation at County Water Quality Coordinating Committee in the Finger Lakes region

No information about meetings available
Actively participating
No information about meetings available
No information about meetings available
Attendance meetings by proxy, when
appropriate
No information about meetings available
Actively participating
Actively participating by proxy
No information about meetings available
No information about meetings available

Livingston	Actively participating
Madison	No information about meetings available
Monroe	Actively participating, presented at
	meetings, on list for meeting agenda and
	notes
Onondaga	Presented at meetings, on list for meeting
	agenda and notes
Ontario	Presented at meetings, on list for meeting
	agenda and notes, participation by proxy
Schuyler	Actively participating by proxy
Seneca	Actively participating

Grant Awards

The Finger Lakes-PRISM actively sought funding from state and federal sources over the 2016-2017 fiscal year. Table 3 shows the number of funded projects that were awarded during this fiscal year. In the winter of 2017, the Finger Lakes-PRISM applied for projects related to invasive species totaling **\$1,224,251**. The Finger Lakes Institute will be notified during the 2017-2018 fiscal year. A table of the funding agency and project title and competitive funding applications submitted in January, 2017 are available in Table 3.

Years	Funding Agency	Project Title	Funded \$
		Water Chestnut Control in the Finger Lakes Region of the	
2016-2018	EPA GLRI	Great Lakes Basin	\$516,367.00
2016-2018	USFS GLRI	Ganondagan Guardians Increase Grassland Restoration	\$40,000.00
2016-2019	USDA-NRCS	Giant Hogweed Control in Monroe and Wayne Counties	\$263,002.00
2016-2019	NYSDEC	Watercraft Steward Prevention and Training Grants (n=2)	\$200,000.00
		TOTAL AWARDS	\$1,019,369.00
Submitted		Hydrilla Control in Aurora, NY, Finger Lakes region of the	
January 2017	EPA-GLRI	Great Lakes Basin	\$598,960.000
Submitted			
January 2017	EPA-GLRI	Nitellopsis obtusa collaborative in the Great Lakes Basin	\$295,293.000
Submitted		Grassland and Floodplain Restoration on Ganondagan State	
January 2017	USFS-GLRI	Historic Site	\$39,999.000
Submitted			
January 2017	USFS-GLRI	Finger Lakes National Forest Invasive Species Roundup	\$40,000.00
		TOTAL COMPETITIVE APPLICATIONS	\$964,252.00

Table 3. Grant awards that support the Finger Lakes-PRISM and its strategic mission over the 2016-2017 fiscal year.

Selected Partner Projects

Hemlock woolly adelgid partnerships

The Finger Lakes-PRISM funded a crew to survey 25 sites within the Finger Lakes-PRISM region over the winter of 2016. HWA was observed at ten locations and information was entered into iMapInvasives and provided to the New York State Hemlock Initiative.

The Canandaigua Lake Watershed Association (CLWA) was funded through the Finger Lakes-PRISM to conduct HWA monitoring programs and outreach in the Canandaigua Lake watershed. An HWA brochure was created and distributed to 875 property owners in the Canandaigua and Honeoye Lake watersheds through targeted mailings. The CLWA held three public workshops with 112 people in attendance; surveyed 28 sites; and uploaded 51 data points for HWA. This project engaged 16 volunteers to survey and monitor for HWA in this region. Additionally, the project created a HWA priority for biocontrol ranking schema (Table 4).



Table 4. Priority criteria for applying biocontrol to hemlocks infested with HWA in the Canandaigua Lake Watershed

PRIORITIES FOR BIOCONTROL APPLICATION HEMLOCK WOOLY ADELGID IN THE CANANDAIGUA LAKE WATERSHED

Criteria :

Presence of Hemlocks (#trees in contiguous	10	50	250	500
area)				
Presence of HWA	High	Medium	Low	None
(% infested)				
Unique Species factor	Plants high	Animals high	Animals low	Plants Low
	(endangered)	(endangered)		
Adjacent Land Use	Public use	Private use	Mixed use	
Natural Capital score	High	Medium	Low	unknown
Slopes	Very severe (over 40%)	Severe (25-40%)	Steep (15-25%)	Moderate
Accessibility for	Very	Somewhat	Difficult	Almost
treatment, monitoring				impossible
Water Quality factor	Large drainage,	Medium	Small drainage,	Small, no cover
(acres drained, shaded	mostly shaded	drainage, some	little shade	
= temperature)		what shaded)		

2. Recruit and Train Volunteers

Coordinator Projects

The Finger Lakes-PRISM engaged in various recruitment and training opportunities across the region. Examples of some of the educational events and activities are listed below. Programs included invasive species identification workshops, iMapInvasives trainings across the region, and programs that were part of the Finger Lakes-PRISM subcontract work in the region. Recruitment and training of volunteers in invasive species management were ongoing through the 2016-2017 season. There were 110 people trained in reporting invasives through iMapInvasives. Between the periods 4/1/16 to 3/31/17, there were 7,874 observations reported in iMapInvasives for the region. starry stonewort (*Nitellopsis obtusa*) was the most predominate observed organism (n=1,249) followed by Eurasian watermilfoil (n=1,214)





(www.imapinvasives.org). Additionally, the Finger Lakes-PRISM provided training and recruited volunteers for partner events and utilized social media, the listserve, and working groups to advertise and promote partner events.

The EPA GLRI-funded water chestnut control project hired and trained eight people to survey, identify, and report invasive species in the region. Over the 2016 field season, the crew surveyed 9,769 acres for invasive species across 16

sites. All encountered invasive species were reported using iMapInvasives.

The Finger Lakes Institute trained watercraft stewards from across the region in May, 2016. Watercraft stewards from the Finger Lakes Institute, Onondaga Environmental Institute, Chautauqua Lake Association, and Cortland-Onondaga Federation of Kettle Lakes were in attendance to learn about AIS, how to prevent the spread and impact of AIS, and how to engage in education and outreach to recreationists to enable the public to remain diligent in the fight to #stoptheinvasion

through Clean, Drain, Dry practices. The Finger Lakes-PRISM supported multiple programs by providing this training and resources.

Utilizing partnerships such as the

3. Identify and Meet the Finger Lakes-PRISM Education and Outreach Needs

Community and regional engagement is key to a strong program and the Finger Lakes-PRISM was tireless in its attempts at increasing the education and outreach capacity of the region. Over the 2016-2017 season, over 5,000 people were engaged in either tabling, workshop or lecture attendance, and monitoring programs in the region. The Finger Lakes-PRISM is becoming established as the go-to resource for educational resources for programming.

> Cornell Cooperative Extensions, Finger Lakes Institute's Environmental Education Program, and other programs, the Finger Lakes-PRISM has a strong presence across the region.

Coordinator Projects

In addition to iMapInvasives training and ID session, the Finger Lakes-PRISM presented information about ongoing invasive species efforts at meetings,

conferences, briefings, and water quality coordinating committees. The NYS Envirothon oral presentation and multiple choice test were both written by the Finger Lakes-PRISM for use by all successful Envirothon participants who advanced to the state testing.

The EPA GLRI-funded water chestnut control project funded education and outreach across the Great Lakes Basin. As part of the goals and objectives, education and outreach across the region targeted 4,750 people at events and 900 community members were targeted to address AIS across the region.















Billboard marketing

Partnering with Wildlife Forever, the Finger Lakes-PRISM secured two billboards to promote Clean, Drain, Dry messaging across the state. The two billboards, placed in strategic locations in the region were estimated to provide 7.06M impressions reminding people to engage in pro-environmental behaviors.

Bootbrush stations in the Finger Lakes

The Finger Lakes-PRISM engaged with partners to pilot bootbrush stations to promote the Play, Clean, Go campaign that encourages people to remove seeds or other invasive species that may hitch a ride on shoes while hiking. Partners agreed to place bootbrush stations in well-utilized locations for recreationists to engage in outreach and control to stop the spread of invasive species carried on boots. The campaign began in 2015 and has been successful into the 2017 season with over 30 bootbrush stations deployed across the region.





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The bootbrush station signage to encourage Play, Clean, Go_{TM} . The sign is customizable and can be designed specifically for a trail program. Currently there are 18

Bootbrush station constructed by the NYSDEC Excelsior Conservation Corp Interns and summer research students at the Finger Lakes Institute.

4. Monitoring Network for Early Detection of Invasive Species

Coordinator Projects

iMapInvasives trainings and invasive species identification and detection sessions were held throughout the region to increase the monitoring networks for early detection of invasive species. Due to the increased eyes on the ground and water, several new detections were reported in the Finger Lakes region.

Mile-a-minute, a fast growing vine was reported in Livingston County, NY in a hedgerow in the Conesus Lake watershed. The Finger Lakes-PRISM supported a field crew who led survey efforts alongside NYSDEC staff and interested community members to collect the ripened seed before birds could carry new populations to other areas. The crew worked with homeowners to determine if their land was infested and do preliminary survey. More survey work is needed to confirm whether this infestation is more isolated than the delineation would suggest. During the fall, 14 quart-sized bags of fruit were collected from vines encountered in this area. More survey and control will occur during the 2017 season.



Oak wilt was discovered in Canandaigua, Ontario County in fall of 2016. The homeowner, who discovered the fungus, contacted the resource of Cornell Cooperative Extension in Ontario County because an oak tree on the property began



showing signs of decline with no identifiable causes. Samples were analyzed by the Cornell Plant Disease Diagnostic Clinic where they tested positive for the fungus. At this time the NYSDEC has increased its quarantine due to the seriousness of the infestation and outreach materials will be provided to Ontario County to increase awareness of the disease. Several media outlets covered the story and participation at an Oak Wilt program was at full capacity with interested community members.

Hydrilla verticillata in the Finger Lakes region is an unwelcome report. While many residents and community members have been trained in identification of Hydrilla through various citizen science programs, training, and attendance at workshops, the Finger Lakes-PRISM has been comforted by numerous negative occurrences in areas of concern and near areas with known infestations. Unfortunately, this season has brought two confirmed reports of Hydrilla in the region; one in Cayuga County near Aurora, and the other in Tioga County. The Finger Lakes-PRISM has led the efforts to bring together stakeholders to address these infestations through control and provide education and outreach to the larger community.



The USFS GLRI-funded project on

the Ganondagan State Historic Site had stewards survey and remove invasive species across a culturally-historic site. Over 250 acres were surveyed for invasive species and 30 acres of honeysuckle were surveyed within this area.

The EPA GLRI-funded project surveyed across 16 sites in the Finger Lakes region of the Great Lakes Basin. The crew was able to survey 9,679 acres looking for high priority invasive species such as Hydrilla, European frogbit, or starry stonewort.

The USDA NRCS- funded GH control project surveyed for GH across 95.8 acres across Monroe and Wayne Counties. The crew also looked for high priority invasive species such as kudzu, mile-a-minute, and Asian longhorn beetle.

5. Support Academic Research Through Citizen Science

Coordinator Projects

The Finger Lakes-PRISM working groups were surveyed to determine the needs of the region for invasive species issues. The identified projects were sent to Carrie Brown-Lima, Coordinator for the Invasive Species Research Institute. The organisms of interest for the region included Hydrilla, EAB, and hemlock woolly adelgid. Hydrilla is being actively managed in the Finger Lakes and HWA is ravaging our important hemlocks. The Finger Lakes region encompasses 17 counties and there are many invasive species here or encroaching on our region. Some of the major organisms of concern from the working groups are listed above but include HWA, EAB, and Hydrilla.

Additionally, the Finger Lakes-PRISM has supported academic research by providing monitoring and survey capacity for multiple research projects for institutions such as Finger Lakes Community College, SUNY Brockport, and ESF. For example, the USDA NRCS-funding

giant hogweed control project provided the baseline for a graduate student project seeking to determine the cooccurrence of invasive species with giant hogweed as part of a master's thesis at ESF under Dr. Melissa Fierke. The Finger Lakes PRISM also served as a reviewer for Cornell University small grants projects that focused on invasive species work in the region.

The Department of Biology at Hobart and William Smith Colleges has a strong interest in invasive species. Meghan Brown (Associate Professor of Biology) recently confirmed the presence of the bloody-red shrimp (*Hemimysis*) in Cayuga Lake and has published on the effects of *Bythotrephes longimanus* in waterbodies and effects of other species invasions in the Finger Lakes. Brown also maps the current spread of invasives, explores ways to limit their range expansion, and quantifies the effect of invasives on native species. Brad Cosentino, Assistant Professor of Biology, is studying the impact of the invasive earthworm on native populations of salamanders in the Finger Lakes.

6. Develop PRISM-specific Invasive Species Management Plans

The Finger Lakes-PRISM follows a strategic plan that outlines seven goals with objectives and strategies to effectively manage invasive species in the Finger Lakes region and beyond. NYSDEC has created a rapid response for invasive species: framework for response which outlines the steps necessary steps for effective management of an invasive species once discovered. This is a foundational document created by the Invasive Species Coordination Unit that guides decision-making for invasive species issues. Other management plans such as control of water chestnut, are in development.

7. Implement Eradication Projects to Remove Invasive Species Coordinator Facilitated Projects Water Chestnut Project

In spring 2016, the Finger Lakes Institute received an Environmental Protection Agency Great Lakes Restoration Initiative Grant to control water chestnut from 12 sites in the Finger Lakes region of the Great Lakes Basin. This two-year project committed to removing invasive water

chestnut from waterways whose infestations ranged from a few years old to decades. This project greatly increased the capacity of the Finger Lakes-PRISM to address AIS in the watershed. The water chestnut field crew consisted of five team members, one field crew lead, and a project manager. Over the 2016 field season, the project reported controlling water





chestnut on 179 acres across 12 project sites. The crew surveyed for high priority invasive species such as water chestnut, starry stonewort, and Hydrilla across 9,679 acres. Additionally, 810 students were engaged in AIS education and outreach at such events as Conservation Field Days, NYS Envirothon, and through guest lectures at institutions of higher education. In addition, over 1,100 community members were engaged at events across the Finger Lakes region on topics related to AIS. Increased reach of community members was accomplished through participation and information disseminated at events such as the NYS Fair and National Hunting and Fishing days where it is estimated that over 5,000 took materials on invasive species.





Giant Hogweed Control Project

A cooperative agreement between USDA NRCS and Hobart William Smith Colleges (HWS) was developed for Giant Hogweed (GH) control for three years. This greatly increases the capacity of the Finger Lakes-PRISM to control this noxious weed in Monroe and Wayne County. The field crew supported by this funding controlled GH across 24.5 acres and surveyed 95.8 acres (Table 5).

The funding also provides for education and outreach to aid in prevention of this invasive from spreading. Conservation practices utilized by this agreement include: (314) Brush Management, (315) Herbaceous Weed Control, (327) Conservation Cover, (342) Critical Area Planting, (647) Early Successional Habitat Development and Management, (484) Mulching, (391) Riparian Forest Buffer, (390) Riparian Herbaceous Buffer, (612) Tree and Shrub Establishment, and (490) Tree and Shrub Site Preparation. Habitat restoration is planned post-treatment contingent upon additional funding sources.

This project has three intended outcomes:

- Remove GH at 320 sites across 45 acres in Monroe and Wayne Counties where prevention and control has not been feasible previously, thus enhancing, restoring or creating early succession habitat, grassland habitat, wetlands, forestlands and riparian areas on private lands including abandoned cropland/orchards negatively affected by giant hogweed and other invasive plants.
- 120 students and teachers trained and educated in invasive species ID, biology, survey and control
- 30 people trained to report giant hogweed in imapinvasives and 100 people engaged in early detection

Table 5. 2016 Finger Lakes region GIANT HOGWEED CONTROL BY THE NUMBERS

County	Survey Acres	Control Acres
Monroe	30	7.5
Wayne	65.8	17
TOTAL	95.8	24.5

Mile-a-minute vine (Persicaria perfoliata)



After the initial report of mile-a-minute vine in Livingston County, the Finger Lakes-PRISM surveyed the landscape for the invasive and removed the fruiting berries so that birds would not be able to carry them to satellite locations in the area. The control removed 14 quart bags of seeds from the property where the initial observation was made. This report is the first known infestation outside of the Lower



Hudson region and the Finger Lakes-PRISM is expanding the survey and outreach to include this highly aggressive vine that may be in multiple locations within the region. A management plan is in

development and survey work is in scheduled for 2017 and beyond.

Hydrilla verticillata

The 2016 field season controlled Hydrilla verticillata across 1.0 acres in Tinker Nature Park using benthic mats through contract with Racine-Johnson Aquatic Ecologist, funding through the NYSDEC. The grass carp that were stocked in 2015 were not observed in the pond during the 2016 and it is expected that there was 100% mortality due to overwintering in the pond, predation, and drought during the 2016 season. Benthic matting will expand for the 2017 season and include additional area within the cattails where Hydrilla is growing.

The Finger Lakes PRISM also supported Tioga County Soil and Water Conservation in their application for early detection and rapid response for the Hydrilla infestation in Owego County. The Finger Lakes PRISM worked with partners and the municipality to gain the appropriate letters of support, funding match, and landowner permission so that the infestation can be treated during the 2017 field season and beyond. This infestation has previously not been treated and is a high need and priority for our region.



Highlighted Partner Projects

Partner Reports:

Number of Partners Completed Surveyed: 24 Total Amount Spent on Invasive Species: \$316,389 Total Participants Reached: reached 2,478 Total Staff Time: hours calculated 28,161.5 Total Volunteer Hours: hours calculated 4,778

8. Develop annual work plan

The annual work plan was approved by the Steering Committee and is available in Appendix B.

9. Coordinate with other PRISMs and Office of ISCU

The Finger Lakes-PRISM has participated and provided updates during the monthly statewide invasive species calls, attended the state invasive species conference during the CCE In-service at Cornell University, and provides regular updates to the representative for ISAC, and the ISCU. The Finger Lakes-PRISM had a strong presence in the region to celebrate NYS Invasive Species Awareness Week and held workshops, conferences, and supported 18 unique programs throughout the region.

10. Support NY ISC regular invasive species conference

The Finger Lakes-PRISM provides support to the NYS ISC regular invasive species conference through planning, presentations, contributed papers, posters, and workshops.

11. Description of Obstacles to Achieving Objectives

- Making sure that partners knew about the PRISM and communicated events
- The Finger Lakes region consists of 17 counties and has incredibly diverse ecosystems
- There are many waterbodies for consideration including five watersheds
- The 11 Finger Lakes often overshadow the smaller waterbodies
- The waterbodies and AIS often overshadow the agricultural and terrestrial invasive species
- State agency regions or jurisdictions don't line up with PRISM boundaries and often no 'dedicated' representative to sit on one PRISM or another
- Lack of funding for significant control of infestations such as common reed, Japanese knotweed, Eurasian watermilfoil
- Lack of strong relationship/coordination/communication with CCE education efforts
- Lack of name recognition of Finger Lakes-PRISM for coordination with partner organizations
- Southern Tier has a focus limited to forest and streams
- Members will come and go (soft funding, loss of institutional knowledge)
- Bias on steering committee towards Aquatics; need more Ag & Terrestrial
- Some parts too far from Great Lakes and Chesapeake Bay to get funds
- Lack of organizations for forestry; lack of connections
- Terrestrial IS affect aquatics but people may not make the connection; lack of holistic view of IS and interest in different ecosystems
- Terrestrial and Ag don't have a rallying point that lakes provide
- Economic potential of IS to wipe out a crop
- Prevention can't prove a negative
- Message of hopelessness leads to negative environmentalism
- Too much to do; too many species
- Groups with hierarchies that need to be understood and respected (Native Nations, Amish)
- General public has low skills for identification
- Lack of support for ID
- Unclear what level of service should/could be provided since the level of service varies
- Consistency of approach is difficult
- Unclear what are the top few priorities, what species are not consistently prioritize/priorities not communicated
- Regionality: different regions have different priorities

12. Potential Solutions to Obstacles and/or Resources Needed

- PRISM System is in place, CCE IS team in place
- Finger Lakes in the region serve as a rallying point
- Academic institutions, Finger LakesI: expertise, research
- Cornell NYS Invasives Species Institute hired coordinator
- Diversity of the region: ecosystem, climate (a lot of, water, open space)
- Impact of Lake Ontario to moderate weather/temperatures

• Geography: central NY, bordered by 4 PRISMS

• People: volunteerism, passionate, good communication (DEC, DOT, Parks meet together), capacity for communication

- Stakeholders: Lake Associations, NYS Forest Owners, etc.
- Economic drivers are tied to natural resources, gets the attention of legislators
- Federal lands- National Forest & Montezuma
- Active TNC and land trusts
- Southern Tier has large warm water stream
- Water Connections to outside the region
- Clean Drain Dry NYS regulation
- Preventions Act
- CCE invasives species team
- Army Corps regulations to limit IS in mitigation
- DEC regulation IS Part 575 and Part 576
- Public awareness is growing as increased legislation occurs
- Finger Lakes-PRISM is part of Great Lakes basin funding potential, Sea Grant and other working on the region
- PRISMs across the state have been funded at different times and some had funding for years and are leaders
- National model for PRSIM type system in place since early 90s
- Funding: Great Lakes restoration funds, current 5 year funding
- Elected officials are thinking about IS
- Lake Associations, trail associations, NYS forest owners assoc., rod and gun clubs/federations, Isaak Walton league, etc.
- High profile IS that provide the opportunity to engage people. HWA tie terrestrial and water systems together
- Opportunities to engage Higher Educational Institutions, public agencies, and NGOs
- NRCS: EQIP, WHIP funds could be used
- There is a constant need for increased resources, human and otherwise. With a region as expansive as the Finger Lakes, it is impossible to carry-out all the education and outreach, prevention, and early detection/rapid response work that is needed to effectively manage invasive species. In the near term, a prevention specialist and administrative

support are of utmost priority to obtain to provide support to the Finger Lakes-PRISM.

13. Summary of project expenses



Conclusion

The Finger Lakes- PRISM has come a long way since funding was awarded to the Finger Lakes Institute in 2013. The program has strong partnership with outreach groups, natural resource managers, and others who are committed to furthering invasive species management and issues in the region. The Finger Lakes PRISM has leveraged the partnership to secure over \$1M in funding for invasive species control and restoration and yields nearly a threefold increase in

programming for every dollar used to support the program. Additionally, working with researchers and program managers at the FLI has greatly expanded the capacity of the Finger Lakes PRISM to broaden its reach and secure the PRISM as the go-to for all things invasive.

References

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The Economic Impact of Tourism in New York. Tourism Economics, an Oxford Economics Company. Online at: <u>http://www.fingerlakes.org/uploads/pages/pdf/NYS%20Tourism%20Impact%20-%20Finger%20Lakes.pdf</u> Accessed on February 21, 2015.

APPENDICES

Appendix A. List of Participating Members of Steering Committee and Working Groups **Partners**

Steering Committee

Kathy Bertuch, Program Manager, Central New York Regional Planning Development Board Pauline Burnes, NYS DOT Region 6, Hornell, NY (on email list for SC news and updates) Lisa Cleckner, Director, Finger Lakes Institute Don Cook, Finger Lakes Regional Watershed Alliance, New York State Federation of Lake Associations Bruce Gilman, Professor, Finger Lakes Community College Dorothy Gronwall, Honeoye Valley Lake Association Terry Gronwall, Honeoye Valley Lake Association Web Pearsall, NYS DEC, Region 8, Fisheries Miranda Reid, Conesus Lake Watershed Manager, Livingston County Planning Department Gregg Sargis, Director of Ecological Management, The Nature Conservancy, (on email list for SC news and updates) Emily Sheridan, Great Lakes Watershed Program, NYS DEC (on email list for SC for news and updates) Emily Staychock, Keuka Lake Watershed Educator Cornell Cooperative Extension Yates County

Aquatic WG

James Balyszak, Hydrilla Program Manager (until December 2016) Kathy Bertuch, Program Manager, Central New York Regional Planning Development Board Fred Blom, President, NYS B.A.S.S. Nation Lisa Cleckner, Director, Finger Lakes Institute Don Cook, Finger Lakes Regional Watershed Alliance, New York State Federation of Lake Associations Sarah Finger Lakeseming, Ducks Unlimited (on email list for AWG for news and updates) Bill Foster, Cayuga Lake Finger Lakesoating Classroom Bruce Gilman, Professor, Finger Lakes Community College Dorothy Gronwall, Honeoye Valley Lake Association Terry Gronwall, Honeoye Valley Lake Association Angel Hinickle, Tompkins County Soil and Water Conservation District (on email list for AWG for news and updates) Roxanne Johnston, City of Ithaca (on email list for AWG for news and updates) Kristy LaManche, Finger Lakes-Lake Ontario Watershed Protection Alliance, Coordinator Dave MacDonald, President, Save Our Sodus, (on email list for AWG for news and updates) Russ Nemecek, Onondaga County, Soil and Water Conservation District, (on email list for AWG for news and updates) Web Pearsall, NYS DEC Region 8, Fisheries Miranda Reid, Conesus Lake Watershed Manager, Livingston County Planning Marcus Riehl, NYS Parks, (on email list for AWG for news and updates) Dave Scudder, President, Save Our Sodus Emily Sheridan, NYS DEC, Great Lakes Watershed Program (on email list for AWG for news and updates) Emily Staychock, Invasive Species Education Program, Cornell Cooperative Extension Roy Widrig, Cornell Cooperative Extension, Onondaga County Michele Wunderlich, Associate Planner, Cayuga County Planning and Economic Development

Education & Outreach WG

Fred Blom, President, NYS B.A.S.S. Nation Kristina Farrare, Team Coordinator, Forestry, Agriculture & 4-H Youth Development, Cornell Cooperative Extension, Onondaga County, (on email list for AWG for news and updates) Bill Foster, Cayuga Lake Finger Lakesoating Classroom Bruce Gilman, Professor, Finger Lakes Community College Deb Grantham, Invasive Species Education Program, Cornell Cooperative Extension (until July 2015) Rebecca Hargrave, Assistant Professor, SUNY Morrisville Hilary Lambert, Executive Director, Cayuga Lake Watershed Network, (on email list for EOWG for news and updates) Jessi Lyons, Natural Resources Team Coordinator, Cornell Cooperative Extension, Onondaga County

Emily Sheridan, NYS DEC, Great Lakes Watershed Program, (on email list for EOWG for news and updates) Anna Stalter, Associate Curator and Extension Botanist, CALS School of Integrative Plant Science, (on email list for EOWG for news and updates)Emily Staychock, Cornell Cooperative Extension, Invasive Species Education Program Kristy Sullivan, Cornell Cooperative Extension, (on email list for EOWG for news and updates) Russ Welser, Cornell Cooperative Extension, Ontario County Michele Wunderlich, Associate Planner, Cayuga County Planning and Economic Development Carri Marschner, Invasive Species Education Program, Cornell Cooperative Extension until July 2015, Invasive Species Specialist, Finger Lakes Hemlock Initiative, Cornell University after July 2015 **Terrestrial WG** Sylvia Albrecht, Citizen Advocate Kathryn Amatangelo, Assistant Professor, The College at Brockport SUNY Mary Beth Deller, Botanist and Non-native Invasive Plant Program Coordinator, USDA Forest Service Kristina Ferrare, Team Coordinator, Forestry, Agriculture & 4-H Youth Development, Cornell Cooperative Extension, **Onondaga County** Mark Gooding, NYS DEC, Forester 3, Region 8 Bruce Gilman, Professor, Finger Lakes Community College Jules Ginenthal, Cornell Plantations, Natural Areas Stewardship Coordinator, (on email list for TWG news and updates) Jason Gorman, Finger Lakes Land Trust, (on email list for TWG news and updates) Jon Harman, Landscape Architect, NYS DOT, Region 4 Rebecca Hargrave, Assistant Professor, SUNY Morrisville Gary Koplun, NYS DEC, Region 8 Jessi Lyons, Natural Resources Team Coordinator, Cornell Cooperative Extension, Onondaga County Bruce Natale, Cayuga County Planning Walt Nelson, Horticulture Program Leader, Cornell Cooperative Extension Monroe County Chris Olney, Finger Lakes Land Trust, (on email list for TWG news and updates) Marcus Riehl, NYS Parks, (on email list for TWG news and updates) Emily Sheridan, NYS DEC, Great Lakes Watershed Program, (on email list for TWG news and updates) Anna Stalter, Associate Curator and Extension Botanist, CALS School of Integrative Plant Science, (on email list for TWG news and updates) Zeb Strickland, Cornell Plantations, (on email list for TWG news and updates) Emily Staychock, Cornell Cooperative Extension, Invasive Species Education Team Kristy Sullivan, Cornell Cooperative Extension, (on email list for TWG news and updates) Mark Whitmore, Cornell University, (on email list for TWG news and updates) Carri Marschner, Invasive Species Education Program, Cornell Cooperative Extension until July 2015, Invasive Species

Specialist, Finger Lakes Hemlock Initiative, Cornell University after July 2015

Juliana Quant, Post-doc candidate, SUNY ESF, until January 2016

Appendix B. 2017-2018 Work Plan for the Finger Lakes PRISM

	Work Plan		
Scope o	Scope of Work Element		
1.	Coordinate PRISM partner invasive species (IS) management activities		
?	Utilize electronic and social media networks and communication outlets to engage partners and share		
informa	ition (listserve, etc)		
?	Coordinate full partnership meetings on a regular basis (2 full partnership per year) and working group		
meeting	gs (Steering Committee, Agriculture, Aquatic, Education & Outreach, Terrestrial Working Groups) as		
necessa	ry (no less than 4x a year)		
?	Utilize the Finger Lakes-Website as a means of information sharing (fingerlakesinvasives.org)		
?	Share information on IS management activities and participate in activities as appropriate		
2.	Recruit and train volunteers		
?	Present IS issues at various community outreach and education events (WQCC, school groups, etc.)		
?	Utilize electronic and social media networks and communication outlets to engage partners and share		
informa	ition (listserve, etc)		
?	Host iMapInvasives trainings per year or as needed		
?	Use CCE Master Gardeners, Master Forest Owners, lake associations, and other groups for volunteers		
3.	Identify and meet PRISM Education and Outreach needs		
?	Present IS issues at various community outreach and education events (WQCC, etc.)		
?	Coordinate with E&O WG to assess Finger Lakes regional needs		
?	Create and maintain a robust website that fulfills all the needs of the Finger Lakes region		
?	Encourage and support partners to develop E&O materials		
?	Create and distribute E&O materials to partners		
?	Create a toolbox for outreach that includes educational materials and information		
4.	Establish monitoring network for early detection of invasive species		
?	Train watercraft stewards, volunteers, and community members within the region		
?	Create and maintain an ED/RR protocol for the region and for specific, high priority organisms		
?	Utilize the WG and SC to gather information from partners about invasive species distribution in the		
region			
?	Create and maintain a priority IS list and ISPZ		
?	Create a database of groups that are likely users of priority locations (areas likely to be invaded)		
?	Utilize the iMap Invasive training and software app to increase participation in monitoring		
?	Create and support a train the trainer program to encourage use of iMapInvasives		
?	Host or support iMapinvasive workshops to input data into program for the region		
5.	Support academic research as needed through citizen science		
?	Create and support a train the trainer programs		
?	Support CSLAP, iMap, and other avenues for data collection		
?	Utilize the CSLA model to collect terrestrial data		
?	Utilize the Finger Lakes-PRISM website as a means of sharing data		
?	Utilize groups such as Boy Scouts, Hikers, biking, etc. to collect data for the region		
?	Identify research needs for prevention, ED/RR, and control		
6.	Develop a PRISM Strategic Plan		
?	Develop a strategic plan to include input from all partners based on NYS format		
7.	Develop Finger Lakes-PRISM-specific IS Management Plan		
?	Coordinate with leading researchers to develop species-specific management plans		
?	Coordinate with conservation targets to develop a location-specific plan		

?	Identify funding sources for implementation of IS Mgmt plans
8.	Implement eradication projects to remove invasives species
?	Utilize the partnership to leverage resources for IS work
?	Support demonstration and eradication projects
?	Utilize BMPs for control
?	Monitor management areas for restoration success
9.	Develop annual work plan
?	Develop 2016 AWP utilizing SC and WGs
10.	Develop annual report to include:
?	Progress towards priority objectives outlines in strategic plan
11.	Coordinate access to private and public lands
?	Develop a protocol/plan to access lands for IS work
?	Create a plan to provide information for private owners about permitting, funding, etc. and make
availabl	e on website
12.	Coordinate with other PRISMs and OISC
?	Keep an open dialogue and collaborate with other PRISMs and the NYS ISAC
?	Provide updates during PRISM calls as needed
?	Attend PRISM leader in-person meetings and other IS conferences
13.	Support NY ISC regular invasive species conference
?	Support regular conference through participation, presentation, and attendance

Baltimore Woods Nature Center and Central New York Land Trust Invasive Species Inventory and Management Tracking using iMap Invasives 2016

Julie Grinstead, Invasive Species Intern, and Fran Lawlor, Land Manager, Baltimore Woods Nature Center

Scope of Work: Baltimore Woods Preserve is comprised of 2 parcels, 175.05 acres owned by CNYLT and 4.39 acres owned by Baltimore Woods Nature Center. The first land parcels that make up the preserve were protected starting in 1972. The origins of Baltimore Woods Nature Center, Central New York Land Trust, and the protection of Baltimore Woods are deeply intertwined and the conservation of this preserve is paramount to both organizations. BWNC manages the encompassed 179.44 acres and conducts nature education programs throughout the year for children and families at the preserve. BWNC education mission includes awareness of the impacts of invasive species on the habitats and wildlife of Baltimore Woods and the greater Central NY environment and works to include community volunteers, youth and university students in management efforts on the preserve.

CNYLT owns 48 nature preserves totaling 2800 acres in Onondaga and Oswego counties, including the Baltimore Woods Preserve. All preserves are open to the public all year for quiet recreation free of charge. Invasive species management is a key goal in the conservation efforts of CNYLT on their preserves. Reforming its Stewardship Committee in late 2014, CNYLT has been working to meet the request by its stewardship volunteers to develop their skills and capacity to identify and document invasive species occurrences to facilitate management planning.

The two Baltimore Woods properties are on glacial deposits that have been cut through by the spring-fed Baltimore Brook and tributaries. These streams are in the upper watershed of Ninemile Creek, which flows out of Otisco Lake, the easternmost Finger Lake. The preserve supports mature forest, successional forest and shrubland, mowed grass/forb bird habitat, riparian corridors, conifer plantations and agricultural fields. The high diversity of habitats at Baltimore Woods Preserve make it one of the most ecologically diverse natural areas in Central New York. The preserve is considered a "resource of statewide importance" as listed in the New York State Open Space Plan's Region Seven Supplemental List. The post agricultural areas of the preserve also support significant populations of typical post agricultural invasive plants. In recent years, management efforts have been directed particularly towards pale swallow-wort, garlic mustard, and Japanese barberry, along with multiflora rose, honeysuckle and buckthorn, with an eye to prevent invasion into the high quality mature forest, which is found in the steeper slopes draining into Baltimore Brook. Swallow-wort has been particularly intractable. Control efforts of swallow-wort over the past decade have been targeting containment and preventing new infestations.

Our management and control efforts need to be dramatically increased to protect the ecological diversity of the preserve and the resulting public enjoyment of this unique area. In spite of seasonal herbicide applications, our swallow-wort core infestations have not been controlled and new infestations are popping up. There is a total of over 5 acres of core infestations and numerous satellite populations on the BWNC preserve. Our management plan has to adapt to increasing pressure from the expanding core infestations. Our herbicide contractor is ready to

increase efforts on the preserve and we have increased our mowing efforts in core areas to reduce seed pressure in downwind areas of the preserve. To effectively support this increased effort we needed resources to quantify the abundance of and map locations of swallowwort occurrences. The mapping will help the BWNC Land Manager more effectively focus and coordinate the efforts of the herbicide contractor and stewardship volunteers. Having a trained cadre of stewardship volunteers for mapping will help CNYLT initiate invasive species control efforts needed at other preserves in its service area.

Our proposal requested funds to hire an intern to learn iMap Invasives and to inventory the preserve, giving us a tool to better understand the challenges to our management of grassland bird habitat, riparian areas and mature forest stands. Our inventory can finally inform our management and monitoring program. Also, stewardship volunteers from both BWNC and CNYLT are now trained in the iMap program and can assist in management of invasive species of concern on other CNYLT preserves and can help us update records at BWNC.

The BWNC invasive species inventory and mapping intern devised a comprehensive sampling scheme to assure good coverage of the whole preserve. The preserve was divided into 3.5 to 8 acre sections (Figure 1). Each section was further divided into a grid squares of 100 foot by 100 foot sections with the coordinates of the corners determined using ArcGIS. A transect was prescribed walking the perimeter of the southeast corner of each grid square (Figure 2). All occurrences of species of concern within the intern's ability to identify were recorded as she walked each transect (Table 1). Records included date, latitude and longitude, species and an abundance code. The abundance code is described in Figure 3. The inventory took more than the full internship resources to execute and we thank our intern for going above and beyond what she was asked.

Our intuitive observations about invasive species pressure on the BWNC preserve is that the areas with the most historic forest cover are resistant to invasion. This resistance of intact forest cover to invasion is a common observation by ecologists and we were not surprised to see the inventory data generally supported that expectation. The shaded areas of Figure 4a illustrate the extent of forest cover from a 1935 aerial survey. The hatched areas illustrate the additional 1972 forest cover. These polygons projected on our GPS units and in our results maps enhance our understanding of the distribution and frequency of our species of concern. We have not attempted to project these polygons in our iMap Invasives project results. This is a potential topic for further collaboration with the IMap Invasives program managers. Figures 5a and 5b demonstrate the comparatively fewer occurrence of all identified species in the areas of historic forest cover.

Species occurrence data were entered into ArcGis, including the abundance code. The data were also entered into iMap but no record of abundance was recorded. Species occurrences and abundance were readily displayed using ArcGIS symbology. Figure 6a, for example, illustrates occurrences of garlic mustard (*Alliaria petiolata*) with the lightest shade of brown circles representing single plants and the darkest brown circles representing dense patches and infestations.

Past invasive species management activities at BWNC may impact occurrences of *Cynanchum rossicum* and *A. petiolata* in particular and in the tightly managed vicinity of the Mildred Faust Wildflower Garden in the southeast corner of the preserve. *Lonicera* and *Berberis* species have also been the target of removal but we do not have documentation of those activities. Figure 7a, *C. rossicum* occurrences, also shows areas of current management activity. These records do

not reflect all historic herbicide applications and patches that have been eradicated are not documented. Future documentation will need to include herbicide applications aw well as manual removal and mowing activities for all species.

Figure 5a is a projection of the presence of the most abundant species, each with its own symbol, on the transects in the grid of our inventory. The color gradations from lightest to darkest demonstrate, from single plant to infestation, of each positive occurrence readily show the resistance of the preserve areas within 1935 and older forest cover. With the exception of garlic mustard all other species have low presence in those areas, compared with younger forest cover in our more recent post agricultural forested areas. Examination, in particular, of our shade tolerant invasive shrub species, *Rhamnus* cathartica (Fig. 8), *Rosa multiflora* (Fig. 9), Lonicera spp. (Fig. 10), *Ligustrum vulgare* (Fig. 11), and *Berberis* spp. (Fig. 12) show the occurrences, if at all, tend to be immature plants or small patches. Significantly, we understand that privet (*Ligustrum vulgare*) and barberry (*Berberis* spp.) have low presence in our highest quality forested habitats and this can guide our management efforts as we protect those habitats.

We did confirm that we have low presence of *Eleagnus* spp. (Fig. 13), *Phragmites australis* (Fig. 14), and *Artemesia vulgare* (Fig. 15) and can plan to control these small infestations as a priority. Not illustrated, but in the inventory, are small occurrences of *Euonymous alatus, Celastrus orientalis* and *Acer platanoides*, which we have been managing and are watching.

Although the data are readily displayed in iMap Invasives and is a useful and accessible tool for communicating to the general public about the scale of our invasive species challenges, the ability to view abundance classes projected using ArcGIS has proven a more useful tool to communicate invasive species management needs to decision makers within the BWNC and CNYLT communities.

However, ArcGIS is a complex and expensive program not available to the general stewardship volunteer pools of BWNC and CNYLT. The iMap Invasives program, being free and readily accessible to the interested public, was well received by our stewardship volunteers. Twenty volunteers received training in the Fall of 2016 and were given level 2 access to the iMap Invasives program. (Figures 16 and 17). When these newly trained stewards deploy to our preserves this year, they are equipped to record occurrences of invasive species of concern.



Figure 1. GIS based division of BWNC preserve into sections for tracking inventory data collection coverage.



Figure 2. BWNC data collection section subdivided into 100' x 100' grid squares with GIS determined coordinates of each corner for location of transect beginning point.

Table 1. Number of Occurrences in Sampling of Baltimore Woods
Invasive Species Inventory

Species	Total records
Alliaria petiolata	356
Artemesia vulgaris	20
Berberis spp.	551
Celastris orbiculatis	4
Cynanchum rossicum	226
Elaeagnus alatus	34
Euonymous alatus	8
Ligustrum vulgare	108
Lonicera species	710
Phragmites australis	2
Rosa multiflora	514
Grand Total	2533



Abundance Code

- 1 single immature plant
- 2 single mature plant
- 3 patch of young plants
- 4 patch of mature plants
- 5 patch of mixed age plants
- 6 infestation





Figure 4a and 4b. BWNC preserve with trails and historic forest cover and iMap Invasives view of preserve area.





Figure 5a and 5b. All species observations. ArcGIS projection includes a species symbol and the abundance class code by color value.



Figure 6a and 6b. *Alliaria petiolata* observations. ArcGIS projection includes the species symbol and the abundance class code by color value.

Pale Swallow-Wort (CR) & Triclopyr-Treated Areas - Baltimore Woods (2016)





Figure 7a and 7b. *Cynanchum rossicum* observations and treatment areas (7a, hatched). ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 8a and 8b. *Rhamnus cathartica* observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 9a and 9b. *Rosa multiflora* observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 10a and 10b. *Lonicera* species observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 11a and 11b. *Ligustrum* species observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 12a and 12b. *Berberis* species observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 13a and 13b. *Eleagnus* species observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 14a and 14b. *Phragmites australis* observations. ArcGIS projection includes the species symbol and the abundance class code by color value.





Figure 15a and 15b. *Artemesia vulgare* observations. ArcGIS projection includes the species symbol and the abundance class code by color value.



Figure 16. Central New York Land Trust stewardship volunteers walk through steps of setting up the iMapInvasives app for the practice project and species occurrences data collection.



Figure 17. Volunteers practice collecting and downloading observations collected using iMapInvasive app.

Subcontract No. FI-PRISM 3.9

Boscarino

Project Title: Early detection and range expansion of the invasive bloody-red shrimp (BRS), *Hemimysis anomala*, in the Finger Lakes: A citizen science and survey-based approach
Project Leader: Brent T Boscarino, PhD Upper School Science Teacher and Research Associate Poughkeepsie Day School 260 Boardman Road Poughkeepsie, NY 12603 (315) 559-7266

Fax #: 845.462.7603 bboscarino@poughkeepsieday.org

Executive Summary

In sum, our project involved an estimated 300 hours of invested work time from PI Boscarino, ~1500 volunteer hours (including, but not limited to: 16 HS interns plus Poughkeepsie Day School adult chaperones and volunteers, Finger Lakes resident citizen science volunteers and the Finger Lakes Watercraft Stewards working with PI Boscarino). Our collective citizen- and scientist-based surveys covered a total of 187,896 acres, including all 11 Finger Lakes, plus the stretch of area of the Erie Canal/Mohawk River from Sylvan Beach (Oneida Lake) to Waterford, NY (Hudson River). All "BRS present" survey results have been entered into the NYS iMAP database for a total of 21 new data points. We are currently establishing the proper protocol for mapping an "absent" data point into iMAP and will enter in all survey points (presence as well as absence) by spring 2017. These additions will push our survey result numbers close to 60 new observations on iMap. In the meantime, we have created an all-encompassing survey map on Google maps (Figure 1).

Based on iMAP data entry points and our various educational outreach initiatives, we have received a number of follow-up requests and interest in continued BRS monitoring throughout the Finger Lakes, Great Lakes, Adirondack and Mohawk River/Hudson River regions. We are currently developing an invasive species grant to include BRS early detection and rapid response efforts with the Otisco Lake Association. The Finger Lakes Watercraft Stewards have expressed keen interest in continuing monitoring work using BRS light traps in the summer of 2017. We have also been contacted by the Aquatic Invasive Species Project Coordinator of the Adirondack Chapter of the Nature Conservancy, Erin Vennie-Volrath, with interest in our project. Erin became concerned about the species' spread east along the Erie Canal when she viewed our entries into iMap. Erin is interested in pursuing a program to help with early detection monitoring of BRS in southern Adirondack Lakes.

Our research team's work will be presented at two upcoming conferences in the spring and summer of 2017. Poughkeepsie Day School student/FL-PRISM interns Sonomi Oyagi '17, Julia Roellke '15, and Anni Gundeck '17 and PI Boscarino will all be presenting results of our citizen science investigations and survey results at the Mohawk Watershed symposium on March 17th at Union College. A link to information on this conference as well as our team's abstracts can be found <u>here</u>. In addition, PI Boscarino and Poughkeepsie Day School students/ FL-PRISM interns Elinor Stapylton '16 and Katherine McKeon '17, have submitted a proposal to present work resulting from this FL-PRISM grant at the upcoming Ecological Society of America conference in Portland, Oregon from August 6-11, 2017. We have also submitted updates on our work and progress in a newsletter as part of the Finger Lakes Institute's Happenings website which can be accessed <u>here</u>. Results of our light trap work and experimentation has also been accepted for publication in the Journal of Great Lakes Research (see reference section below, Brown et al., In press).
Project Summary:

The bloody-red mysid shrimp, *Hemimysis anomala* (hereafter BRS, for bloody red shrimp), is a recent Ponto-Caspian invader that was first reported in North America in 2006 and has since become established in the Great Lakes, St. Lawrence River, inland lakes (Oneida, Seneca, and Cayuga Lakes, New York), the Seneca-Cayuga Canal and the Erie Canal. BRS represent a new type of organism in these systems and is a potential threat to native species in the Great Lakes and Finger Lakes region. With this grant, we aimed to: (1) engage in early detection and monitoring of BRS through controlled scientific surveys, (2) pilot a BRS citizen science and educational outreach campaign to help with early detection, rapid response and control mechanisms throughout the Finger Lakes region.

Scientific/Plankton net survey results

In June-July of 2016, our team fully completed an expansive plankton net survey of all Finger Lakes and canals within the Finger Lakes that built upon our previously published work conducted in 2013 (Brown et al., 2014). No significant changes were observed in terms of further spread to new systems in the Finger Lakes region since 2013. The following Finger Lakes did not test positive for any instances of BRS: Otisco, Owasco, Skaneateles, Keuka, Canandaigua, Honeyoye, Canadice, Hemlock, Conesus. Our survey revealed multiple sites of BRS presence and/or infestation in Seneca Lake and Cayuga Lake (see Figure 1). An extended survey was also conducted to ascertain if (a) the BRS invasion front/expansion extended to neighboring waterways outside of the FL-PRISM jurisdiction area, or (2) the BRS invasion was truly restricted only to the Seneca-Cayuga Canal and Cayuga and Seneca Lakes. Our results indicate that BRS has now expanded its distribution as far east at Waterford, NY (less than one mile from the Hudson River) and that BRS is utilizing the Erie Canal east of Oneida Lake as a vector of rapid spread towards the Hudson River.

Of interesting note: We conducted a separate survey (of our own volition and charge, separate from this contracted work) of the Erie Canal east of Oneida Lake to monitor the change in presence/absence and abundance of BRS since our 2013 survey. While the areas we sampled are outside of the jurisdiction of the FL-PRISM, we believe that our results have a direct bearing on this grant and how we interpreted our results of our survey. We found BRS as far east as Lock 2 on the Erie Canal- less than 1 mile from the Hudson River. Prior to this year, they had only been reported as far east as Herkimer, NY along the canal. Our results are further evidence that what happens in the Great Lakes and Finger Lakes (early detection, control techniques, public education and awareness) has a direct bearing on not only the health of ecosystems within the FL-PRISM, but also impact other regions that are hydrologically linked to this area. We consistently found BRS at every major lock site and marina along this stretch of the Erie Canal, in high numbers and with individuals of multiple age classes. This is a noteworthy finding as it suggests that BRS is capable of moving through canals at a rapid pace, through both lentic and lotic environments, yet the canals within the Finger Lakes do not appear to be

serving as a main vector of spread (with the exception of the Seneca-Cayuga Canal). Future research could target these differences between the eastern Erie Canal and the FL-PRISM canal system by exploring differences in environmental variables and recreational use of these different regions.**

Citizen science survey results and potential for light traps as rapid response/control mechanism

Our team also deployed BRS-specific light traps to determine their efficacy in early detection, rapid response and control efforts in areas of known or suspected BRS infestation in lake systems. Citizen science survey results utilizing these BRS-specific light traps were an extremely important addition to our survey coverage as we were able to target and deploy these traps in private marinas, docks and waterfront properties as well as in habitats that were otherwise not conducive to scientific plankton net sampling (e.g., shallow, rocky, sloped habitats). Through the help of the Finger Lakes Watercraft Stewards Program, we focused on developing a robust and accurate method of reporting BRS through citizen volunteers that have deployed these traps. Sampling and reporting combined both capturing video of BRS behavior and preserving samples obtained from the traps. The distinctive swimming pattern of BRS makes video footage an ideal method for identifying the presence and abundance of the species. The species has two very large, distinctive eyes and a darkened stomach just behind the eyes that is relatively simple to identify through video capture. A video of BRS caught from one of our traps can be found here. In cases in which video capture was inconclusive, we also developed a lowbudget method of capturing the contents of the trap by sieving the contents through a coffee filter and preserving the remains in rubbing alcohol. This technique will hopefully be used in future citizen science surveys to further track the spread and detect BRS as they continue their expansion throughout NYS.

In addition, we also assembled and distributed 50 low budget (< \$10 apiece) student plankton nets and collection instructions to citizen volunteers throughout the Finger Lakes (Figures 2-5). Through the help of these trap and net citizen science volunteers, we were able to sample several private piers and marinas that currently-funded research projects are not/have not been able to sample. We report that no additional instances of BRS were recorded in any of the Finger Lakes outside of Cayuga and Seneca Lakes using citizen science-focused light and plankton-net traps.

Repeat field experiments performed at Stiver's Marina in Geneva, NY/Seneca Lake (an area of known high concentration of BRS) reveal that our BRS-specific light traps, if deployed overnight during calm conditions, are capable of capturing hundreds of BRS per night per trap. Given (1) the swarming nature of BRS, (2) the highly localized nature of their establishment and infestation within an invaded system, and (3) the fact that their numbers in areas of high infestation range from the hundreds to thousands of individuals m⁻³, our results indicate that multiple traps deployed in strategic areas of infestation should serve as highly effective control mechanisms in newly invaded systems (see Figure 6 for images of our traps deployed for the purposes of evaluating our traps as possible rapid response/control mechanisms).

Outreach and education

Lastly, as part of our education and outreach initiatives, we developed educational brochures on BRS that inform lake users and stakeholders of BRS ecology, demography, taxonomy and identification. These educational materials include how to identify the species, how to contribute to ongoing monitoring and rapid response efforts of invasive BRS in the Finger Lakes, how the species is likely to impact native Finger Lakes food webs, as well as provide tips on how to avoid their future spread throughout the region. We plan to distribute these brochures to lake stewards in the summer of 2017 as well as make these materials available for perusal and distribution in the main office of the Finger Lakes Institute in late spring of 2017. In addition, we developed a BRS profile to add to the FL-PRISM website to make available to the general public in late spring of 2017. These materials will be delivered to FLI at the upcoming FL-PRISM reporting conference in the spring of 2017.

References

Brown M, Boscarino B, Roellke J, Stapylton E, & Driller-Colangelo A. 2014. Fifteen miles on the Erie Canal: the spread of *Hemimysis anomala* G.O. Sars, 1907 (bloody red shrimp) in the New York State canal system *BioInvasion Records* 3: 261-267.

Brown M, Roth J, Smith B, Boscarino B. In Press. The light at the end of the funnel: Using light-based traps for the detection and collection of a nearshore aquatic invasive invertebrate, *Hemimysis anomala*. Journal of Great Lakes Research.

Figures



Figure 1. Results of our 2016 BRS survey, including all research scientist and citizen science sampling efforts. Red placemarks indicate presence of the species and blue represent absence. In 2013, there were no reported instances of BRS east of Herkimer, NY. Our current results reveal their presence on the doorstep of the Hudson River.



Figure 2: Leigh Williams Grinnell of Poughkeepsie, NY sewing together homemade plankton nets for distribution to citizen science volunteers. Volunteers will be sampling various marinas, boat launches and piers across the Finger Lakes to look for the presence/absence of the aquatic invasive species, the bloody-red shrimp (BRS) as part of a larger research and monitoring program headed by Dr. Brent Boscarino of the Poughkeepsie Day School.



Figure 3: Poughkeepsie Day School graduate and summer intern, Mia Foucek (Class of 2016) in a planning and strategy meeting for BRS citizen science monitoring. Photo credit: Julia Roellke



Figure 4: Poughkeepsie Day School student and summer intern, Anni Gundeck (Class of 2017) with the finalized BRS citizen science survey nets. Phot credit: Julia Roellke



Figure 5. Plankton nets developed by student researchers from the Poughkeepsie Day School were distributed to citizen science volunteers to help with monitoring the spread and population dynamics of BRS. The nets were constructed with lightweight materials that could commonly be purchased at local stores for less than \$10. Photo credit: Julia Roellke



Figure 6: A BRS-specific light trap deployed by Poughkeepsie Day School SCUBA diver and junior, Erik Hedlund. The device emits a preferred light level forBRS that draws the invasive species into the funnel trap where they cannot escape. These trap sampling devices can be deployed from most marinas and piers and are weighed down with a brick and are a potentially effective early detection tool for BRS. Photo credit: Johan Hedlund

Title: Sub-Contract Report to Finger Lakes Partnership for Regional Invasive Species Management for an Invasive Species Outreach and Education Assistant based at Morrisville State College

Final Report

Project Leader:

Rebecca Hargrave Assistant Professor- Environmental Sciences, Morrisville State College <u>hargrajr@morrisville.edu</u> 315-684-6239

Project Assistant:

Elisa Livengood, Ph.D. Assistant Professor – Aquaculture and Renewable Resources Morrisville State College livengej@morrisville.edu 315-684-6120

Institutional Contact:

Julie Wright Business Office Morrisville State College P.O.Box 901 Morrisville, NY 13408 Office: (315) 684-6161 Fax: (315) 684-6261 wrightje@morrisville.edu

Student Invasive Species Education and Outreach Assistants

Caitlin Murney, July-August 2016 Caitlynn Adams, December 2016 – February 2017

Budget Amount: \$12,674.25

Project Dates: April 1, 2016- February 28, 2017

Introduction

In 2016, the Morrisville State College Environmental Sciences department applied for a sub-contract from the Finger Lakes PRISM to promote invasive species awareness and the Finger Lakes PRISM and its efforts to the eastern half of the Finger Lakes PRISM territory with the use of a Morrisville State College Department of Environmental Sciences Student; at the request of the Finger Lakes PRISM.

One student was to be hired by Morrisville State College to fulfill the needs of the FL-PRISM Subcontract. Assistant Professor Rebecca Hargrave and Dr. Elisa Livengood at Morrisville State College collaborated to oversee the position. Professor Hargrave, Dr. Livengood, and Hilary Mosher, Coordinator of the FL-PRISM, will provided onsite support and direction to the Education and Outreach Assistant (E&O Assistant). The position's direct report was Rebecca Hargrave.

The original plan was to hire a student starting on April 6, 2016 to work part-time until the semester ended and then work full-time over the summer, then finish with some part time work in the Fall 2016 semester. A student was identified and given an orientation in April 2016, but due to contract paperwork hold ups, we were not able to execute the contact until July 11, 2016. While we were able to give the E&O Assistant some projects for her to work on before the official starting date of the contract, we lost time that could have been used to improve our outcomes.

Partially due to the late starting date, our E&O Assistant for the summer also did not work a full time summer schedule.

The summer E&O Assistant was able to be stationed at the Finger Lakes PRISM office in Geneva, as it was close to her house, and received direct supervision from Hilary Mosher on a regular basis. While working at the FLPRISM office, the E&O Assistant was able to participate in many education and outreach events, research invasive species natural history and control, and participate in removal events. The summer E&O Assistant was also able to assist the other FLPRISM intern with her research projects. Specific activities are organized under the individual outcomes, below.

The summer E&O Assistant decided not to return to Morrisville State College in the fall of 2016. And, since we had not been able to expend all of the monies for her position, we requested to hire a second student to continue the work. A winter E&O Assistant was hired and worked from the end of December 2016 through February 2017.

The winter E&O Assistant primarily worked on fact sheets, the web site and with iMapInvasives.

Primary Responsibilities Completed

- Organized outreach events and educational opportunities for the Finger Lakes Region
 - Target 4; completed 1
 - Tinker Nature Park- Spoke with students in the World of Inquiry 6/16
- Represented FL-PRISM at community events and meetings
 - Target 4 events and 250 people reached; Completed 6 events, over 3000 people reached
 - Owasco Lake Days- June 22
 - Tabled at the Busch Beer Bassmaster Elite Union Springs June 23 through 26, 2017
 - Wells College July 13, 2016
 - Tabled at the Seneca County Fair July 23 through July 31, 2016
 - Tabled at Empire Farm Days- August 8, 9 and 10, 2016
 - Tabled at the Boonville Woodsmen's Field Days August 19 and 20, 2016
- Helped update and maintain the FL-PRISM websites, social media accounts, and community events calendar
- Assisted with FL-PRISM information distribution, materials development and communications
 - Assisted research intern on educational value of FLPRIM education
 - Assisted with the creation of an Invasive Species Display at the Rogers Environmental Education Center in Sherburne, NY.
- Wrote press releases or news articles promoting invasive species management and FL-PRISM
 Drafted a news article about the FLPRISM.
- Develop educational materials
 - Target 5; completed 7
 - Created an Aquatic Invasive Species Binder of fact sheets.
 - Seven fact sheets created (full and half sheets) (see appendix)
 - o Hydrilla
 - Water chestnut
 - Water lettuce
 - European Frogbit
 - Variable milfoil
 - Starry stonewort
 - Round goby
- Maintained detailed records for all educational, outreach and volunteer events and information
- Maintain detailed records of communications with Partners, Volunteers and Area Residents
 - Created a list of potential partners in the eastern half of the FLPRISM that consists of environmental education centers, colleges, agencies and environmental related nonprofits.
- Recruited and trained volunteers
 - Target 20 people trained; completed 16 trained
 - iMap training January 2017, 13 attendees
 - Individual trainings, 3 attendees
- Assisted with reporting
- Assisted with building FL-PRISM Network of Partners and Stakeholders
 - o Attended meetings with Partners

Additional Responsibilities

- Assist with invasive species surveys and mapping, using iMapInvasives
 - o 48 observations
- Assist the FL-PRISM with invasive species removal efforts
 - Water Chestnut Pulls- numerous
 - Assisted in the creation of rakes for rake tosses
 - Assisted with the installation of 5 boot brush stations in Region 8 (DEC land)
- Attended Training Sessions:
 - o iMapInvasives May 12, 2016
 - GIS Training July 28, 2016

Primary Responsibilities not completed

- Lead educational workshops and trainings (n=2)
 - Due to the late start of the position and the knowledge level of the assistants, no workshops or trainings were led by this position.

Budget Items

Materials:

- Plastic Invasive Plant Samples (three sets purchased, one for FLPRISM office, one for Rogers Center Display, one for Morrisville State College awareness events);
- Photocopies of fact sheets for displays
- Preserved Aquatic Invasive Species Samples (two sets, one for Morrisville State College and one for the Rogers Center Display/educational activies)

Appendix

Example Photograph of Summer Table Image of Plastic Weed Samples Copies of Aquatic Invasive Species Binder Fact Sheets (separate files) List of Potential Partners: Colleges and Nature Centers (separate files)



Example of the Summer E&O Assistant's booth: at the Seneca County Fair



Image of the Plastic Weed Bouquet (taken from website) Purchased from Montana State University: Extension https://store.msuextension.org/Departments/Weed-Models.aspx

Contents: One stem each of: perennial pepperweed, garlic mustard, purple loosestrife, saltcedar (tamarisk), spotted knapweed, Dalmatian toadflax, leafy spurge, and yellow starthistle. One of each corresponding weed ID card

Final Report

Invasive Plant Management and Outreach Events at Island Cottage Woods Preserve

Project Leader

Kevin Farrell Genesee Land Trust 46 Prince Street, Suite LL005 Rochester, NY 14607 (585) 256-2130 kfarrell@geneseelandtrust.org

Collaborators

Lorna Wright Genesee Land Trust 46 Prince Street, Suite LL005 Rochester, NY 14607 (585) 256-2130 lwright@geneseelandtrust.org

June Summers Genesee Valley Audubon Society P.O. Box 15512 Rochester, NY 14615 summers@frontiernet.net

Amount approved: \$2,307.00 Actual costs: \$2,461.00

Final Report: Invasive Plant Management and Outreach Events at Island Cottage Woods Preserve

Last year Genesee Land Trust was selected for funding by the U.S. Forest Service through the Great Lake Restoration Initiative (GLRI) to plant 2,580 native trees and shrubs at Island Cottage Woods Preserve in Greece, NY to mitigate the impacts of the Emerald Ash Borer to this important migratory bird habitat. Genesee Land Trust began planting trees and shrubs in the spring of 2016 followed by another round in fall of 2016. Two additional planting periods will be completed in 2017 throughout the 61 acre wooded wetland Preserve.

The Finger Lakes Partnership for Regional Invasive Species Management (FL-PRISM) grant provided much needed support to the larger GLRI project by treating and removing invasive shrub species that are competing with these newly planted tree and shrub species. Genesee Land Trust contracted with Jim Engel of White Oak Nursery to cut multiflora rose, honeysuckle, privet, autumn olive and buckthorn and treating stumps with glyphosate. As mentioned in the grant application, his team's efforts were focused on the northern 4.1 acres of the property and a 10.1 acre area previously treated in 2015, which was also funded through a 2015 FL-PRISM grant. Jim and his team spent three days out at the site during ideal weather and site conditions to complete the work; April 28, May 17 and May 18 and were able to cut and treat invasive shrubs covering the 14.2 acre area.

In addition to invasive species management, Genesee Land Trust included an outreach component in this year's application for three outreach and service events to be held at Island Cottage Woods Preserve. These three events took place on April 16, April 22 and April 29. These service and outreach events included an educational field trip for Genesee Land Trust's Urban Youth Conservationists, an Earth Day lecture and walk led by Genesee Land Trust staff, and a volunteer work party with Nixon Peabody. Each event was a success and provided event participants with a background on invasive species and the threats they pose to wildlife in addition to visiting areas that had undergone invasive species management thanks to FL-PRISM funding.

On Saturday April 16, Genesee Land Trust staff members Lorna Wright and Rodregus Tripp brought five youth from the Urban Youth Conservationist program, a year-long program created to introduce youth from the City of Rochester to the environmental field, to Island Cottage Woods for a field trip. To begin the field trip the group met with June Summers, President of the Genesee Valley Audubon Society, to learn about migratory birds, followed by a walk through the trails learning about invasive shrubs, land management, and wildlife.

On Earth Day, Friday April 22, Genesee Land Trust staff member Kevin Farrell hosted a guided walk for the public through Island Cottage Woods Preserve to discuss the ongoing GLRI and FL-PRISM projects. Eleven people including two children attended the evening event.

On Friday April 29, Genesee Land Trust hosted around thirty individuals for the 14th Annual Nixon Peabody Earth Day Work Party at Island Cottage Woods Preserve. This annual event had volunteers from Nixon Peabody and other organizations working on stewardship projects including mulching trails and cutting invasive plants. The day began with a discussion of the ongoing GLRI and FL-PRISM projects occurring on the site. Nixon Peabody is excited continue to participate in the restoration of this property into the future.

Genesee Land Trust came in \$134 dollars over the approved budget for this project (\$2,307 budgeted, \$2,441 spent). Although one less trip to the site was made (6 trips budgeted \$81.00, 5 trips actual \$68.75), the trip to Island Cottage Woods Preserve on April 16 with the Urban Youth Conservationists required a van rental due to a higher turnout and interest in this field trip from the youth.

FL-PRISM 2016-17, Genesee Land Trust

Contractor Services			Budgeted Costs		Actual Co	osts
	Invasive plant control: April 28 (1 hr), May 3 (1 hr), May 17 (13.5 hrs) and May 18 (14.5 hrs)		\$	1,500.00	\$	1,500.00
	• • • • • • •		\$	1,500.00	\$	1,500.00
Salaries						
	Kevin Farrell (2 days, \$143/day)		\$	286.00	\$	286.00
	Fringe benefits (2 days, \$16.71/day)		\$	33.42	\$	33.42
	Lorna Wright (0.5 day, \$170.35/day)		\$	85.00	\$	85.00
	Fringe benefits (0.5 days, \$23.90/day)		\$	11.95	\$	11.95
	Rodregus Tripp (0.5 day, \$176/day)		\$	88.00	\$	88.00
	Fringe benefits (0.5 days, \$24.64/day)		\$	12.32	\$	12.32
			\$	516.69	\$	516.69
Travel			-			
	6 trips to the site (25 miles, \$.55/ mile)		\$	81.00	\$	68.75
	Vehicle rental (Urban Youth event 4/16)		\$	-	\$	146.00
			\$	81.00	\$	214.75
Indirect	Costs					
	de minimus rate of 10%		\$	209.77	\$	209.77
		Totals	\$	2,307.46	\$	2,441.21

FL-PRISM Treatment Area- Island Cottage Woods Preserve 61 acres | Greece, NY



All locations are approximate. Map created 1/26/17

0

500





WHITE OAK NURSERY

Invoice No.

801 W. Washington St. Geneva NY 14456 (315) 789-3509 fax None

INVOICE =

Name Address City Phone	Genesee Land Trust 46 Prince Street Rochester	State <u>NY</u> ZIP 14	607	Date Order No. Rep FOB	5/18/2016
Qty		Description		Unit Price	TOTAL
	Invasive plant control at	t Island Cottage Woods			
2	Invasie control on 4/28	(1 hr) 5/3 (1 hr)		\$50.00	\$100.00
13.5 14.5	Invasive control on 5/1 Invasive control on 5/1	7 Laurie and Jim 8 Laurie and Jim		\$50.00 \$50.00	\$675.00 \$725.00
	Payment Details —		Ship	SubTotal	\$1,500.00
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YOUR NON TAXABLE ITEMS LOSS DAMAGE WAIVER: PAE/ESP/SLI CHG	9.00 17.55			
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Urban Yout ICW Field Trip to ICW paul by Lorna ICW

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Final Report Finger Lakes Partnership for Regional Invasive Species Management Subcontract 2016-2017

Control and monitoring of populations of *Microstegium vimineum* (Trin.) Camus in Ithaca, Tompkins County, NY.

Summary of Data

Total # of sites with *M. vimineum* present: **40 sites** Total area of *M. vimineum* removed: **116,384.59 sq ft** Total number of volunteers: **18 volunteers** Total # of volunteer hours: **65 hours** Total hours of paid labor: **335 hours**

August 2016:

8/10: Project leader Jeanne Grace, collaborator Anna Statler, and project steward Brittany Lagaly, began to hold bi-weekly meetings to discuss strategies and timeframes for stilt grass control in the Six Mile Creek Natural Area and other known invasions in Tompkins County.

8/15: The project steward met with Jake Brenner, Faculty Manager of Ithaca College's Natural Lands, to discuss their active stilt grass research and management program and gain insights from their years of data collection and mapping.

8/15-8/24: Since the project site is located almost entirely within a protected natural area and wildflower preserve, the project steward conducted background research focused on studies evaluating both the effectiveness of different control methods and the response of the native community to each method. Research evaluating the effects of removal methods on different ecological impact metrics, such as soil pH, microbial biomass, CEC, soil organic matter, PAR, etc, were also examined. The steward found that species richness, evenness, and community diversity are most improved by handweeding or, in the case of larger, more homogenous invasions, mowing *M. vimineum* in the early fall before flowering is initiated. Research also demonstrates that the benefits

of stilt grass removal often aren't seen until after two or more growing seasons due to the species' long seed bank residency: the longer an invasion has persisted, the longer the site must be managed for successful long-term eradication. The steward's review of the literature also revealed that all removal methods result in the creation of patches of bare, disturbed soil, a site condition that lends itself quite well to subsequent colonization by additional invasives. Based on these observations, the decision was made to collect and sow native seed at all pull sites in order to both discourage the colonization of these areas by novel invaders and to aid native seed recruitment, which many studies show to be a major limiting factor to post-removal site recovery.

8/20: Project leader Jeanne Grace and Project Steward Brittany Lagaly met with Susan Nixon, GIS Professional for the city of Ithaca, who designed an ArcGIS map with custom-made layers and data fields specific to invasive species research. In addition to allowing the steward to map areas where stilt grass is present in the Six Mile Creek Natural Area, it allows the collection of data on understory species, canopy species, invasive species, percent herbaceous cover, percent canopy cover, invasive density, and habitat type. In the short term this information will help to reveal the character and extent of the present invasion; in the long term it will aid in evaluating the effectiveness of the management program.

8/24: To help fulfill the educational component of the project, plans were developed to install two boot brush stations with educational information about invasive species. The signs will feature stilt grass but will also include pictures and information on black and pale swallowwort, garlic mustard, and Japanese knotweed and their associated ecological impacts. These will be placed at two different access points to the Natural Area.

8/24: In preparation for the volunteer events in September, Grace, Statler, and Lagaly contacted collaborators at Ithaca College, Ithaca High School, the Native Plant Society, the Town of Ithaca Conservation Committee, and the volunteer coordinator for Cornell's Ecology House, soliciting for volunteers. Advertisements were also submitted to the

Ithaca Times and the Ithaca Journal, and a colorful event flyer was placed in the Six Mile Creek Natural Area kiosk.

September 2016:

9/7: The project steward met with field botanist David Werier, who was first to identify Japanese stilt grass growing in Tompkins County, and who is also familiar with a particularly sensitive area at Six Mile Creek currently threatened by stilt grass, where populations of several state-listed Carex and Poa species thrive. In order to protect individuals of these species from being trammeled by well-meaning volunteers, the steward needed to know where these species occur. Mr. Werier gave the steward a guided tour of the sensitive habitat and identified several individuals belonging to both endangered species, *Poa sylvestris* (S1), and *Carex caryana* (S2) growing in the area. On the hike back out, Mr. Werier and the steward found the largest patch of stilt grass in the preserve to date, located uphill of the sensitive area.

9/10: The first volunteer stilt grass pull was held on September 10th along Six Mile Creek in the Wildflower Preserve. It was a cold, damp morning, but six volunteers braved the weather and managed to pull a particularly thick and extensive patch between the creek the main trail. Volunteers received a quick lesson in stilt grass ID and then pulled for three hours, clocking in a total of 18 human hours of hand-weeding that day.

9/17: The second volunteer event was held on September 17th at the Second Dam area of Six Mile Creek, where the first populations of stilt grass in the preserve were discovered. The weather was much more conducive to outdoor work, and an eager group of eleven volunteers, six of whom were with Wells College and New York State Park's FORCES program, managed to clear all of the stilt grass out of the area. A thorough combing through of the site a few days later turned up only a few isolated individuals. A total of 33 human hours were expended hand-weeding stilt grass that day.

9/18: Having noted several large *M. vimineum* individuals flowering during the second volunteer event, the decision was made to hire one of the volunteers in order to scale up hand-weeding efforts. The new hire (hereafter referred to as the assistant) and the steward proceeded to work a full 40-hour week from September 18-22 hand-weeding small and medium-sized patches of stilt grass along Six Mile Creek. Considering that the mapping survey had revealed a much more extensive stilt grass invasion than had previously been envisioned, efforts were focused on removing those populations occurring near human and deer trails and along waterways in order to limit seed dispersal and the subsequent colonization of new areas. Seed was also collected from several native species in the preserve, including rye grass, Joe Pye weed, milkweed, geum, Virginia knotweed, and herb Robert geranium; these were broadcast over pull sites. Mapping and seed collection efforts are still ongoing at this time.

9/20: The project steward penned a letter to property owners neighboring McDaniel's Park, a community park with a multi-acre stilt grass invasion along its southern and western borders and adjacent properties. At this time the goal is to educate residents on stilt grass identification and eradication and to ascertain whether or not there is sufficient interest among stakeholders in the community for a large scale collaborative effort between said residents and the city of Ithaca. The effectiveness of any program aimed at managing this population is limited to the extent that property owners are willing to participate in such management, considering that much of the invasion is located on private land.

10/5: The project steward and the assistant conducted a survey of the Second Dam area by kayak in order to accurately map stilt grass populations occurring along its shores, which are quite heavily saturated, thick with vegetation, and therefore hard to navigate by foot. This allows the accurate mapping of the Second Dam area and provides valuable insights into the extent and character of the Six Mile Creek invasion. No new populations were found during this survey.

10/6: The kayaks were washed and taken to the Ithaca City Reservoir, a dammed

section of Six Mile Creek situated upstream of Second Dam, in order to ascertain whether or not the invasion extends further upstream than is currently known. Unfortunately, two new populations of stilt grass were found along the western shore of the reservoir.

2/1: Project leader Jeanne Grace and Project Steward Brittany Lagaly gave a PowerPoint presentation to the Ithaca City Council outlining current and past efforts to control *Microstegium* within the city in hopes of securing funding from the Council to continue such efforts into the future. The response of the council members seemed highly encouraging, though the budget for the upcoming year will not be finalized until September.

Invasive Species





A collaborative effort between:



Hemlock Woolly Adelgid Monitoring and Outreach in the Canandaigua Lake Watershed

FINAL REPORT

February 28 2017

Project Coordinator: Stephen Lewandowski

Principal Investigator: Mark Whitmore

Canandaigua Lake Watershed Association PO Box 323 Canandaigua, NY 14424 (585) 394-5030 info@canandaigualakeassoc.org

Executive Summary

First detected in the Canandaigua Lake watershed in November 2014, the Hemlock Woolly Adelgid is quickly becoming one of the more familiar invasive forest pests in our area. Public education and media attention have helped bring awareness to the community, and local monitoring efforts have started to track the progress of HWA in our watershed forests.

Our partners at the NYS DEC, the NYS Hemlock Initiative, the Town of Canandaigua, and Finger Lakes Community College are currently involved in important monitoring and assessment efforts on public lands in the Canandaigua Lake watershed. Because this invasive has strong ties to water quality impacts, the Canandaigua Lake Watershed Association saw a unique opportunity to get involved in the fight against HWA by utilizing this grant to extend outreach to private property owners, who are by far the principal owners of hemlocks in the watershed.

Efforts through this grant included the development of an HWA brochure "A guide for property owners on the impacts of Hemlock Woolly Adelgid", which was distributed to 875 property owners in the Canandaigua and Honeoye Lake watersheds through a targeted mailing. Information on recognizing the signs of HWA, monitoring infestations, and treatment options were presented. Data provided by Ontario County Planning and FLCC helped us develop a list of property owners with confirmed presence of eastern hemlock- allowing us to get the most detailed in information into the hands of property owners that may be up against HWA infested trees.

During this grant period, three public outreach events were hosted on the impacts of the Hemlock Woolly Adelgid – two in Canandaigua and one at the South end of the watershed in Naples. Workshops were attended by 112 individuals, many of whom were private property owners looking to get details on treatment options and reporting techniques. A "woods walk" through Grimes Glen provided hands-on training for volunteers. Sixteen individuals served as volunteers in some capacity, whether through local monitoring efforts, assistance with the distribution of educational materials in their neighborhoods, or serving as potential caretakers of insectaries.

information



Volunteer Cindy Smith examines a hemlock branch at a training event in Grimes Glen, Ontario County.

Local monitoring of watershed forests was an additional component of this initiative. Volunteers and paid "scouts" surveyed 28 locations around Canandaigua Lake and the western Finger Lakes region. Of these 28 locations, 11 were on private properties, and 17 were on public lands. All but 5 sites reported observations of HWA. 51 data points were recorded on these sites, which will assist with statewide monitoring efforts through the NYS Hemlock Initiative.

By the Numbers: 16 Volunteers engaged in HWA locally 28 Sites surveyed for HWA 16 Volunteers engaged in HWA locally 51 Data points recorded 112 Workshop attendees 875 Property owners contacted with HWA Volunteers engaged in HWA locally

Final Report – Initiatives and Deliverables

Because the HWA is only detectable to the naked eye on trees between November and March, the work of an annual project like this was compressed into an eight-month period, from the contract signing in early July until the end of February. The project followed the Progress Report filed with the grant application with few variations.

Progress Report – Attachment 1

Protocol – Treatment and Biocontrols

A protocol to prioritize the location of the release of biocontrols (insects) was one of the first, and last, considerations. Draft recommendations were shared with Cornell's NYS Hemlock Initiative, Dr. Bruce Gilman, volunteers, concerned citizens and landowners, and comments on the Priorities have been favorable. Priority areas include Tannery Creek, and private lands on Seneca Point, where infestation is heavy and property owners are interested in establishing and monitoring hedges as insectaries.

The Canandaigua Lake Watershed Association was aware that the options for treatment of HWA were very limited and to some extent needed to be coordinated, so we developed a policy when discussing HWA infestations on private properties. Our policy development was driven by the actions of a small group of property owners on a particular "point" at the south end of Canandaigua Lake who had mature hemlocks near their homes and cottages. As a group, they hired a licensed contractor to do a chemical application to their trees. We added a description of this action to our several workshops, but warned that our policy was NOT to recommend widespread use of these chemicals especially near water. CLWA's policy is only to recommend chemical treatment

Thick infestation observed at a private property on Seneca Point, Ontario County

of large, valuable hemlocks in close proximity to property such as homes. Otherwise we counsel property owners that more general treatment of hemlocks must wait for safe, effective biological controls to be developed for NYS. The NYS Hemlock Initiative is working on just this issue. It should be noted that the eventual condition of the watershed vis-à-vis HWA will NOT be an extirpation of HWA; instead, we hope that biocontrols will limit HWA populations so that some hemlocks (sadly not all) will survive.

While initial plans for this grant period included \$500 for the release of biocontrols, CLWA was advised by Mark Whitmore that funding for biocontrol's through the NYS Hemlock Initiative looks promising, and that funds would be better spent in the local community. It was decided that CLWA would work locally with Jim Engle of White Oak Nursery to establish hemlock hedges to serve as insectaries.

Deliverable: Priorities for Biocontrol Application – Attachment 2

Local Monitoring – Paid and Volunteer Efforts



Volunteers go over monitoring techniques at a training event in early December.

This project benefited from 10 days of paid professional work and 10 days of work by CLWA staff paid for by CLWA during the contract period. During the project, 28 site visits were made by paid and volunteer staff. During each visit, and average of three acres were investigated, for a total of 84 acres. 17 of the visits were to publicly accessible lands and 11 to privately owned lands, at the owners' request. Reporting forms developed by the NYSHI were filled out, and a matrix of site visits was maintained (attached).

A corps of six trained scouts was developed during

the course of the project, and they contributed about 116 hours to scouting and recording information (both sighting HWA and HWA absence).

Deliverable: 2016-2017 Site Visits for HWA Monitoring - Attachment 3

Educational Outreach

The project developed and presented three workshop programs for interested citizens and volunteers at both ends of the watershed in November and December 2016 and February 2017. Invitations to the first two workshops went out along with a HWA brochure developed specifically for this purpose to 875 property owners in the Canandaigua Lake watershed, and 112 property owners and volunteers attended these workshops. CLWA used maps of hemlock groves developed by Dr. Bruce Gilman and the **Ontario County Planning Department to improve** the targeting of the mailing. CLWA also used social media postings, press and radio to advertise the dangers of HWA and invitations to the workshops.

Deliverable: HWA Brochure – Attachment 4

Keep a lookout for the tell-tale signs of HWA when Look for Eastern Hemlock in or near gullies or on steep slopes, where their tenacious ro structure holds highly erodible soils in place. us root hiking with friends and family Flat, blunt evergreen needles arranged in pairs Focus on high risk locations, like Glossy on top, pale green underneat watershed gullies Report suspected infestation:

THREE STEPS TO HELP IDENTIFY HWA

wo white lines on the nderside of each need Hemlocks have the smalle cones, half an inch in length, of any other local evergreen

STEP 2: LOOK FOR SIGNS OF HWA

STEP 1: LEARN HOW TO IDENTIFY



- woolly egg masses attached near the base of needles on the underside o emlock branches
- Best time for detection is between Janu but the white wool can be seen year rou
- When examining trees from afar, look for gray foliage tint

Identification techniques for property owners from HWA brochure. Fall 2016



Call CLWA to have a "HWA Scout" visit yo property to verify the presence of HWA

Spread the word about HWA:

STEP 3: TAKE ACTION

- Tell your neighbors, family and friends about the threat Help your neighbors scout for signs of HWA on their
- trees and hedgerows
- Initiate a neighborhood action team help by distributing info and treatment options

How to Report HWA in the Canandaigua Lake Watershed





Follow Up

There is a continuing need for ongoing education for private property owners. CLWA will continue to formalize relationships with Dr. Bruce Gilman, Finger Lakes Community College, local towns and municipalities, and potential volunteers. CLWA will continue its relationship with the NYS Hemlock Initiative as potential suppliers of biocontrol agents. CLWA is moving ahead to assist willing property owners in prioritized areas of the watershed to site, plant and harvest insects for biocontrol from hemlock hedge/insectaries. Such insectaries will serve as protection for their immediate vicinity and a source of insects to be "seeded" into other areas.

Monitoring in the Canandaigua Lake watershed will continue (and is continuing into March 2017), with sites needing to be revisited each year to track the progress of this invasive. As the monitoring season ends, data will continue to be compiled and will be uploaded to MapInvaisves (March 2017).

Conclusion

The Canandaigua Lake Watershed Association thanks the Finger Lakes PRISM for this opportunity to expand HWA outreach in the Wester Finger Lakes region. Public education is a vital component to the limiting the movement of invasive species throughout our region. Efforts to engage the public on invasive species observation, management, and control supplements the important work being done by agencies across the state. While may not be able to eradicate invasives from our environment entirely, we can forge strong working partnerships with like-minded community groups to help minimize their impact.

Attachment 1

HEMLOCK WOOLY ADELGID MONITORING IN THE CANANDAIGUA LAKE WATERSHED FINAL REPORT- February 28, 2017

WHEN	WHAT	WHO	COMPLETION	WHEN
July 8-October 2016	Begin to develop criteria for deployment of biocontrols	Steve Lewandowski, Finger Lakes Hemlock Initiative, scouts and volunteers	X	August, 2016
July-August 2016	Identify property owners with hemlocks and develop mailing list	Lindsay McMillan, Sherri Norton, OCPD	X	September, 2016
Late August 2016	Develop informational brochure on HWA	LM	X	September 2016
August-September 2016	Develop cadre of trained HWA scouts	SL, FLHI	X	December 2016
September-October 2016	Plan and deliver training workshop for scouts and property owners	FLHI, SL	X	November and December 2016, February 2017
September - November 2016	Develop social media coverage of training workshop	LM	X	December 2016. February 2017
September 2016 and January 2017	Distribute educational materials and brochure to property owners (twice)	SL and LM	x	October 2016, October, 2016
January-February, 2017	Plan and deliver second educational workshop with site visit for property owners	FLHI	x	December 2016
February-April, 2017	Develop final criteria for biocontrol locations	FLHI, SL, property owners, scouts, volunteers	X	February, 2017
February 28, 2017	Deliver Final Report	LM and SL	x	2/28/17

Attachment 2

PRIORITIES FOR BIOCONTROL APPLICATION HEMLOCK WOOLY ADELGID IN THE CANANDAIGUA LAKE WATERSHED

Criteria :

Presence of Hemlocks	10	50	250	500
(#trees in contiguous				
area)				
Presence of HWA	High	Medium	Low	None
(% infested)				
Unique Species factor	Plants high	Animals high	Animals low	Plants Low
	(endangered)	(endangered)		
Adjacent Land Use	Public use	Private use	Mixed use	
Natural Capital score	High	Medium	Low	unknown
Slopes	Very severe (over 40%)	Severe (25-40%)	Steep (15-25%)	Moderate
Accessibility for	Very	Somewhat	Difficult	Almost
treatment, monitoring				impossible
Water Quality factor	Large drainage,	Medium	Small drainage,	Small, no cover
(acres drained, shaded	mostly shaded	drainage, some	little shade	
= temperature)		what shaded)		

Candidates:

- *Grimes Creek
- *Tannery Creek
- *Eelpot Creek
- *Reservoir Creek
- *Parish Gully
- *Hicks Gully
- *Seneca Point
- *Menteth Point
- *Tichenor Point
- *Fisher Gully

* With single stream often gully, other drained by multiple streams

*Deep Run *Gage Gully *Clark Gully Lower Naples Creek Stid Hill South Hill Bare Hill Hi Tor Lower West River (Robbers Gulch)

WHAT IS HEMLOCK WOOLLY ADELGID?

The Hemlock Wooly Adelgid is a tiny, aphidlike insect that originated in Japan and has been killing hemlock forests in North American since the 1950s. It has been moving slowly northward becoming adapted to colder climates and reached the Finger Lakes several years ago.

When it settles on a hemlock (blown by wind, carried on clothing, fur or feathers), it inserts a long feeding tube into the hemlock twig. When enough adelgids are present, the tree responds by shutting down food to the twig, killing the buds, needles, and finally the tree. From beginning to end, the process can take four to ten years.

Hemlocks are some of the largest and most beautiful trees in the Finger Lakes forest. Because they are shade tolerant, they often grow in gullies and help to stabilize slopes, support unique indigenous assemblies of plants and animals, and keep water and homes cool and shady.

Looking for more information?



The mission of the New York State Hemlock Initiative is to coordinate research, management, and volunteers to conserve New York State's hemlock resources in the face of multiple threats, particularly that posed by an invasive pest, the Hemlock Woolly Adelgid.

Visit: blogs.cornell.edu/foresthealth/nyshemlock-initiative/ for more information.

TREATMENT OPTIONS FOR LANDOWNERS

The Hemlock Woolly Adelgid, a pest we CAN manage.

Have you identified HWA on your hemlock trees? It's not too late to protect them!

There are two insecticide treatments available, Imidacloprid and Dinotefuron (Safari), which must be applied by a licensed pesticide applicator. Licensed professionals will be able to analyze your trees and discuss the best treatment option with you based on the health of the tree and how heavy the infestation.

The best time to treat your trees is during spring (mid-March to early June) and fall (mid-September to mid-November) when the tree is actively taking up water. Treatments can be effective for up to 7 years.

Biological controls are also being developed, but are currently only available for research purposes. It's important to act now and keep our hemlocks alive until further treatment options are available.

Local Resources:

We have contacted these companies and know they have licensed applicators with some experience:

Birchcrest Landscaping

Phone: (585) 288-3572

birchcrestlandscape.com

Broccolo Tree and Lawn

Phone: (585) 424-4476

Ted Collins Tree and

Phone: (585) 381-9000

www.tedcollinst-l.com

Landscape

broccolotreeandlawn.com

Care

White Oak Nursery Contact: Jim Engle Phone: (315) 789-3509 Email: jengel53@rochester.rr.com

Summit Tree and Landscape Contact: Noreen Riordan Phone: (585) 509-3526 summittreeandlandscape.com

Forest and Water Solutions Contact: Zeb Strickland Phone: (585) 704-4907 Email: zeb077@gmail.com forestandwatersolutions.com

Additional questions?

Please give us a call at (585) 394-5030, visit www.canandaigualakeassoc.org or follow us on Facebook.

Hemlock Woolly Adelgid In the Canandaigua Lake Watershed



A guide for property owners on the impacts of Hemlock Woolly Adelgid.





HOW YOU CAN HELP.

Eastern Hemlocks (*Tsuga Canadensis*) have been occupying Canandaigua Lake's gullies for more than ten thousand years, since the last glaciers retreated. The recent discovery of the invasive forest pest Hemlock Woolly Adelgid (HWA) in our watershed is a reminder of what an important role that hemlocks play in our ecosystems.

HWA has the ability to attack and kill hemlock trees in the matter of a few years, posing a significant threat to the structure of our watershed gullies, the beauty of our lakeside properties, and ultimately, the water quality of Canandaigua Lake.

Join with us in the detection of HWA in our area by following these 3 steps.



THREE STEPS TO HELP IDENTIFY HWA

STEP 1: LEARN HOW TO IDENTIFY

Look for Eastern Hemlock in or near gullies or on steep slopes, where their tenacious root structure holds highly erodible soils in place.

- Flat, blunt evergreen needles arranged in pairs
- Glossy on top, pale green underneath



- Two white lines on the underside of each needle
- Hemlocks have the smallest
 cones, half an inch in
 length, of any other local evergreen

STEP 2: LOOK FOR SIGNS OF HWA

- Check underside of branches near the ground, and examine branches that fell to the ground after a storm
- Look for small, woolly egg masses

attached near the base of needles on the underside of hemlock branches

- Best time for detection is between January and May, but the white wool can be seen year round
- When examining trees from afar, look for gray foliage tint

STEP 3: TAKE ACTION

- Keep a lookout for the tell-tale signs of HWA when hiking with friends and family
- Focus on high risk locations, like watershed gullies
- Report suspected infestations
- Call CLWA to have a "HWA Scout" visit your property to verify the presence of HWA

Spread the word about HWA:

- Tell your neighbors, family and friends about the threat
- Help your neighbors scout for signs of HWA on their trees and hedgerows
- Initiate a neighborhood action team help by distributing info and treatment options

How to Report HWA in the Canandaigua Lake Watershed

If you suspect hemlock trees on your property may be infested with HWA, call the Canandaigua Lake Watershed Association Office at (585) 394-5030, or send photos to <u>info@canandaigualakeassoc.org</u>

Your early detection will help us gain a clearer picture of HWA coverage in the watershed.

Have a Smartphone?

Download the iMapInvasives App for your smartphone and select "Hemlock Initiative – 2016" as the project. Snap a picture of suspected infestations, and submit! The app records your GPS coordinates and will



help us increase our mapping capabilities in the Finger Lakes Region.


No. of HWA	Site	Coordinates or	HWA	Foliage	Notes on infestation	Date	Reported By
Observations		Property Address	Infestation	Transparency		Visited	
at site			Density	Rating (1-5)			
			Rating (1-5)				
7	Private	6907 Walton Point	Mid-range	Mid-range	Infestation discovered and	5/1/2016	Thurston,
	Properties -	Dr.			subsequently treated on 7		Landsman
	Walton Point	Naples, NY 14512			properties on Walton Point		
		6909 Walton Point					
		6911 Walton Point					
		6845 Walton Point					
		6841 Walton Point					
		6847 Walton Point					
		6877 Walton Point					
None	Private Property -	6468 Italy Valley Road			Tannery Creek in the Town of	11/15/2016	Lewandowski
observed	Bisset	Naples, NY 14512			Naples		
None	Mouth of Grimes	End of Vine Street			 No HWA detected during 	12/3/2016	Lewandowski
observed	Glen				volunteer training		
					HWA is reported further up		
					the glen		
1	Clark's Gully	42.29.933 /	1-2	1-2	Northern Ridge- top of first	12/26/2016	Sarkis
		-77.20.044			infested artery		
2	Deep Run	42.821076 /	2-3	3-4	Thick infestation along southern	12/28/2016	Sarkis
		-77.251855			ridge		
		42.81974 /	1-2	1-2			
		-77.24677					
2	Private Property	42.7440278 /	4	2	Private property with gully	12/27/2016	Nagel,
	– Chris Bennem	-77.3402832			running through it		Lewandowski,
		12 711232 /	1	1	2 observations of HWA		Hurd
	5680 Seneca	-77 3/0006	4	4	 10 trees surveyed 		
	Point Rd. Naples,	-77.340000			• 40 branches examined		
	NY 14512				• 20% with HWA		
1	Deep Run	42.81974/	1-2	1-2	Above the main falls	12/28/2016	Sarkis
		-77.24677					

1	Tannery Creek	42.36.179N /	1-2	2-3	Similar HWA appearances up gully	12/30/2016	Sarkis
4		77.24.367W	2	1.2		12/24/2016	C. I.I.
1	Gully outside of	42.40.864N /	2	1-2		12/31/2016	Sarkis
	woodville (upnill	77.21.888W					
	Of Rt.21)		1.2	1.2		42/24/2046	<u> </u>
1	Woodville Gully	42.40.864 N /	1-2	1-2		12/31/2016	Sarkis
		77.21.901W		_			
6	Private Property	42.6832210 /	3	2	Private property with small	1/4/2017	Hurd
	– McCabe	-77.3823260			gully		
	residence	42.6830120 /	3	2	6 observations of HWA		
		-77.3818530			Small stand in back of		
	6470 Powell Hill	42.6829050 /	3	2	property near stream		
	Rd	-77.3814550			 35 trees surveyed 		
	Naples, NY 14512	42.6827040 /	3	2	• 150 branches examined		
		-77.3805650			• 75% with HWA		
		42.6827440 /	3	2			
		-77.3805490					
		42.6824050 /	3	2			
		-77.3782080					
1	Private Property	3367 Flint Hill Road	3	3	HWA observed on property	1/3/2017	McCue,
	– Sean McCue	Naples, NY 14512			by property owner, confirmed		Lewandowski
	3367 Flint Hill				by Lewandowski		
	Road Naples, NY						
	14512						
1		42. 42.104 N/	0-1	1-2	Young, clustered grove	1/3/2017	Sarkis
		77.22.080W					
1	Seneca Point	42.44.635 N /	4	4-5	Seneca Pont gully, HEAVY	1/3/2017	Sarkis
	gully	77.20.4424W			infestation throughout		
None	Canadice Lake	42.72444844 /			Gully located just north of	1/12/2016	Root
Observed	Boat Launch	-77.55721288			Canadice Boat Launch		
1	Reynold's Gully	42.66896842 /			• 2-3 acre stand is at end of	1/13/2017	Root
	(Hemlock/	77.58858265			trail on north side of Reynolds		
	Canadice)				Gully		
					Trail Starting at Johnson Hill		
					Road		

					•	Some trees >30" dbh		
					•	1 small colony of HWA		
10		42 0070550 /				observe	40/07/0046	Ness
16	High For WIVIA	42.60/9550/	U	1	•	Large gully with dense hemlock stands on both sides,	12/2//2016	Nagel,
		-//.34/6200					-	Hurd
		42.60851/0/	U	1		and scattered clusters	1/13/2016	
		-//.34/2930			_	throughout		
		42.0089320 /	U	1	•	 19 observations of HWA 400 trees surveyed 2000 branches examined 40% with HWA 		
		-//.34/2450	0	1	•			
		42.0091110/	U	1	•			
		-//.5481430	0	1	•			
		42.0102290/	0	-				
		/2 6109/70 /	0	1				
		-77 3/88780	0	1 ×				
		42 6056710 /	2	2	-			
		-77 3719690	2	<u> </u>				
		42,6237830 /	2	2				
		-77.3414410	-	-				
		42.6358330 /	3	2				
		-77.3510610	-					
		42.6320940 /	3	2				
		-77.3546810						
		42.6320590 /	3	2				
		-77.3566560						
		42.633950 /	3	2				
		-77.3655430						
		42°36.950 /	4	2				
		-77°22.045						
		42°37.182 /	1	1				
		-77°22.492						
		42°37.176 /	4	4				
		-77°22.511						
		42°37.074 /	3	4				
		-77°22.692						

1	Stid Hill WMA	42°43.955 / -77°23.509	2	1	 HWA observed at the start of gully 30 trees surveyed 150 branches examined 10% with HWA 	1/17/2016	Nagel, Hurd
None observed	Ontario County Park	42.705637 / -77.414021			 Hemlocks scattered along trails and roadways 50 trees surveyed 250 branches examined No HWA detected 	1/20/2016	Nagel, Hurd
None	Cummings	42.701253 /			Large Hemlock stands	1/20/2016	Nagel,
Observed	Nature Center	-77.457909			surrounding trees and ponds		Hurd
		42.706936 /			200 trees surveyed		
	Outout de Daule /	-77.457280		4	No HWA	1/25/2017	Negal
8	Onanda Park /	42°4/.118/	4	1	Large stand of hemiocks on acch side of gully	1/25/2017	Nagel,
	barnes Guily	-77-19.197	4	2	 a 200 troos surveyed 		пиги
		42 40.941 /	4	2	 1 000 branches examined 		
		-77 19.025 12°16 051 /	Δ	2	• 30% with HWA		
		42 40.934 / -77°19 146		2	Site is possible candidate for		
		42°46 955 /	4	2	Biocontrol		
		-77°19,230		-			
		42°46.912 /	2	1			
		-77°19.175					
		42°46.960 /	3	2	1		
		-77°19.006					
		42°46.988 /	3	2			
		-77°19.231					
		42°47.024 /	2	1			
		-77°19.336					
None		42.697246 /				2/1/2017 -	Nagel,
observed		-77.517407				2/8/2017	Hurd

Attachment 3

2016-2017 Site Visits – HWA Monitoring

Harriet Hollister	42.683545 /		•	Hemlocks distributed along	
Spencer	-77.5177407			gullies and scattered	
Recreation Area				throughout park	
			•	300 trees surveyed	
			•	1,500 branches examined	
			•	No HWA detected	

- 28 LOCATIONS SURVEYED
 - $\circ~$ 11 Private lands
 - $\circ~$ 17 Public lands
- 51 RECORDED OBSERVATIONS OF HWA

Hilary Mosher PRISM Coordinator, Finger Lakes Institute Hobart and William Smith Colleges 300 Pulteney Street, Geneva, NY 14456

10/3/2016

Hydrilla Sampling in Monroe County: Summary Report

Dear Hilary,

From 7/26 to 9/24/2016, Megan Casler and I visited a total of 24 ponds and embayments around Monroe County (Table 1), sampling each one for the presence of the aquatic invasive plant *Hydrilla verticillata*. Sampling methods were consistent with those used by Racine-Johnson Aquatic Ecologists at the south end of Cayuga Lake, where *Hydrilla* is established and being actively managed. Number of samples was determined by surface area of the pond (Table 2). Data of plant community composition, abundance, and GPS location were recorded at each sampling site. Sites ranged from private to public, 0.2 to nearly 45 Ha in size(not in including Irondequoit Bay), with a wide range of habitat types, human access, and surrounding land use.

I am happy to report that no *Hydrilla* was found at any of the sites sampled. I feel confident that these locations are *Hydrilla*-free. We did, however encounter several other exotic/invasive species including *Elodea spp., Potamogeton crispus, Najas minor, Myriophyllum spicatum*. There were also several water bodies that we were unable to sample due to denied access by private owners or inability to contact or identify the parcel owner (Table 3). It is recommended that if possible, these sites be included in future assessments in order to more confidently rule out the possibility of *Hydrilla*'s spread beyond Tinker Pond in Henrietta.

Megan and I are currently in the process of transcribing the data into a spreadsheet for analysis. She plans to use the data for her Senior Honors thesis, which I'm sure she would be happy to share with you; I will also provide you with a copy of the raw data once it is ready. Please let me know if there is anything else you need from me to wrap up the project. Thank you for all your support and guidance. I'm glad I was able to be a part of the project.

Best,

Kevin Berend

Table 1. Sites sampled for *Hydrilla* survey in Monroe County, NY, 26 July - 24 September, 2016. Sitenumber refers to Google Earth (.kmz) file.

Site	Name	e Lat. Long.		Size	# Samples	Date
No.				(Ha)		sampled
1	Hillside Camp Abilities	43° 3'48.27"N	77°34'46.56"W	1.9	5	8/6
2	Town of Pittsford (1)	43° 3'42.46"N	77°34'9.66"W	0.4	3	8/2
3	Town of Pittsford (2)	43° 3'51.87"N	77°34'7.99"W	0.8	3	8/2
4	Town of Pittsford (3)	43° 3'52.54"N	77°33'47.45"W	0.5	3	8/2
8	Hundred Acre Pond	43° 1'45.97"N	77°33'52.63"W	44.8	15	7/26 & 8/5
9	Deep Pond	43° 1'22.48"N	77°34'15.28"W	9.98	10	8/5
10	Round Pond	43° 1'8.71"N	77°33'47.98"W	2.4	5	7/28
15	Hergesell - 118 Fishers Rd.	43° 1'58.34"N	77°28'23.32"W	0.9	3	8/13
19	Irondequoit Bay	43°10'41.06"N	77°31'22.87"W	628.2	15	8/12 & 9/6
20	MCC Ret. pond	43° 5'57.62"N	77°36'6.01"W	2.5	5	8/3
21	Thomas E. "Bill" Farrell Baseball Complex	43° 1'55.76"N	77°39'38.89"W	0.3	3	7/30
22	Blue Pond	43° 1'39.73"N	77°49'16.50"W	4.8	10	8/10
24	Erie Canal Lock #33 - Edgewood Ave.	43° 5'43.26"N	77°34'1.90"W	N/A		8/1
25		43° 5'35.39"N	77°32'58.26"W	5.7	3	8/8
26	King's Bend Park	43° 5'16.30"N	77°32'3.73"W	1.0	10	8/3
27	Erie Canal - Pittsford boat launch (Clover St.)	43° 5'26.50"N	77°32'35.63"W	N/A	5	8/1
28	Erie Canal - Perinton boat Iaunch (Ayrault Rd.)	43° 4'45.91"N	77°27'37.67"W	N/A	3	8/1
34	Wexford Glen, Pittsford	43° 4'34.24"N	77°33'3.99"W	0.3	3	9/6
35	Rt. 531 pond #1	43°10'37.36"N	77°47'53.94"W	5.1	10	9/24
36	Rt. 531 pond #2	43°10'38.66"N	77°47'13.06"W	1.6	5	9/17
39	Lattuca - 144 Ferguson Dr., Hilton, 14468	43° 20'19.07"N	77°47'08.24"W	0.03	3	9/17
40	Black Creek Park	43° 4'54.96"N	77°48'13.54"W	1.1	5	9/10
43	Martin Road Park	43° 1'39.45"N	77°39'0.73"W	0.4	3	9/17
44	Greece Canal Park	43°11'34.16"N	77°44'14.82"W	0.3	3	9/6
	•	136				

 Table 2. Sampling effort criteria, based on pond area.

Size (ha)	# Samples
<1, + Canal launches	3
1-2.99	5
3-9.99	10
10+	15

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fable 3. Recommended future sites	. Site number refers to	Google Earth (.kmz) file.
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Site No.	Owner	Lat.	Long.
7	Clover Ponds, LLC	43° 2'32.58"N	77°34'4.74"W
14	Lilly Pond	43° 3'19.32"N	77°28'41.71"W
16	Crossmans Pond	43° 1'59.60"N	77°28'1.46"W
18	Old Quarry Lane, LLC	43° 8'38.34"N	77°30'17.51"W
23	U of R	43° 6'30.70"N	77°38'25.40"W
29	McClean, Justin	43° 0'51.69"N	77°38'11.52"W
30	Blatter, Edwald R.	43° 2'3.32"N	77°36'54.64"W
31	Locust Hill Country Club	43° 5'20.89"N	77°33'33.44"W
32	Jewish Home of Rochester	43° 6'16.00"N	77°34'55.29"W
33	French Creek Townhouses	43° 6'16.24"N	77°34'35.61"W
38	Hunting Spring - Private	43° 6'50.01"N	77°46'5.43"W
	City of Rochester - Lake Riley, Cobbs		
45	Hill Park	43° 8'32.21"N	77°34'27.22"W
46	Arrowhead Golf Club	43°11'58.84"N	77°52'33.81"W

A Survey for *Hydrilla verticillata* in the Three Rivers System of Onondaga County



Submitted by

Russell Nemecek Onondaga County Health Department and Mark Burger Onondaga County Soil and Water Conservation District

December 2016

INTRODUCTION AND OBJECTIVES

A surveillance level investigation for the presence of *Hydrilla verticillata* (hereafter referred to as hydrilla) was conducted in several portions of the Three Rivers System of Onondaga County utilizing depth and sonar technology in conjunction with a cloud-based software for data analysis and mapping.

The study objectives included the following

- 1) Create maps in pilot study locations assessing vulnerability to hydrilla introduction due to proximity to public access and habitat type.
- 2) Assess the methodology's utility to provide an accurate and cost-effective means for mapping areas vulnerable to hydrilla infestation on a larger geographic scale such as the entire Three Rivers system or a large lake.
- 3) Evaluate the methodology's utility as an early detection tool to identify unknown hydrilla infestations especially in larger geographic areas such as the entire Three Rivers system or a larger lake.

METHODS

A Lowrance HDS depth finder and Structurescan equipment were portably attached to the sampling boat and used to collect water depth, bottom hardness, and aquatic vegetation presence. Near shore areas were the primary focus for data collection as opposed to the navigational channel normally located in the river center. Data were analyzed, tabulated and mapped by the ciBioBase software.

StructureScan imagery was reviewed from a number of other data collections efforts to evaluate how well a dominant species could be identified from the imagery. These studies included Beaver Lake (August 2013), Otisco Lake (September 9, 2016/ July-August 2014), DeRuyter Reservoir (July 2016) and Tully Lake (August 5, 2016). A segment (transect) in Onondaga Lake from the vicinity of Hiawatha Point to the Onondaga Lake Yacht Club on the lake's east shore was also reviewed.

Virtual images of plants are captured and reproduced in ciBioBase . Sonar charts record at 200 kHz and 455/800 kHz provide real time, recorded visuals of the bottom and vegetation present. Rake tosses were taken to ground-truth samples to validate the identification of a predominant species.

Different species of aquatic plants have different acoustic signatures, but this technology and others like it do not provide the resolution to confidently identify individual species when there is no dominant species present. However, imagery of dominant and/or morphologically distinct species is possible.

Elodea was going to serve as a hydrilla surrogate due to its morphological similarity. Unfortunately, a suitable site in the Three Rivers study area was not found and a verified imagery of elodea could not be identified from other previous surveys.

The study locations were riverine habitats, but part of the regulated New York State Barge Canal lock and dam system: i) Seneca River between the Baldwinsville Dam and the Route 690/Route 40 Overpass, ii) Seneca River upstream of the Route 370 Overpass to upstream of J and S Marine including a portion of the Onondaga Lake Outlet, iii) Oneida River between the NYSDEC boat launch and the Three Rivers confluence, and iv) Oswego River downstream of the Three Rivers confluence.

These areas were selected to represent a geographic stretch of each river (Oneida, Oswego and Seneca) comprising the Three Rivers system and felt to be vulnerable to a hydrilla introduction due to the proximity to marinas and recreational boat launches.

As might be expected, hydrilla's habitat requirements are general in nature and this further complicates assessing site vulnerabilities. Hydrilla grows rooted to the bottom and submerged in either still or flowing water. The depth of growth depends on the water clarity (light penetration) and substrate type, but normally it is found in water depths less than 25 feet and in softer bottoms consisting of sand or mud. Water temperature seems to be an important factor since a sufficient number of days with temperatures in excess of 60-65 degree F are needed for plant populations to successfully establish themselves (U.S. Army Corps of Engineer, Ecology and Environment, Inc., 2016). Of interest is that the pattern of range expansion for Eurasian watermilfoil and its habitat requirements in the upper Midwest may serve as a surrogate for hydrilla expansion in the Great Lakes Basin (K. Erickson, personal communication, November 7, 2016).

In this investigation, assessing vulnerability to hydrilla, was assumed to be greater where submerged aquatic vegetation is presently found and in abundance (e.g., 80-100% biovolume). Bottom hardness and water depth were also used to help explain current plant abundance and vulnerability to hydrilla.

DISCUSSION

Objective 1

• Create maps in pilot study locations assessing vulnerability to hydrilla introduction due to proximity to public access and habitat type.

Screen shots of mapped data layers for bathymetry, bottom hardness, and aquatic vegetation abundance are shown in Figures 1through 9. Due to a malfunction, bottom hardness data were not recorded for the Oswego River segment. Customized Geographic Information Systems (GIS) maps have been produced for each data layer and pdf files for those will be provided separately. A summary of the mapped results is provided below by study area:

• Seneca River- Baldwinsville Dam-Route 690 Overpass Segment

Due to the size of this segment, the center of the river where the navigational channel is located was not surveyed in its entirety. Furthermore, much of the area adjacent to the southern shore was not surveyed since this area is covered with water chestnut. An approximate 3-acre area in front of the Riverview Cemetery was previously infested with water chestnut, but has been reduced to a minimal number of scattered plants.

In sporadic areas along the northern shore, submerged vegetation is abundant. However, most prominent are areas along the southern side of the river and just east (downstream) of the water chestnut coverage (Figure 1). Water depths away from shore become limiting to vegetation coverage around the 9-ft. contour and this was the typical pattern for all of the sampled segments (Figure 2).

Much of the southern shoreline habitat is shallow and extends outward in close proximity to the navigational channel. Most of the bottom substrate surveyed was defined as hard with the soft substrate bottom correlating quite well with vegetation abundance. Ekman dredge sampling from another study from the water chestnut covered area have shown bottom substrate to be predominantly mud and silt (Figure 3).

There are two boating access points within this river segment: a private marina with a launching ramp for paying customers and a public launch in Mercer Park located in the village of Baldwinsville, proper. This access in conjunction with considerable shallow and soft bottom habitat makes this segment highly vulnerable to hydrilla introduction and establishment.

• Seneca River- Hayes Rd/Onondaga Lake Outlet Segment

Much of the immediate shoreline adjacent to the two marinas in this segment is covered with water chestnut. However, a considerable portion of river habitat extending to the 6 ft. contour and beyond is heavily vegetated (80%+ water column biovolume) with Eurasian water milfoil one of the dominant species. In addition, there is a small area of abundant vegetation opposite the marina along the Klein Island shoreline. The Klein Island near shore habitat and the surveyed portion of the Onondaga Lake Outlet have a limited amount of aquatic vegetation present (Figure 4). Harder bottom types are also predominate in this stretch. Water depth limits aquatic vegetation from the mid-river navigation channel and from most of Onondaga Lake Outlet where depths are even greater (Figures 5, 6).

• Oneida River Segment

While the presence of the navigational channel restricts shallow water habitat in all of the riverine sites, this is most pronounce in the Oneida River segment (Figure 7). Vegetation presence and bottom coverage is limited with only moderately abundant in few locations mainly; nearly adjacent to the Oswego County (north) riverbank where water depths are around 10 ft. Aquatic vegetation is scarce since depths exceeding 15-16 ft predominant throughout most of the reach (Figure 8).

Despite the presence in the river of a NYSDEC public boat launch just upstream of the study segment, vulnerability to hydrilla establishment in this reach would seem low due primarily to water depth where a maximum depth of more than 24 ft (24.2 ft) was recorded. Although not measured, current, flow and associated velocities would also appear to be a limiting factor. Water depth) light penetration) is probably more of a limiting factor in this stretch since a mix of bottom types (hardness) were identified (Figure 9).

• Oswego River Segment

The Oswego River study segment is the northernmost area sampled. It includes a private access boat ramp on the western or Onondaga County side of the river for use by members of the Radisson Community, only.

Abundant aquatic vegetation is limited to two areas roughly midway in the study reach on the western (Onondaga County) side of the river extending beyond the 9-foot depth contour. The close spacing of the contours are indicative of a quick drop off in depth along the eastern (Oswego County) shore which helps explain the limited presence of aquatic vegetation. Aquatic vegetation is largely absent within the navigational channel (Figures 7 and 8).

Objective 2

• Assess the methodology's utility to provide an accurate and cost-effective means for mapping areas vulnerable to Hydrilla infestation on a larger geographic scale such as the entire Three Rivers system or a larger lake.

The data parameters being analyzed for the U.S. Army Corps of Engineers (2016) Great Lakes Hydrilla Risk Assessment include water depth, water temperature, sediment texture, depth of light penetration, and presence or absence of submerged aquatic plants. Most of these parameters were directly measured (e.g., water depth, presence/absences of submerged aquatic plants) or indirectly (e.g., sediment texture, depth of light penetration) during this study. From these data, multiple data layers can be mapped, but only single-data layer with overlay depth contours were generated to provide ease of analysis and aesthetics.

While coverage within study sites focused on areas where submerged vegetation was abundant. A variety of habitat types were surveyed to evaluate the data collection methodology. The four study sites were surveyed over a two-day period and totaled just over 146 acres (146.17acres). To provide a time frame for conducting a survey on a larger lake, Otisco Lake was completed in its entirety (2,263 acres) in eight sampling days. Initial surveys for an invasive species would likely be focused on areas near recreational boating ramps or other access points and not require full lake surveys. In the case of a riverine system, vulnerability to introductions and target (invasive species) dispersal could further delineate study areas to those downstream of such access points where slow- moving water habitats (reduced current velocities) prevail.

The StructureScan methodology employed in this study can serve as a useful tool in assessing the vulnerability of site-specific areas to hydrilla introduction and dispersal. Larger-sized water bodies can be surveyed in short spans of time. Excluding costs associated with a small boat and motor purchase or use, the initial equipment cost was approximately \$2000. There is also annual cloud storage and data analyses cost fee based upon the size of the water body surveyed. Costs can range from several hundred dollars for conducting a single survey from one lake to a subscription of unlimited surveys and water bodies for around \$2500.

Objective 3

• Evaluate the methodology's utility as an early detection tool to identify unknown hydrilla infestations especially in larger geographic areas such as the entire Three Rivers system or a larger lake.

It was not anticipated that the technology would be able to provide discrete species identification of individual plants or small groups of plants. Identification of one species from within a multispecies composite of dense vegetation without a clearly dominant species present would also be challenging. However, in sufficiently large enough areas of vegetation dominated by one species a "fingerprint" can be obtained and used to identify characteristically identifiable species which include hydrilla. However, "ground" truth sampling would be necessary for final confirmation especially if a similar morphological species (e.g. elodea) was present or thought to be present.

Three examples of scans are shown in Figures 10, 11, and 12 and include Eurasian watermilfoil, chara/starry stonewort and coontail. These have characteristic traits making their identification with a good degree of confidence. More specific identification of the two macroalgae species, chara and starry stonewort, is not possible due to their similarity. However, in the case of Tully Lake where this work was done, one could infer that starry stonewort was at least dominant where the identified macroalgae bottom layers are thick which is characteristic of starry stonewort.

Without verified scans of hydrilla or a surrogate such as elodea, it is difficult to evaluate the methodology's utility for early detection. However, the results from this study and over three years of data collection using the ciBioBase technology provide the following insights:

- Identifying the species of solitary or scattered plants is beyond the capability of the technology. However, suspected locations identified could be verified by field sampling or divers.
- Early detection/identification of an invasive species where there is a high density of submerged vegetation and where the invasive is clearly not abundant or dominant would be difficult and probably unlikely.
- However, if the invasive species is abundant or the dominant species in the area in question, a verifiable scan and identification should be possible.

RECOMMENDATION FOR FUTURE STUDY

Lake and/or river aquatic vegetation studies planned for 2017 will include efforts to obtain more definitive species delineation including a focus on elodea to serve as a surrogate for hydrilla. The possibility of surveying in Cayuga Lake to obtain an actual hydrilla "fingerprint" and to evaluate the methodology's ability to locate and map its presence will be explored.

LITERATURE CITED

US Army Corps of Engineers (Buffalo District) and Ecology and Environment, Inc. 2016. Great Lakes Hydrilla Risk Assessment. Fact Sheet.



Figure 1.Seneca River between Baldwinsville Dam and Route 690/48 Overpass
Aquatic Vegetation Abundance as Percent Biovolume



Figure 2. Seneca River between Baldwinsville Dam and Route 690/48 Overpass Bathymetric Map



Figure 3. Seneca River between Baldwinsville Dam and Route 690/48 Overpass Bottom Composition as Hardness



Figure 4. Seneca River near Hayes Road /Onondaga Lake Outlet Aquatic Vegetation Abundance as Percent Biovolume



Figure 5. Seneca River near Hayes Road /Onondaga Lake Outlet Bottom Composition as Hardness



Figure 6. Seneca River near Hayes Road /Onondaga Lake Outlet Bathymetric Map



Figure 7. Oneida River and Oswego River (Three Rivers) Bathymetric Map



Figure 8.Oneida River and Oswego River (Three Rivers)
Aquatic Vegetation Abundance as Percent Biovolume



Figure 9. Oneida River Bottom Composition as Hardness



Figure 10. Eurasian Watermilfoil bed- Seneca River



Figure 11. Coontail in the Seneca River- Hayes Rd area opposite Onondaga Lake Outlet



Figure 12. Tully Lake Chara/Starry Stonewort







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