



EPA GLRI Final Report

Grant Number: 00E02246-1
Project Title: Collaboration to Halt the Spread of Invasive Species
Project Manager: Jill Hapner, Ph.D.
Project Period: 10/1/2017 - 9/30/2020

Summary of Nature and Extent of the Project

This project implemented multi-organization collaboration to control the spread of non-native invasive plant species (NNIS) into our Great Lakes natural areas through two components: 1) working with local government roadway crews and adjacent landowners to manage NNIS populations previously mapped by citizen scientists, and 2) professionally branding an annual program and executing that program to provide NNIS control education and workdays for community-based organizations and Grades 6-12 school groups. As a result, 2,224 populations of NNIS were controlled along more than 2,000 miles of roadways and 921 adult and youth volunteers controlled established and new NNIS populations on 1,213 acres of woodland habitat. 92% of the funds granted through this project was used for on-the-ground control of NNIS.

Methodologies Employed

Garlic Mustard Pull-A-Thon:

A request for proposals was developed and distributed widely to secure a contractor to professionally brand our Garlic Mustard Pull-A-Thon Program. Three proposals were received and reviewed/rated by the SEWISC Board of Directors. A graphic artist was selected, and the principal investigator worked with this contractor to develop and receive marketing deliverables which were posted to the SEWISC website on several newly-created Garlic Mustard Pull-A-Thon website pages. Thirty-two past Garlic Mustard Pull-A-Thon teams from southeastern Wisconsin were sent invitations to participate in the 2018 and 2019 regional Pull-A-Thons and the annual event opportunities were posted on social media.

Nine Pull-A-Thon Team Leaders within our project area recruited volunteers to pull garlic mustard and dames rocket on scheduled workdays each year. Pull-A-Thon Team leaders submitted final counts to the principal investigator by mid-July in 2018 and 2019 (see compilation of data on page 9).

Non-native Invasive Species (NNIS) Control in Right-of-ways (ROW):

Group and individual meetings were scheduled and held in-person and electronically with County and local government roadway managers throughout the past 3 years to provide pre-mapped project target NNIS population locations, species identification tools and best management practices for controlling the infestations. Information regarding the subawards available for the NNIS control work through this project was also explained during the meetings. Additional information was provided through email and telephone communication as well as an internet online website page dedicated to the topic: (<https://sewisc.org/invasives/roadside-inventory-and-management>).

Subawards were developed with local roadway managers and signed before work began. ROW managers controlled mapped populations of priority targeted NNIS within the ROW using an integrated approach involving mechanical and chemical treatments timed for maximum efficiency. ROW managers reported their

treated and untreated populations within the ROW as well as reporting any new and/or spreading populations on property adjacent to the ROW. The follow-up field data was added to the project geodatabase (see compilation of data on page 9).

Outside environmental contractor selection process was developed in the third year due to COVID-19 related issues prohibiting some local government on-the-ground management activities. The process was implemented, and two separate contractors were hired for different counties within our project area. Contractors controlled mapped populations of priority targeted NNIS within the ROW using an integrated approach involving mechanical and chemical treatments timed for maximum efficiency. Contractors reported their treated and untreated populations within the ROW as well as establishment of any new and/or spreading populations on the adjacent property. The follow-up field data was added to the project geodatabase (see compilation of data on page 9).

Outreach to Affected Property Owners:

Expert botanical volunteers re-surveyed adjacent roadway target NNIS populations originally mapped in 2011-13 and added new NNIS populations to their data sheets. Land ownership mailing information for those populations was determined by using public County GIS parcel maps. Customized letters and educational packets were developed and mailed to the landowners. The follow-up field data was added to the project geodatabase (see compilation of data on page 9).

Significant Events and Experiences

Garlic Mustard Pull-A-Thon:

The 2-year Garlic Mustard Pull-A-Thon component of this project was extremely successful. Professional branding of this annual event was key to long-term program success. We engaged 84% more volunteers for the Pull-A-Thon than proposed in our grant application (we estimated 500 volunteers and successfully recruited 921 volunteers). The volunteers collectively pulled 18.79 tons of garlic mustard and dame's rocket in 1,213 acres of project area habitat, greatly exceeding the 13 tons of pulled NNIS in 90 acres estimated for the project.



Non-native Invasive Species (NNIS) Control in Right-of-ways (ROW):

SEWISC worked with the Wisconsin Department of Transportation to gain permission for controlling the target NNIS on all State roadways throughout our project area. We held four group in-person information meetings and several personal, individual phone meetings and virtual meetings throughout the project period to help organize roadway managers. As planned, each local government was instructed to follow our [Invasive Species Roadside Management Plan](#), but also examine their management protocols and develop an adaptive plan that would allow them to *uniquely* manage their roadsides for NNIS long-term. We worked with them to find solutions to actual and perceived constraints and as a result, many different approaches were discovered and implemented. Unfortunately, many other local governments expressed little interest in the solutions provided for them and declined to participate. Examples of approaches by program participants are listed below.

SHEBOYGAN COUNTY

County Highway Department: This County government had been working with various local non-profit organizations through a Contractor over the past few years to control one of our target NNIS (common reed grass). The County government therefore decided to request a subaward from SEWISC and acquire services from contractors following Federal Procurement Standards requiring competition. Their selected Contractor met with County roadway staff to share plant identification and management resources while completing the control work on 599 roadway populations throughout the County. Since the County manages most of the roadways within the county boundaries, the government plans to create a program encouraging local governments to contribute to a fund that will cover the costs to continue this NNIS control work within the ROW annually. This is a “model” that could be a great solution if successful and SEWISC will follow the progress of this program development.

Town of Lyndon: When this small town in Sheboygan County was contacted by SEWISC regarding the EPA-GLRI funding, they told us that they actually began controlling the target NNIS populations after we delivered the original inventory maps to them in 2014 (Phase 3 as described in our proposal and workplan!). They had successfully eradicated some of the populations through their persistent annual control while keeping an eye on those sites for any re-sprouts. Other sites were still undergoing annual control and there were new sites that they needed to tackle. This small town had already responded to our earlier 2014 outreach and the addition of this new funding was extremely instrumental to their continued their work. 63 target un-treated populations were controlled by the Town in 2019 with the aid of this funding and their work continued in 2020 without financial aid from SEWISC or other sources. They are a great example of how a small community can make a positive commitment in the control of NNIS long-term on their town roads. The response to this problem by the Town of Lyndon is used as a successful model for other local governments.

Town of Holland: This small town had a few target NNIS populations controlled through project funding by the County Highway Department’s Contractor (see above), but like Town of Lyndon (above), an additional 50 populations along their Town roadways needed to be re-visited and controlled. Due to COVID-19 restrictions, the Town requested that SEWISC acquire outside Contractor services for this work, which was completed following Federal Procurement Standards requiring competition. The Contractor met with Town staff to share plant identification and management resources and successfully controlled those 50 target populations. SEWISC will continue working directly with the Town staff to control this project’s target species along with another NNIS (wild chervil) which is spreading along their roadways.

OZAUKEE COUNTY

County Highway Department/Planning & Parks:

The Ozaukee County Planning and Parks Department (Department) requested a subaward to control our target project NNIS populations within the ROWs of the county trunk highways (CTH), state trunk highways (STH) and Interstate 43 within Ozaukee County. Specifically, the Department worked with the Ozaukee County

Highway Department (Highway Department) to control the NNIS populations through a combination of strategically timed mowing and herbicide treatments and a total of 262 populations were treated between 2019-2020. While the control methods and treatments were successful, the Department identified several challenges and lessons learned during the project and graciously took the time to document and share them with us. Going forward, the Department will continue to work closely with the County Highway Department to create and adhere to a schedule that allows for all the work to be accomplished within the narrow window allowed for mowing to be effective. This was especially the case for teasel and wild parsnip. The variable annual phenology and extensive number of sites that need treatment under the County jurisdiction create scheduling challenges to ensure properly timed mowing occurred, while also allowing time for the Highway Department to accomplish numerous other projects during the same timeframe. It has shown to be important to communicate with the Highway Department early in the planning effort and frequently to ensure treatments are on track. Ideally, as treatment continues, the number of sites will decrease and lessen the time commitment needed. Even with properly timed mowing, some of the plants (e.g., wild parsnip and teasel) re-sprouted with viable seed or individual plants were difficult to cut (e.g., around bridge abutments, guardrails, and fences) and follow-up hand work was necessary. Using county government funding, the Department hired and trained a Milwaukee Community Service Corps team to assist with follow-up treatments, which included manually cutting the re-sprouted/missed stalks and seed-heads, bagging and disposing. This was costly, time intensive and potentially dangerous, even with all the best safety protocols in place (on busy ROWs), for individuals working on the project. In addition, some populations were found just beyond the ROW boundary (on private properties) and 100% of the population could not be mowed/treated. This is a challenge going forward as it will almost always be impossible to treat 100% of the populations without follow-up work and/or collaboration with adjacent private landowners with NNIS on their property. Access to major county and state trunk highways and interstates may be a challenge for outside private contractors and the Department felt working with the County Highway Department with experience and safety protocols in place was the best option for this type of management. The County Highway Department has familiarity with the geography throughout the County and also has all the equipment and training necessary to working along these major roads. The County Highway Department would still be required for traffic control on these ROWs due to current County and State policies, even if a private contractor did the actual treatment work. There is also a need for continual inventory to evaluate populations before and after treatment as well as identify new/additional populations and/or additional problematic species that may need management. This is extremely time intensive work and additional funding would need to be secured to continue and maintain updated inventories. This is critically important as often time populations were larger than originally noted and hence required more time, effort, and funding. Regional collaborators should also utilize the same protocols/methods for the inventory to keep database information consistent. Ozaukee County was fortunate in that they had recently conducted additional, detailed inventory and mapping for these target NNIS. Overall, the project was successful, and a considerable number of populations were successfully treated. Ideally, some of these efforts could be funded under general Ozaukee County Highway/Planning and Parks Department annual budgets to sustain the work in the long term; however, there are many pressures on annual Department budgets even for priority programs. Due to the large expense and large number of populations that may need to be treated in the future, additional funding should be secured to supplement staff time, equipment, and materials provided by the County. In addition, the effort should be expanded to encourage this work along smaller town/village/city road ROWs and private landowners for more effective management. The County is very engaged with the problem and SEWISC feels they will continue to develop their custom plan for control and management using best management practices annually.

Friends of the Cedarburg Bog (FOCB): The Cedarburg Bog is an important State Natural Area within Ozaukee County. An area surrounding the Cedarburg Bog is remarkably free from the invasion by wild parsnip, teasels, common reed grass, and Japanese knotweed that is so common along roadways throughout much of our region. The FOCB has taken on a permanent ongoing project with a goal of never allowing these four species to become firmly established in the area around the Bog. They heard about SEWISC's project and worked with the Town

of Cedarburg and Town of Saukville who manage roadways around the Bog. The FOCB obtained permission from officials in both Townships to control 69 target species populations along the roadways within that buffer. This is a great model of how a small non-profit can work with two separate local governments to protect a natural area! Many affected adjacent property owners were also contacted by the FOCB and ultimately gave permission for FOCB to continue the control on their property with the work of local volunteers. This is a great example of how this EPA funding fostered partnerships, public education, and positive action. FOCB has learned some important lessons through this work. The FOCB goal for their work with the biennials, parsnip, and teasel, is the complete elimination of seed production and spread. They realize that allowing even a small amount of seed to be produced in these isolated population will perpetuate the problem and not allow complete eradication. They have learned that it is seldom sufficient to make a single visit to cut and kill these species at any site if seed set is to be completely eliminated. A few plants are often missed during a single visit and the timing of flowering is variable enough that some plants will come into flower after a single visit takes place. FOCB makes every effort to do a follow-up visit a little later in the season to each controlled population.

Town of Cedarburg: In addition to granting FOCB permission to complete some of the control along their roadways (see above), this roadway crew aggressively reviewed their mapping, updated the maps with new populations and timed their roadside management to follow the Management Plan and control 144 populations in 2019. This effort was led by the City Foreman of Public Works, continued in 2020 and SEWISC is confident that their efforts will continue annually. SEWISC has also worked with the City over the past several years to control wild chervil along their roadways and this project has strengthened that working relationship to ensure roadway NNIS management will continue long-term.

City of Mequon: This sprawling suburb covers the southern third of Ozaukee County with quite a temperature difference between the western and eastern (lakeside) boundaries. The City Parks and Forestry Superintendent decided this funding was a great opportunity to not only teach his highway and parks staff to identify and control these target NNIS, but also to educate the public. Their approach was to start the control work in the western part of the city and work their way to the eastern edge of Lake Michigan which would follow the phenology of the target species and time the mowing appropriately. They also decided to mow wider swaths than normal to control as much of the target plants as possible. This resulted in a lot of inquiries from the residents and served as a great opportunity to explain the project goals of controlling NNIS along the roadways and the responsibility of the adjacent property owners to do the same. The City successfully controlled 211 target populations during this project period and have committed to continue the work using best management practices annually.

MILWAUKEE COUNTY

County Highway Department: We engaged in numerous conversations with Milwaukee County Highway Department Commissioner, staff, and elected officials in an effort to gain their participation in this project. Throughout 2018 and 2019, they declined to participate stating they did not have the staff or time to control NNIS along their highways. In 2020, we tried again and found there had been a positive change in the Department staff. The new Highway Commissioner was very cooperative with SEWISC and attempted to receive permission from the County to request and receive a project subaward, but the request was declined due to restrictions pertaining to the global pandemic. The Highway Commissioner therefore requested that SEWISC acquire outside Contractor services for this work, which was completed following Federal Procurement Standards requiring competition. While working in Milwaukee County the Contractor staff identified 228 populations of target NNIS; treating 174 of those populations by cutting while they were in full bloom or prior, to prevent them from seeding. A total of 158 populations of teasel were treated, while only 16 populations of wild parsnip were treated. An additional 54 populations were surveyed and not treated. This group consisted of 3 Japanese knotweed populations, 3 wild parsnip populations, 12 phragmites populations, and 36 teasel populations. Of the 414 populations that were originally identified by SEWISC, our Contractor treated 5

populations of teasel, surveying another 2 teasel populations that were too large to treat, and treated one population of wild parsnip. For the most part, Milwaukee County appears to be diligent about maintaining the ROW. This is not true for the areas around the interstate highway systems, however, and these populations were too large to treat and too dangerous to stop and map due to construction, busy traffic, and high speed limits. In the future the city mowing crews may want to consider mowing the areas surrounding highways and entrance ramps entirely at least once a year. SEWISC communicated these issues with the Wisconsin Department of Transportation, suggesting that the State take a more active role in managing the NNIS along dangerous State roadways such as Interstate 43.

County Park Natural Areas Crew: After attending one of our project information meeting in 2018, this County Park staff began re-visiting our mapped populations and updating the map based on past populations treated by their efforts and new populations which have established over the past years. Following their surveys, the Park staff planned to request a subaward from SEWISC in 2020 to control the populations but were prohibited by the County Government due to the local global pandemic restrictions. The data from their follow-up control and survey work was sent to SEWISC which we incorporated into our project geodatabase. The park Staff has been controlling many of the populations mapped during 2011-13, and plan to continue that effort in 2021 and beyond using our Management Plan protocol. SEWISC is confident that their efforts will be successful and continue annually long-term.

City of Milwaukee: Similar to the Milwaukee County Natural Areas crew above, the of the City of Milwaukee Forestry Property Maintenance & Compliance Manager and her crew attended one of our kick-off meetings in 2018 and began re-visiting the previously mapped target populations. They also mapped new populations and prepared to request a subaward from SEWISC to control the populations in 2020. As with the Milwaukee County Highway and Parks Departments, they were prohibited to accept a subaward and complete the work by the County Government due to the County-wide global pandemic restrictions. The data from their follow-up control and survey work was sent to SEWISC which we incorporated into our project geodatabase. The City of Milwaukee Forestry staff is committed to controlling these target NNIS using our Management Plan protocol in 2021 and beyond. SEWISC is confident that they have the training, knowledge, and resources to be successful long-term.

City of Franklin: The City Forester attended one of our in-person project kick-off meetings, and his resulting efforts were exceptionally successful! He was knowledgeable regarding a variety of NNIS since he was dealing with city-wide damage from Emerald Ash Borer invasion. Over the past several years, SEWISC has also assisted him with control another NNIS (lesser celandine) in other areas of the City, so that previous working relationship was instrumental for this project. Unfortunately, the City Forester was only able to control the NNIS on City ROWs, resulting in 14 populations treated by him during this project. The large majority of the populations fell on Milwaukee County Highway, so he mapped all the populations with the hope of gaining assistance from the County in the following years. The City Forester is committed to continuing the control work annually on City roads and working with the new Milwaukee County Highway staff to control NNIS along County roads within the City of Franklin limits. He also went a step further by drafting an update to the City noxious weed ordinance which includes our project target NNIS along with many more! This is a great example of what can be done on a local level to commit to controlling NNIS long-term on private and public properties.

Village of Fox Point: The Weed Commissioner of this small village in Milwaukee County is very pro-actively informing and educating the community about NNIS issues. SEWISC has worked with the Village government and Village residents on other NNIS control projects and this prior working relationship was instrumental in sharing information about this EPA GLRI-fund project. The Village Weed Commissioner created a Village website page addressing NNIS quickly surveyed all roadways within Village limits and did not observe any of

our target NNIS or other NNIS. The Village will diligently watch for any populations discovered and quickly control any that do establish.

RACINE COUNTY

County Highway Department: After attending one of our kick-off meetings, the County Highway Commissioner invited SEWISC to speak to all local roadway managers in the County during a separate meeting scheduled in May 2018 at the County Administration Building. During that meeting, SEWISC explained the project and distributed plant ID, control, and management resources to the attendees. The County Highway Department manages most of the roadways throughout the County, so the County Executive assigned the project to their staff landscape architect who in-turn contacted one of the original residents who collected the data in 2011-2013. The two women met and drove the County roads together developing a plan for the control work under this grant project. This is a great example of how you can team a knowledgeable and concerned resident with a local government employee who then work together to protect the local natural environment. They have committed to meet each year and drive through the county to plan the control for each season! County staff successfully treated 63 populations of our target NNIS following our Management Plan protocol. SEWISC is confident that this unique approach will continue to successfully manage NNIS along the Racine County roadways long-term.

KENOSHA COUNTY

County Highway Department: We engaged in numerous conversations with Kenosha County Highway Department Commissioner, staff, and elected officials in an effort to gain their participation in this project. Throughout the three field seasons, they declined to participate stating they did not have the staff or time to control NNIS along their highways. We therefore acquired outside Contractor services for this work in 2020, which was completed following Federal Procurement Standards requiring competition. Our Contractor crew met with Kenosha County roadway staff to share plant identification and best management resources.



SEWISC project Contractors sharing target NNIS plant identification and management resources with Kenosha County Highway Staff (left) and using different tools for control (middle and right).

From June 23 through August 14, 2020, the contracted crew worked in the field nearly every day, surveying and treating both new and previously identified populations. 682 populations of the target NNIS were identified by the crew in Kenosha county. Of those populations, 549 were treated by cutting them down prior to, or in full bloom, minimizing the environmental consequences of using herbicides, while maximizing efficiency and the ability to treat large quantities of populations. A total of 414 teasel and 135 wild parsnip populations were treated, while 133 additional populations were surveyed. The surveyed sites included 118 phragmite populations, 3 wild parsnip populations, and 12 teasel populations that were not treated. Of the 357 populations that were originally recorded by SEWISC, the contractor surveyed 18 phragmites populations, treated 31 teasel

populations, surveyed another 3 teasel populations too large to treat, and treated 27 populations of wild parsnip. Overall, the previously identified populations only comprised approximately 10% of the populations the crew mapped during their work. The Contractor met with the Kenosha County Highway Department in the work area, explaining control methods and giving recommendations for how they can improve NNIS management by educating their ROW mowing crews. County Highway staff expressed interest in getting ahead of the problem on roads that currently do not have large populations of the target NNIS but stated that there is no time for any additional management in the ROW as their crews are perpetually running behind their mowing schedule. None the less, our Contractor recommended they have the mowing crews carry a root slayer or machete in their rig so they can cut down small populations of NNIS that they come across, with a focus on the un-mowed areas around electric lines, mailboxes, and white utility line markers. Several root slayers were then donated to the Highway Department crew.

Outreach to Affected Property Owners:

Our re-surveying of the 2013 data that mapped the spread of NNIS onto adjacent properties was a monumental task. We were surprised (and disheartened) to see that the original 403 populations had increased to 986 populations in just 7 years. This is an example of poor roadside management which ignores the need to adjust mowing times to eliminate intentional spread of these problematic species. 409 packets were prepared and sent to property owners who are affected by the spread of NNIS from the right of way onto their properties, but many more packets could have been prepared and mailed if we had not been constrained by our grant budget. We are in search of funding to continue that effort. This was an immensely important aspect of the overall project because management and control of these species must be accomplished on both sides of the fence (see similar concerns voiced by the Ozaukee County Planning and Parks Department on page 3).

A problem that presented initially in the ROW has now spread well beyond to adjacent properties due to poor management and inefficient planning on the part of our local governments. We received a few inquiries from property owners who had received our packets; most notably, those who now have poisonous wild parsnip spreading from the ROW onto their properties. A great example of one response is a property owner in Sheboygan County who said he could not understand why his arms and legs were always breaking out in a horrible rash after he worked on clearing plants in his yard. Then he received a packet from SEWISC, opened it and read that he had wild parsnip on his property. Our packet included information on the ecology and phenology of wild parsnip (along with a description of phytophotodermatitis) and instructions for how to effectively control it. The timing of our mailing through this project was excellent and this property owner was appreciative of our letter and packet. Understandably, this property owner was displeased with his local roadway managers for allowing wild parsnip to spread throughout the ROW and onto his property. It will be a time-consuming and expensive job to eradicate the wild parsnip from his property.



Expert volunteer botanists inspected adjacent roadside populations of our target species. We determined property ownership and then prepared and mailed letters and educational packets. We followed-up with those property owners who contacted us with questions.



Wild parsnip remains on adjacent private property following roadside mowing (left) and property owner was glad to receive our letter and educational materials after suffering burns from trying to control it. Wild parsnip has been spread from the right-of-way to a new detention pond by developers (right).

Compilation of the Data Collected

2018 and 2019 EPA Grant Garlic Mustard Pull-A-Thon Summary										
Team	Mequon Nature Preserve	Milwaukee County Zoo	Riveredge Nature Center	Grant Park	River Revitalization Foundation	OWLT	MALC	Richard Bong SNA	Lion's Den Gorge	Totals
Volunteers	252	10	204	60	190	167	3	26	9	921
Pounds	7,650	570	10,050	350	13,035	5,280	30	125	480	37,570
Hours	671	64	1,103	122	908	693	13	78	24	3,676
Acres	462	15	362	127	20	221	4	1	1	1,213
New populations	2	1	4	1	7	6	0	0	0	21
Donations										\$3,155.00

2018-2020 EPA Grant Roadway Work Summary							
<i>Number of:</i>	<i>County</i>					<i>Totals</i>	<i>% Change</i>
	Sheboygan	Ozaukee	Milwaukee	Racine	Kenosha		
Total 2013 mapped populations	702	586	554	315	420	2,577	71.17%
Total 2020 mapped populations	1,344	889	804	332	1,042	4,411	
2013 populations in ROW	577	539	414	287	357	2,174	57.54%
2020 populations in ROW	1,167	716	494	293	755	3,425	
Treated ROW populations	732	687	192	63	550	2,224	
Inspected treated populations	183	173	48	16	138	558	
2013 populations spreading adjacent to ROW	125	47	140	28	63	403	144.67%
2020 populations spreading adjacent to ROW	177	173	310	39	287	986	
Education packets sent to affected adjacent property owners	89	98	60	33	129	409	
2013 populations not observed in 2020	27	31	14	5	25	102	

Results Achieved

% Complete, # acres/miles	Approach	Measuring/tracking	Output	Outcome
100%	Meet with the Roadway Managers and Staff of our 5 target coastal counties to plan invasive plant population control in their respective jurisdictions. Develop local government application, compose, and approve all agreements. Develop outside environmental contractor selection process; implement that process and hire contractors as needed.	We recorded the initial contact name/date for each jurisdiction, date and location of the meetings, and follow-up communication regarding subawards. We have copies of all subaward agreements. We followed federal protocol for contractor selection and hired two separate contractors to complete the work in Counties that could not complete the work on their own.	Meetings scheduled and held with ROW managers of 5 target counties to inform them of the available funds, provided application materials and plan to proceed with approved control work. Highlights of these meetings were reported in SEWISC newsletter.	2,224 established invasive species populations were controlled to reduce spread throughout Great Lakes basin. ROW managers customized individual adaptive management plans to effectively control invasive species in their ROWs long-term.
100% >2,000 mi.	ROW managers, contractors and landowners controlled mapped populations of priority targeted invasive species within and adjacent to the ROW using an integrated approach involving mechanical and chemical treatments timed for maximum efficiency.	Our GIS database tracked the date, species, location, and treatment approach for each treatment site. At least 90% of stems were detected and effectively treated in each population.	2,224 populations of invasive species were controlled along >2,000 miles of ROW corridors. Invasive species were blocked from spreading through >2,000 miles of ROW corridors to the Great Lakes basin ecosystem. Long-term ecological benefits of the Great Lakes basin ecosystem. Highlights of control work reported in SEWISC newsletters.	Established invasive species were controlled, reducing spread throughout Great Lakes basin. ROW managers customized individual adaptive management plans to effectively control invasive species in their ROWs long-term. Landowners adjacent to ROWs learned to identify and control target invasive species resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.
	Manual control of	Teams reported	18.79 tons of garlic	Established invasive

100% 1,213 ac.	garlic mustard and dame's rocket in woodland recreational natural areas was implemented by community-based volunteers of all ages through the annual Pull-A-Thon program which was been professionally branded and marketed.	total # of bags of invasive species pulled, # of acres treated, # of volunteer team members, and # of hours worked to SEWISC.	mustard and dame's rocket manually controlled by 921 volunteers in 1,213 acres of terrestrial habitat. Experimental learning opportunities were provided for grades 6-12. Long-term ecological benefits were provided as a result to the Great Lakes basin ecosystem. Garlic Mustard Pull-A-Thons were advertised to the public and highlights of control work reported in SEWISC newsletters.	species continued to be controlled each year yielding long-term benefits to Great Lakes basin. Engaged and knowledgeable citizen-stewards continue to stem the influx of invasive species to the Great Lakes basin. Our Pull-A-Thon was fully developed and will provide annual sustaining operating revenue for Great Lakes basin CWMAs, resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.
100%	While field-verifying and treating previously mapped existing invasive species populations (n=2,577), SEWISC, project partners and landowners monitored ROW and adjacent areas for new and/or spreading populations.	Our GIS database tracked the date, species, location for each unmapped (new) ROW population reported (n = 1,939).	4,413 early detection monitoring activities for invasive species were conducted, yielding long-term ecological benefits for the Great Lakes basin ecosystem.	1,939 newly-established invasive species populations were detected and 2,224 populations were treated yielding cost-efficient long-term benefits to Great Lakes basin long-term. ROW managers and adjacent landowners developed a protocol for early detection system resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.
100%	New unmapped populations of targeted invasive species within (and adjacent to) the	Our GIS database tracked the date, species, location, and treatment approach for each	At minimum, 1,939 rapid responses or exercises to control new populations of invasive species	1,581 newly -established invasive species populations were detected and treated yielding cost-

	ROW and in Pull-A-Thon sites were controlled using an integrated approach involving mechanical and chemical treatments timed for maximum efficiency.	unmapped (new) population. New populations of target invasive species controlled in Pull-A-Thon worksites were also be reported and recorded.	were implemented. Adjacent ROW property managers have controlled populations not reported to us. Experimental learning opportunities were provided for grades 6-12 resulting in long-term ecological benefits of the Great Lakes basin ecosystem. Results were highlighted in SEWISC newsletters.	efficient long-term benefits to Great Lakes basin long-term. ROW managers, adjacent landowners, and community partners developed a protocol for rapid response system resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.
100% ~340 mi.	Targeted invasive species in and adjacent to the ROW along with garlic mustard and dame's rocket were controlled along Great Lakes tributaries in 5 coastal counties.	Our GIS database tracked the size and location of each ROW treatment area along a tributary. Pull-a-Thon Teams reported miles treated along tributaries.	~340 miles of Lake Michigan tributaries* were protected by barriers from established invasive species. Experimental learning opportunities were provided for grades 6-12 resulting in long-term ecological benefits of the Great Lakes basin ecosystem. The Annual Garlic Mustard Pull-A-Thon Program was advertised to the public and highlighted in SEWISC newsletters.	Established invasive species were controlled yielding long-term benefits to Great Lakes basin. Engaged and knowledgeable citizen-stewards stemmed the influx of invasive species to the Great Lakes basin. A program was developed that will provide annual operating revenue for Great Lakes basin CWMAs, all resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.
100%	Cost assistance was offered to local roadway departments and we worked individually with them to use	Our GIS database tracked the date, species, location, and treatment approach for each site. During this	We used a minimum of 25 technologies and methods field-tested through adaptive	Established invasive species were controlled, reducing spread throughout the Great Lakes basin. ROW managers

	adaptive management techniques during control activities.	project there were 14 individual custom plans developed and adopted by local roadway crews.	management to control invasive species in the Great Lakes basin resulting in long-term ecological benefits of the Great lakes basin ecosystem.	customized individual adaptive management plans to effectively control invasive species in their ROWs long-term resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.
100%	Cost assistance was offered to local roadway departments along with technical and educational resources to adjacent landowners. We recruited community-based organizations to form Pull-A-Thon Teams.	We recorded 14 ROW local government managers actively involved with invasive species control, 409 affected adjacent landowners received information packets for controlling invasive species populations and 9 community-based organizations who formed Pull-A-Thon Teams.	~ 50 collaboratives were developed and/or enhanced to effectively control invasive species in the Great Lakes basin long-term, providing ecological benefits of the Great Lakes basin ecosystem. Offers for cost and technical assistance and Garlic Mustard Pull-A-Thon Program information was highlighted in SEWISC newsletters. Garlic Mustard Pull-A-Thon Program advertised to the public.	Established invasive species populations were controlled, reducing spread throughout Great Lakes basin. ROW managers customized individual adaptive management plans to effectively control invasive species in their ROWs long-term. Engaged and knowledgeable citizen-stewards stemmed the influx of invasive species to the Great Lakes basin. A program was developed that will provide annual operating revenue for Great Lakes basin CWMAs, resulting in a diversified, more natural ecosystem that sustains a wide variety of native species.

Analysis of the Data

Garlic Mustard Pull-A-Thon:

Professional branding of this annual program immediately helped to increase participation by diverse organizations including school groups, nature centers and neighborhood volunteer groups. We exceeded the proposed \$3,000.00 donations from the 5 project counties by \$155.00. We engaged 84% more volunteers for the Pull-A-Thon than proposed in our grant application proposal (we estimated 500 volunteers and successfully recruited 921 volunteers). The volunteers collectively pulled 18.79 tons of garlic mustard and dame's rocket in

1,213 acres of project area habitat, greatly exceeding the 13 tons in 90 acres proposed for the project. Professional branding of this annual event is key to long-term program success.

Non-native Invasive Species (NNIS) Control in Right-of-ways (ROW):

Project NNIS inventory data collection was the combined efforts of citizen scientists, expert botanists and roadway managers and intended to be used as a general map and “picture” of the problem. Populations of NNIS quickly spread and may be mowed or treated without public knowledge, therefore, the data is not 100% accurate nor 100% complete but can be used as a current “snapshot” of the problem.

Although we expected some spread of our target species since the original survey was conducted throughout 2011-13, we are astonished to record the extraordinary number of new populations during this project. 2,577 populations increased to 4,411 populations in just 7 years (>71% increase), indicating poor roadway management which results in spreading the species rather than controlling them.

Common reed grass populations have increased by over 193% within **Sheboygan County** which was why the County government was working to control that species on public and private properties prior to this project. Our focus on funding

Sheboygan County			
Species	2013 mapped populations	2020 mapped populations	% Change
Japanese knotweed (<i>Polygonum cuspidatum</i>)	84	107	27.38%
Common reed grass (<i>Phragmites australis</i>)	121	355	193.39%
Teasel (<i>Dipsacus sylvestris</i> and <i>D. laciniatus</i>)	42	81	92.86%
Wild parsnip (<i>Pastinaca sativa</i>)	455	801	76.04%
Totals	702	1344	91.45%

common reed grass and other target NNIS within the ROWs was of great assistance to their overall efforts. SEWISC principal investigator encouraged the roadway managers within the County to continue controlling all NNIS within the ROWs, but a focus should be placed on Japanese knotweed and Teasel because the relatively small number of those populations can be effectively controlled to prevent widespread invasions as they are experiencing with common reed grass and wild parsnip.

Ozaukee County			
Species	2013 mapped populations	2020 mapped populations	% Change
Japanese knotweed (<i>Polygonum cuspidatum</i>)	9	10	11.11%
Common reed grass (<i>Phragmites australis</i>)	84	103	22.62%
Teasel (<i>Dipsacus sylvestris</i> and <i>D. laciniatus</i>)	350	477	36.29%
Wild parsnip (<i>Pastinaca sativa</i>)	143	299	109.09%
Totals	586	889	51.71%

Ozaukee County was experiencing a widespread problem with teasel when the 2011-13 survey was conducted. There have been efforts over the past 7 years to control the spread of teasel which is represented by our data which shows only a 36% increase over that time.

However, the roadway crews

throughout the County unknowingly aided the spread of wild parsnip through their roadside management practices with those populations more than doubling. Wild parsnip can be controlled with methods similar to teasel (the timing of mowing is slightly different) so SEWISC principal investigator encouraged the roadway managers to include wild parsnip in their annual NNIS mowing schedules to keep it in-check along with teasel going forward. The County has a wonderful protocol of teaming the Planning & Parks Department with the Highway Department to tackle this work and is fortunate to have dedicated local efforts from the City of Cedarburg, Friends of the Cedarburg Bog, and the City of Mequon.

Milwaukee County is fortunate to have a knowledgeable County Parks Natural Areas Crew, and the City of Milwaukee employs a fantastic City Forestry staff. These individuals proactively map and systematically control all NNIS (including our project target species) and schedule/execute treatment.

Even though the COVID-19 pandemic prohibited these managers from using our project funds to control ROW NNIS populations, we are confident that their control work will continue long-term. The County is also fortunate to have model communities such as the City of Franklin and Village of Fox Point whose past and current efforts are keeping their communities free of widespread NNIS invasions. The new County Highway Commissioner has pledged to follow our best management practices and implement a NNIS ROW control project beginning in 2021.

Milwaukee County			
Species	2013 mapped populations	2020 mapped populations	% Change
Japanese knotweed (<i>Polygonum cuspidatum</i>)	46	49	6.52%
Common reed grass (<i>Phragmites australis</i>)	205	242	18.05%
Teasel (<i>Dipsacus sylvestris</i> and <i>D. laciniatus</i>)	298	490	64.43%
Wild parsnip (<i>Pastinaca sativa</i>)	5	23	360.00%
Totals	554	804	45.13%

Racine County			
Species	2013 mapped populations	2020 mapped populations	% Change
Japanese knotweed (<i>Polygonum cuspidatum</i>)	4	5	25.00%
Common reed grass (<i>Phragmites australis</i>)	117	117	0.00%
Teasel (<i>Dipsacus sylvestris</i> and <i>D. laciniatus</i>)	74	75	1.35%
Wild parsnip (<i>Pastinaca sativa</i>)	120	135	12.50%
Totals	315	332	5.40%

There has been little change in the previously mapped target NNIS populations in **Racine County**, however, throughout 2017-2020, a >1,000 acre construction project (Foxconn) has been underway. As a result, many roadways are blocked off and/or have had vegetation removed as part of the

construction and our follow-up surveys could not be conducted in those areas. SEWISC Principal Investigator has recommended they conduct another thorough survey after completion of the construction. Construction spoils moved from site to site may actually spread NNIS.

Unfortunately, the County Highway Department manages the majority of the roadways in **Kenosha County** and until the County Highway Commissioner realizes the severity of mis-managing ROWs, these populations will continue to spread through the ROWs into natural areas and onto adjacent private properties. Teasel and wild parsnip are spreading fast throughout the county, and the roadway managers must time their mowing to control these species (before seed-set) instead of mowing at the time when they are intentionally spreading viable seed. This is not a difficult task, but County elected officials and staff must acknowledge that this small change in management protocol will make a significant positive improvement. The County repeatedly refused our subaward offer, stating in a letter (see Appendix A) that they did not have ample staff to implement the work. As with all other roadway crews, we offered to help them

Kenosha County			
Species	2013 mapped populations	2020 mapped populations	% Change
Japanese knotweed (<i>Polygonum cuspidatum</i>)	6	5	-16.67%
Common reed grass (<i>Phragmites australis</i>)	189	295	56.08%
Teasel (<i>Dipsacus sylvestris</i> and <i>D. laciniatus</i>)	109	503	361.47%
Wild parsnip (<i>Pastinaca sativa</i>)	116	239	106.03%
Totals	420	1042	148.10%

develop a unique protocol which would alleviate any current constraints, and eventually they did meet with the Contractor we ultimately hired to conduct the control work. The County indicated they would work with the University of Wisconsin Extension staff to develop a NNIS public educational campaign and a plan to incorporate NNIS control into best management practices for the County ROWs as a result of our outreach to them through this project.

Outreach to Affected Property Owners:

Through 2011-2013, our volunteers mapped 403 populations of our target species spreading from the ROW to adjacent property and our follow-up surveys through this grant project mapped 986 populations. That is an increase of nearly 145% and a clear message that the roadway managers are instrumental in this spread due to their current management practices. Our grant budget allowed for 409 letters and packets to be mailed to these affected property owners, yet we obviously need to send more than twice that number. As we worked with local roadway crews, we pointed out the aggressive spread of our target species onto neighboring properties to ensure they were aware of the damage they are causing to adjacent properties. We encourage affected property owners to communicate with their local governments to adopt best management practices for roadway maintenance.

Conclusions and Recommendations

Garlic Mustard Pull-A-Thon:

Professional branding of this important annual program will provide a “familiar face” as the program is launched each spring. This grant project only included 5 of the 8 counties served by SEWISC, but the Garlic Mustard Pull-A-Thon branding portion of the funding benefitted all 8 counties and will continue to do so throughout the coming years. All program objectives were met or exceeded during the project period and will continue to be met each year as a result of the professional branding:

- Promote repeated control and proper disposal of garlic mustard in parks and natural areas.
- Promote public awareness of NNIS issues.
- Share control methods and best management practices with landowners and land managers.
- Create camaraderie and strengthen local volunteer efforts.
- Raise annual operational funds for SEWISC and for partner volunteer organizations.
- Raise in-kind match for grants.

Non-native Invasive Species (NNIS) Control in Right-of-ways (ROW):

During this project, we learned that each ROW management department is equipped with varying resources (e.g., staff capacity, equipment, knowledge, etc.) and each department has an existing protocol and schedule for roadside management. The managers are therefore limited by their resources to make changes to their ROW management routine. We also found that many (e.g., many who did not participate in the project) are limited by their inherent human characteristic of resisting any kind of change to their routine. Conversely, we identified many “champions” - typically one person in a department that understood the negative consequences of spreading NNIS throughout the ROW by continuing poor management practices. Each ROW management department that employed a “champion” found creative ways to take use our subawards to develop creative solutions to any constraints posed. Future efforts by SEWISC to work with roadway managers will focus on connecting with department “champions” to lead the department effort.

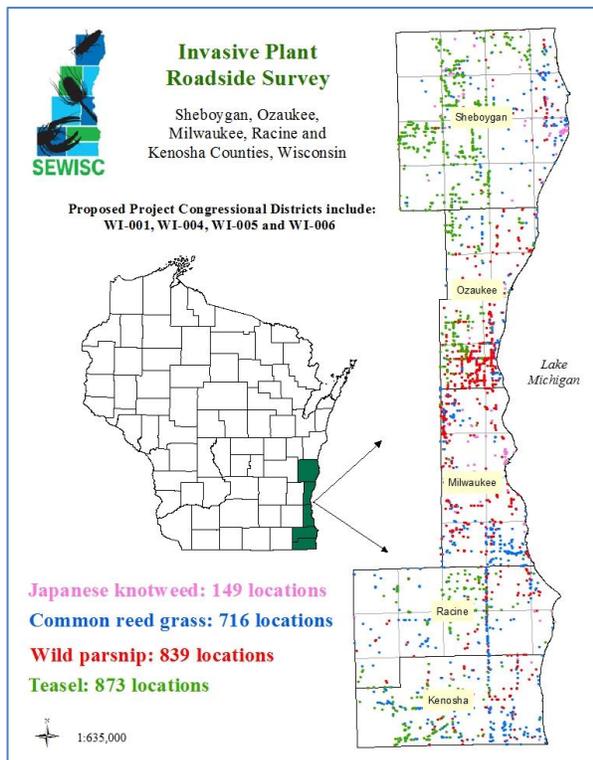
In an effort to continue this ROW NNIS control work each year, SEWISC will electronically send email reminders to the roadway managers during the seasonal “window” for mowing and chemical control. We will also continue to update our Roadside Management website page which will make our Roadside Management Plan and other resources available 24-7.

NNIS control and management must continue to occur on both sides of the property lines. These populations have spread rapidly from the ROW to adjacent properties over the past 7 years, and those residents are slowly recognizing the problem. Several affected property owners have complained to their local governments about this issue, which places more pressure on the local governments to follow the best management practices in our Roadside Management Plan.

Outreach to Affected Property Owners:

Our outreach to affected property owners was intended to share invasive plant species identification, ecology, and management information. This was accomplished with less than one third of the large number of affected property owners identified during the project due to project budget constraints. Our outreach also revealed the poor management by the roadway managers who can be considered at fault for the invasive plant invasion of these properties. Invasive plant introductions must be detected quickly and controlled to keep the cost of control manageable. Property owners must now take on this expense at no fault of their own. Hopefully, this problem will result in action by the affected property owners to communicate with their local government concerning adopting best management practices for ROWs. The populations must be treated concurrently on both sides of the property boundaries, so residents must partner with their local governments to solve the problem. SEWISC will continue to promote this collaboration.

2018 location of target NNIS within and adjacent to the ROW



2020 location of target NNIS within and adjacent to the ROW

