

Invasive Aquatic Plant Managers' Survey Summary Report

December 2022

Introduction

The need for multijurisdictional coordination and collaboration is essential to effectively implement invasive species prevention and control strategies across jurisdictional boundaries. Specifically, jurisdictions in the Great Lakes region identified the need for a collaborative project to improve coordination of invasive aquatic plant control method research and prioritize needs. The Great Lakes Panel on Aquatic Nuisance Species (GLP) has repeatedly expressed its interest in and support for advancing invasive aquatic plant (IAP) management and control as a priority issue and specifically the identification of research needs and/or recommendations. Through interjurisdictional grant funding from U.S. Fish and Wildlife Service, the GLP supported a project to:

1. Provide operational support to regional AIS coordination activities through the GLP and engagement with other regional entities;
2. Establish a comprehensive, baseline understanding of IAP research and management activities and associated gaps in knowledge (with an emphasis on Great Lakes' states case studies);
3. Conduct a workshop focused on priority IAP to refine and prioritize targeted research and management needs;
4. Develop an applied research agenda to inform future investments in IAP control.

In the completion of these four objectives, we hope to aid in the development of future IAP project planning throughout the Great Lakes basin by clearly identifying the crucial research questions and priorities that remain unfulfilled.

The project was conducted through coordinated work from the Great Lakes Commission (GLC), The Nature Conservancy (TNC) and GLP members, with the GLP's Research Coordination Committee leading the operation. An initial step was establishing a Priority Species List to serve as focus for objectives two, three and four. Species were selected using GLANSIS environmental and social/cultural impact scores and distribution (must be established in the Great Lakes or a designated "watchlist" species). The species *Phragmites australis* was excluded from the priority species list due to the high amount of *Phragmites* specific work that is currently being completed across the Great Lakes basin. A total of 20 species were chosen for the Priority Species List (see Appendix A for a list of the species common and scientific names).

To achieve project objective 2, "Establish a comprehensive, baseline understanding of IAP research and management activities and associated gaps in knowledge", literature reviews for each of the 20 priority species were completed. These literature reviews summarized the current knowledge relative to the management and control of each plant, and identified gaps

and challenges related to research and implementation of management and control strategies. To better understand management challenges, jurisdictional approaches, and priorities directly from the perspective of IAP managers, a survey for IAP managers was developed and distributed. Survey questions were developed by the project team (TNC/GLC) and reviewed by the GLP's Research Coordination Committee before submission. Results from the survey were then used to inform the direction of the following objectives (three and four).

Methods and Activities

Surveys were distributed to each jurisdictional representative of the GLP via email. Representatives could then distribute the surveys and/or coordinate with those necessary to draft a response. The survey consisted of two sections: (1) a fillable PDF (Appendix B) that provided open-ended questions for managers, regarding the IAPs their jurisdiction was currently managing and (2) a spreadsheet (Appendix A) that asked managers to select management challenges from a pre-determined list of options for each plant on the Priority Species List and describe the amount of management attention allocated to each. Seven jurisdictions provided survey responses: Indiana, Michigan, Minnesota, Ohio, Pennsylvania, Wisconsin, and the Fond du Lac Band of Lake Superior Chippewa. Results from both sections are provided below. Surveys were submitted digitally via email, apart from Minnesota, in which responses were submitted over a video call. Although seven jurisdictions responded, only six submitted the PDF portion, resulting in some figures having six responses. Responses were not received from the following states/provinces: Illinois, New York, Ontario, and Québec.

Results

"What species are of the highest management concern for your agency?"

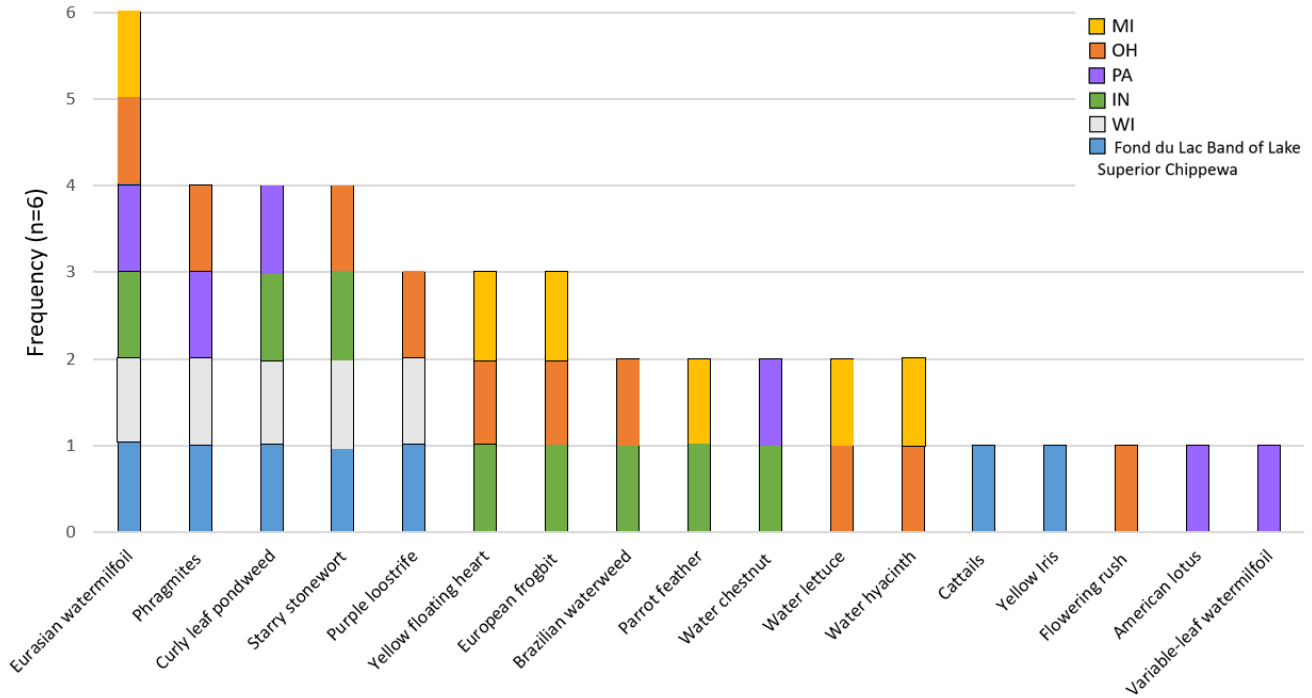


Figure 1. Frequency that each manager selected a species for "What species are of the highest management concern for your agency?".

Figure 1 displays the number of times each species was mentioned in response to the open-ended survey question "What species are of the highest management concern for your agency?". Eurasian watermilfoil was selected as the species of highest management concern, with all six responding jurisdictions including it in their answer, followed by *Phragmites*, curly leaf pondweed, and starry stonewort which were each selected as species of highest concern by four jurisdictions.

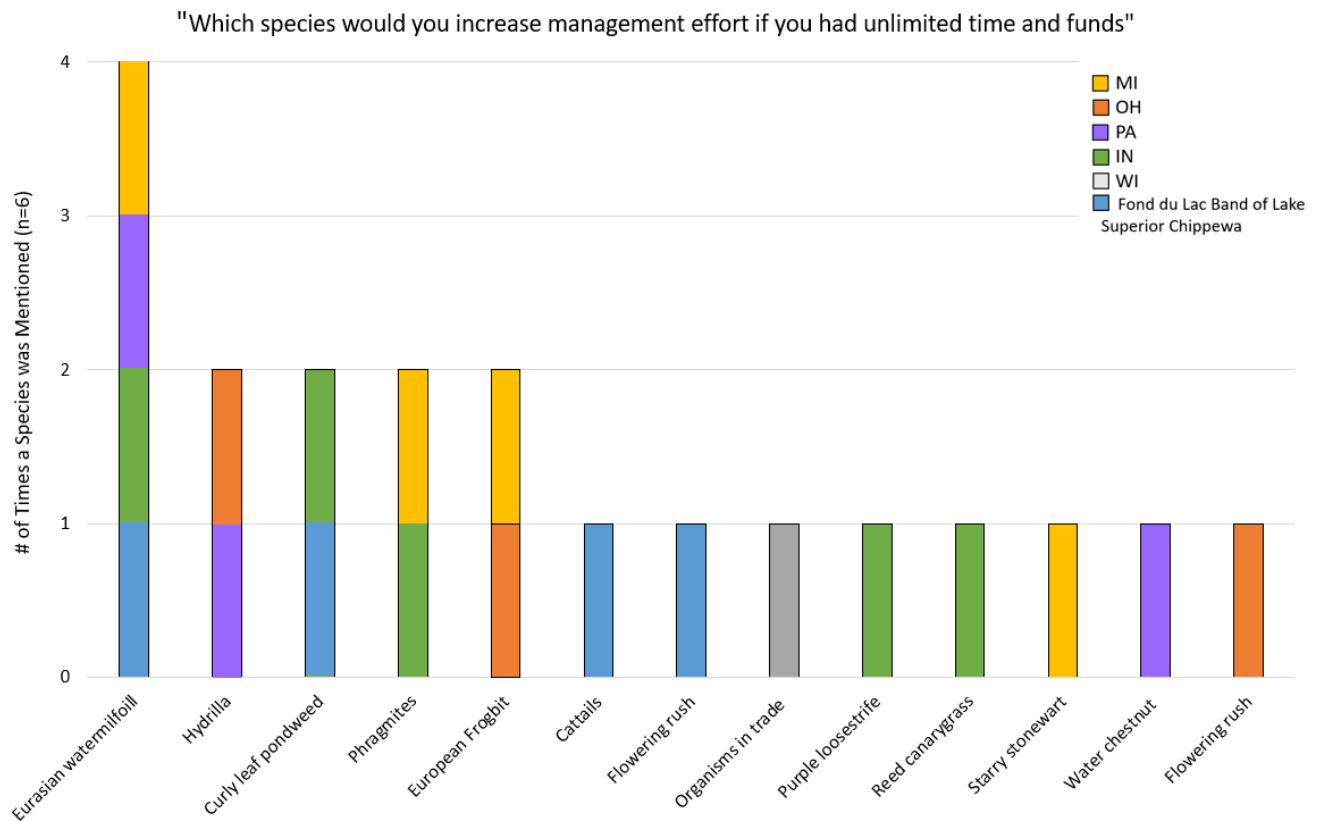


Figure 2. Frequency that each manager selected a species for "Which species would you increase management efforts if you had unlimited time and resources?".

Figure 2 represents the number of times each species was mentioned in response to the open-ended survey question "Which species would you increase management efforts if you had unlimited time and resources?". Eurasian watermilfoil was named most frequently as the species that would receive more management attention if time and resources were unlimited, with four out of the six jurisdictions noting it.

In Section 2 of the survey, managers were asked to describe the level of management attention for each of the 20 priority IAPs by choosing from a pre-determined set of responses (no attention, some attention, moderate attention, receives the most attention). Managers were also asked to indicate which IAP would receive more attention if there were more effective management tools. Each response was given a numeric rating, 0 being the species receives no attention and 3 being the species receives the most attention. The numeric counterpart of all seven jurisdictional responses were summed into a single rating (Figure 3). Eurasian watermilfoil was ranked the highest for receiving the most management attention, followed by curly leaf pondweed and hydrilla. Starry stonewort, purple loosestrife, yellow iris and didymo were species that managers indicated would receive more management if they had access to more effective management tools.

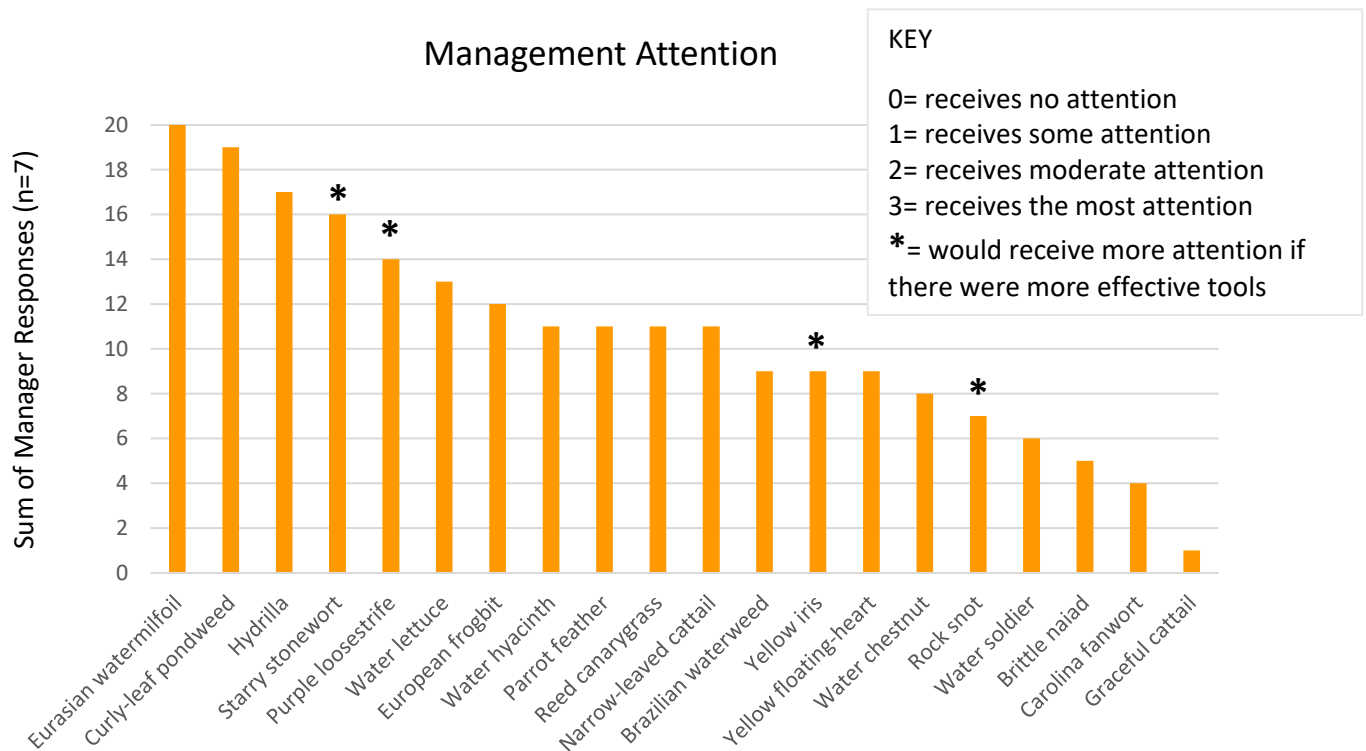


Figure 3. Cumulative results from the question “How much management attention does this species receive?”. Asterisks denote one vote, no species was chosen more than once.

Survey results by species

These species-specific sections summarize responses to the question, “What are the biggest challenges to effective management of this species?”. Managers were asked to select between the options listed below and more than one management challenge per species was allowed. An additional “Notes” section allowed management agencies to provide more context to their response.

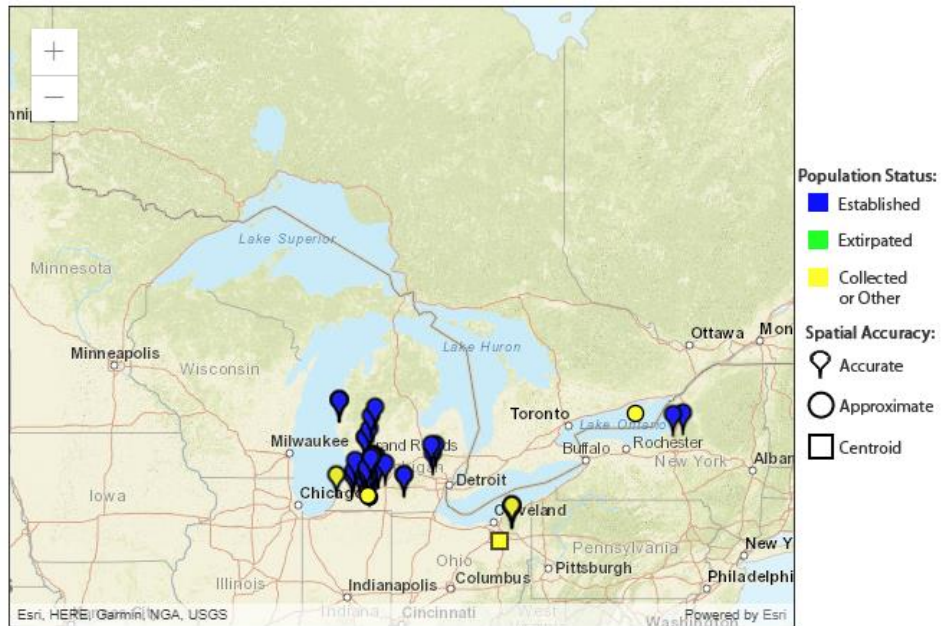
- *Insufficient time*
- *Insufficient staff*
- *Insufficient funding*
- *Non-target impacts on wildlife or other plants*
- *Insufficient knowledge of this species*
- *Not a priority for my agency*
- *Public concern over herbicide use*
- *Uncertainty as to effectiveness of management tools (including herbicide resistance)*
- *Uncertainty as to recommended use of management tools (e.g., recommended concentration and exposure times for herbicides)*
- *Limitation/challenges due to administrative codes, policies, or authorities related to aquatic plant management*
- *Other (specify in Notes)*

The summaries below highlight the management concerns of each priority species, as stated by management agency responses to the survey. Summaries reflect agency concern at the time of response and may not accurately reflect the full management information available. Statements made in the summaries should be taken as management agency beliefs, rather than an absolute statement of fact, as these beliefs may not be fully applicable to every Great Lakes jurisdiction. For simplicity, we have presented all management concerns collectively, rather than attributing to the jurisdiction(s) that reported each one. Additionally, all maps presented below reflect distribution as of October 2022.

	Insufficient time	Insufficient staff	Insufficient knowledge on species	Insufficient funds	Not a priority	Non-target impacts	Uncertainty as to effectiveness of management tools	Uncertainty as to recommended use of management tools	Public concern over herbicide use	Lack of management tools	limitation/challenges due to administrative codes, policies, or authorities related to aquatic plant management
Carolina fanwort	1	1		1	2	1				1	
Didymo			3		1					2	
Brazilian waterweed		1			2	1			1		
Water hyacinth			1		2		1				1
Hydrilla	1	2		2		2	1	1	3	2	
European frogbit	2	2	2	2		2	3	3	1	2	
Yellow iris	2	1	1		2	1			1		
Purple loosestrife	2	2		2	1		1	1	1		
Parrot feather	1	1	1		2			1			1
Eurasian watermilfoil	2	2		3	1	5	2	2	5	2	
Brittle Naiad	2	1	1	1	3		2	2		1	
Starry stonewort	1	1	2			3	3	5	1	3	
Yellow floating-heart	1	1	2		1			1			
Reed canarygrass	4	4		4	1	1					
Water lettuce			3		1		1				1
Curly leaf pondweed	2	1		3		4	1	1	3	2	
Water soldier			2		2						
Water chestnut	1	1	1	1	1		2				
Narrow-leaved cattail	3	3		4		2				1	
Graceful cattail			5		1						
Total	25	24	24	23	23	22	17	17	16	16	3

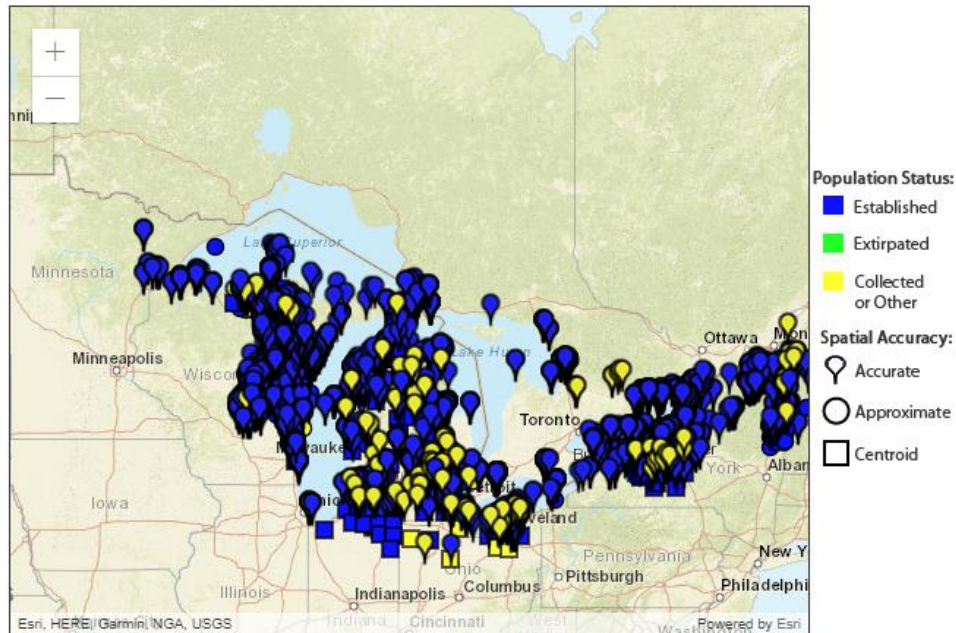
Table 1. The species-specific responses to the question, "What are the biggest challenges to effective management of this species?". Each number represents the total number of jurisdictions who selected that specific management challenge.

Carolina Fanwort (*Cabomba caroliniana*)



The native range of Carolina fanwort is uncertain, making it difficult to manage if it falls within one of the geographic areas of ambiguity. The species is not regulated in many Great Lakes jurisdictions, making it difficult to take certain management actions that are reserved for regulated species (coordinated action with neighboring jurisdictions, restricting sales in the pet trade or online, etc.)

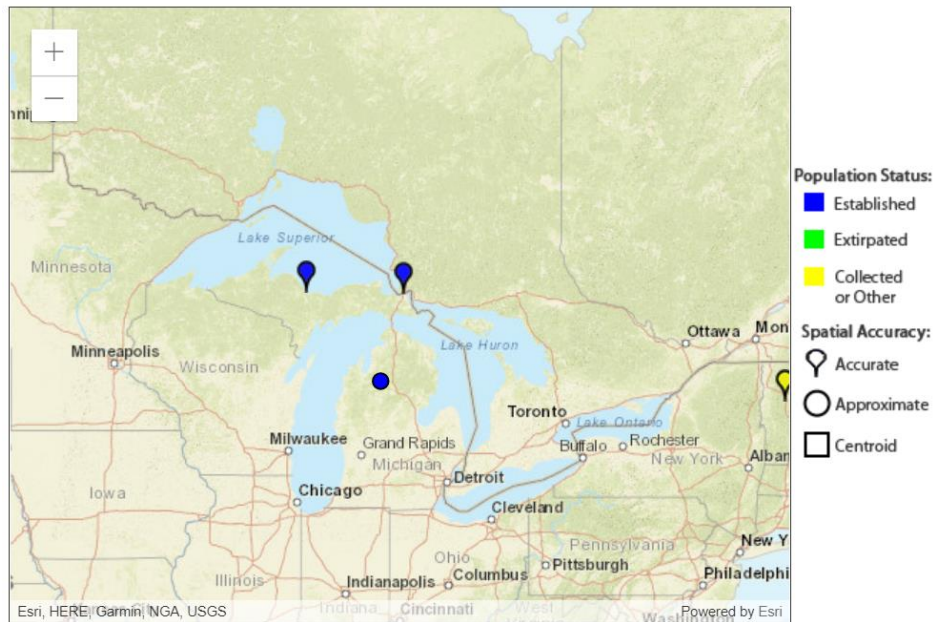
Eurasian Watermilfoil (*Myriophyllum spicatum*)



The general agreement from surveyed managers is that “non-target impacts on wildlife or other plants” and “public concern over herbicide use” are Eurasian watermilfoil’s top management challenges (see Table 1 for more details).

Due to the extensive spread of Eurasian watermilfoil, the cost of treatment tends to be expensive and often exceeds available management funding. Costs are also exacerbated as Eurasian watermilfoil requires multiple herbicide treatments and consistent management to reach eradication. The frequency of herbicide application required generates concerns from managers and the public over non-target impacts. IAP managers need additional management tools that limit non-target impacts on native vegetation. Lastly, the hybridization of invasive Eurasian watermilfoil with native milfoil species raises management concerns in terms of identification and herbicide resistance.

Didymo (*Didymosphenia geminata*)



The general agreement from surveyed managers is that “insufficient knowledge on the species” is didymo’s top management challenge (see Table 1 for more details).

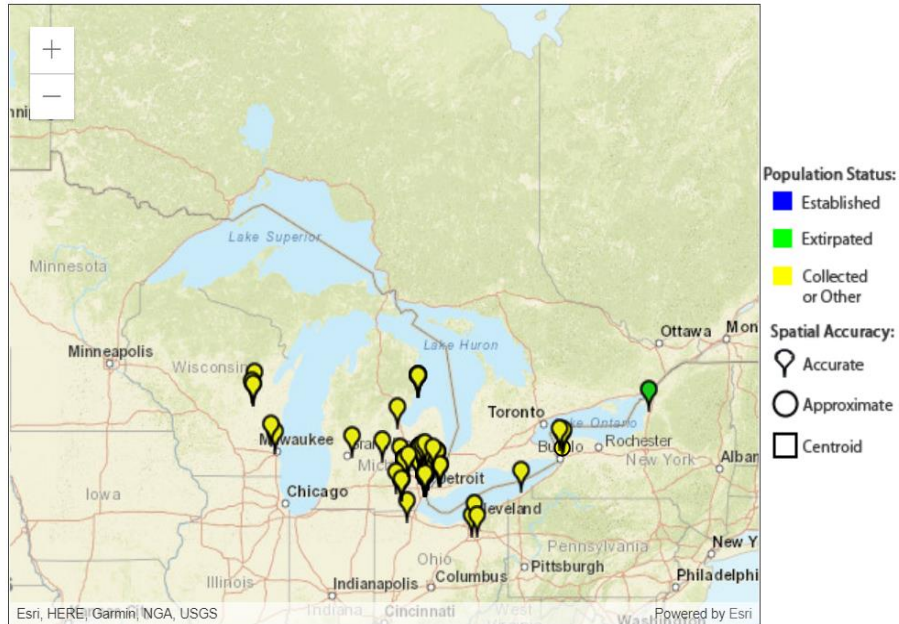
Invasion rates for didymo are currently low, with many jurisdictions citing no occurrences, resulting in insufficient knowledge of environmental impacts and effective management efforts. The native range of the species is ambiguous, as is what environmental conditions trigger nuisance blooms.

Brazilian Waterweed (*Egeria densa*)



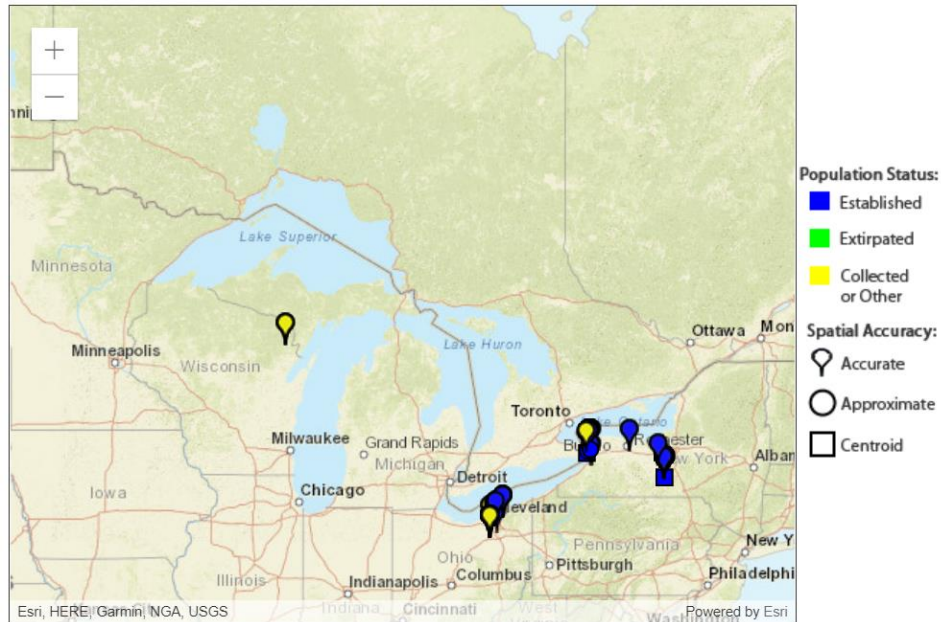
Brazilian waterweed is not observed in most Great Lakes jurisdiction or only found in small amounts, resulting in limited management knowledge. The species is regulated in many Great Lakes jurisdictions but remains popular in the aquarium industry and with teacher/classroom projects.

Water Hyacinth (*Eichhornia crassipes*)



Water hyacinth is not widely present throughout the Great Lakes, resulting in a knowledge gap of what management tools and strategies are most effective. The species is not regulated in some jurisdictions and continues to be sold in trade. The species maintains interest with gardeners and is often intentionally added to water bodies for ornamental purposes.

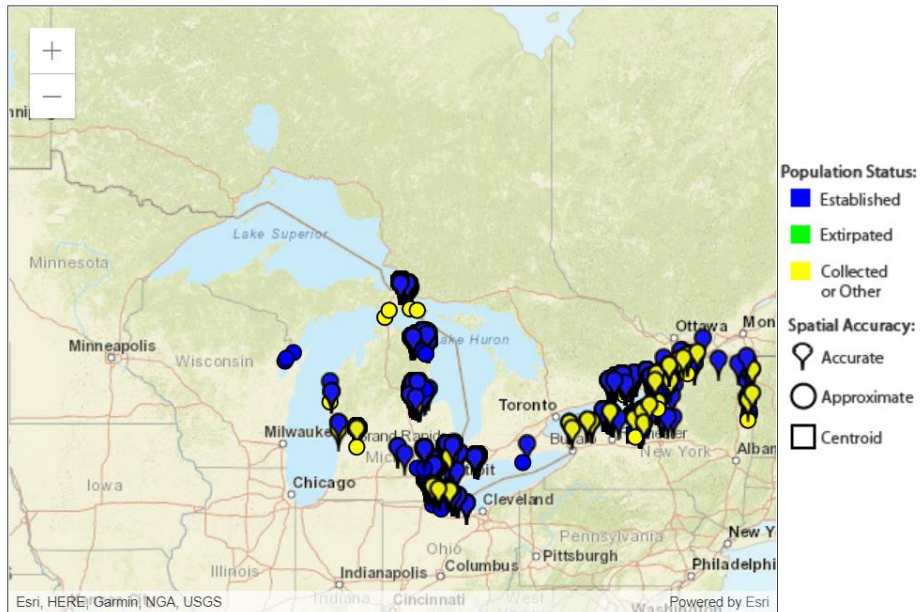
Hydrilla (*Hydrilla verticillata*)



The general agreement from surveyed managers is that “public concern over herbicide use” is Hydrilla’s top management challenge (see Table 1 for more details).

Not yet expansive throughout the Great Lakes basin, most managers lack experience managing hydrilla. When found, full eradication of the species is vital to prevent spread. Treatment for hydrilla often requires temporary heavy impacts to water quality and other non-target species through broad spectrum herbicide use.

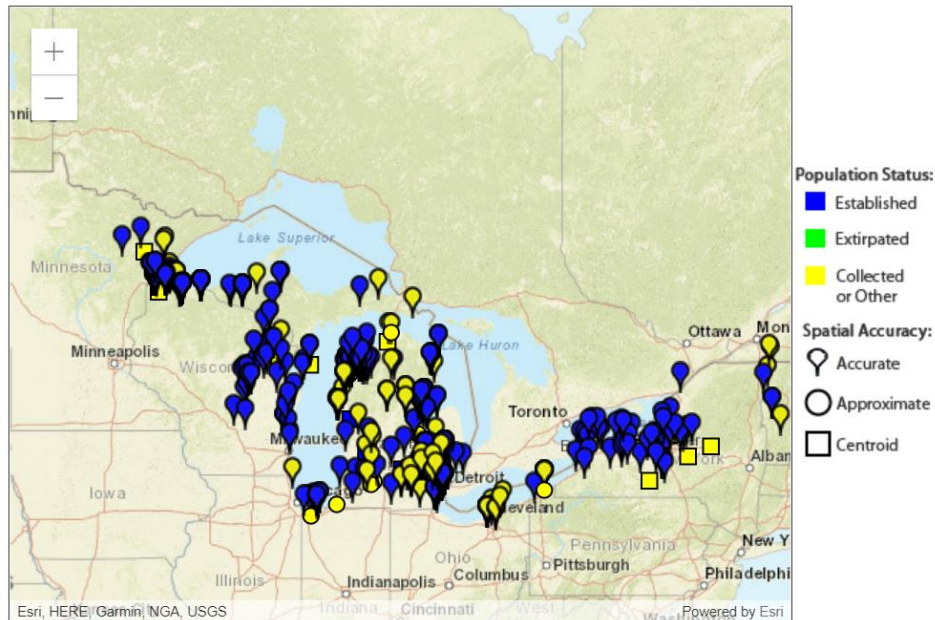
European Frog-bit (*Hydrocharis morsus-ranae*)



The general agreement from surveyed managers is that “uncertainty as to recommended use of management tools” and “uncertainty as to effectiveness of management tools” are European frog-bit’s top management challenges (see Table 1 for more details).

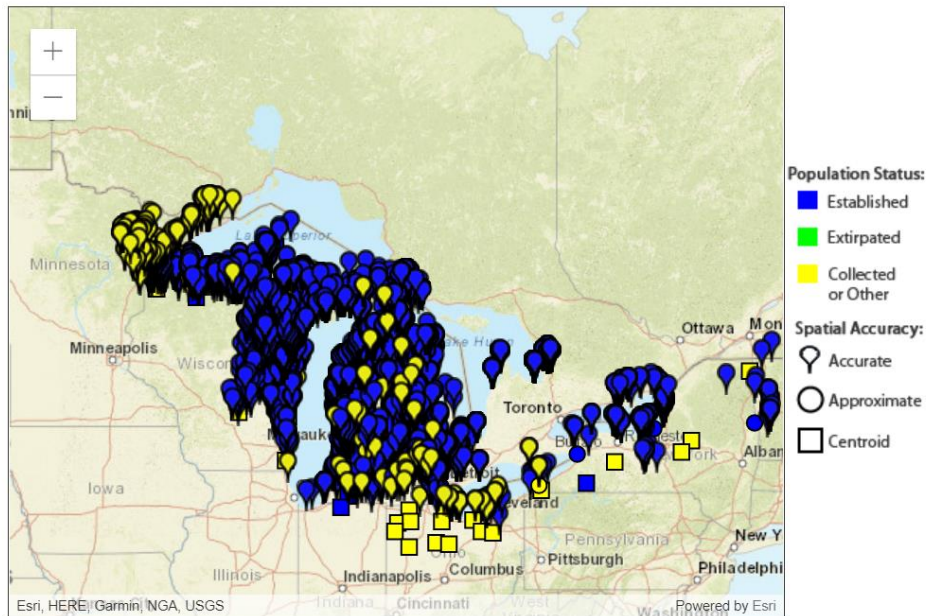
A relatively new invasive species to the basin, jurisdictions cite having little management experience with European frog-bit and are unsure of effective management tools. As a floating emergent species, management strategies that are typically applied to submerged IAP may not be as effective and the labor cost of hand pulling results in a high treatment cost. Effective control and containment tools are needed.

Yellow Iris (*Iris pseudacorus*)



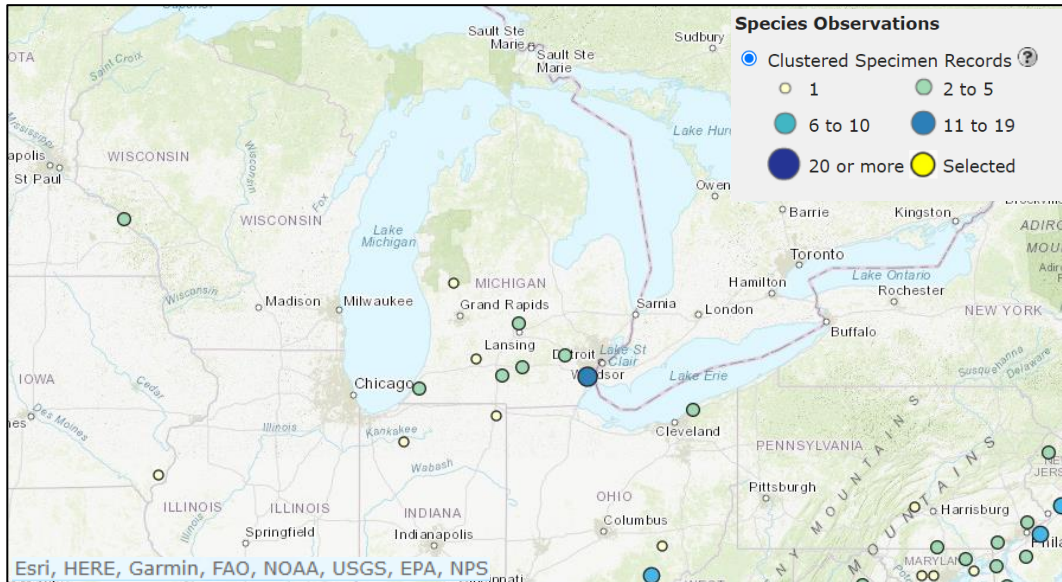
Yellow iris is not regulated consistently throughout all Great Lakes jurisdictions and continues to be a popular plant within the nursery industry. Identification of the species, especially when not flowering, can be challenging and public awareness of the invasive is low. There is currently little funding designated for controlling and containing yellow iris or understanding effective management tools. The species is not easily managed in areas that restrict herbicide application.

Purple Loosestrife (*Lythrum salicaria*)



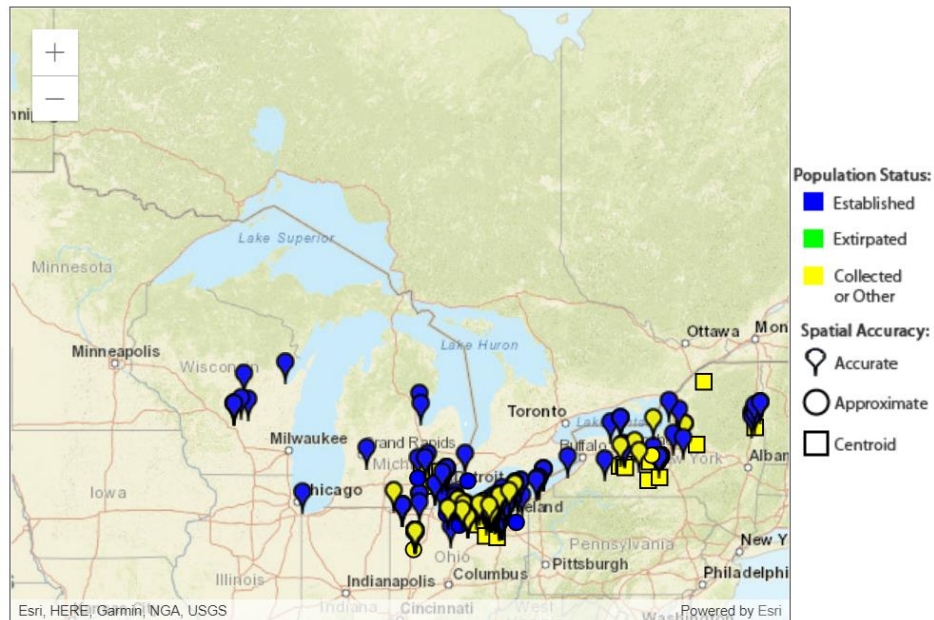
Purple loosestrife is widespread throughout the Great Lakes and produces an immense seed bank that requires consistent management. Availability of a biocontrol agent (beetles *Galerucella calmariensis* and *G. pusilla*) has prompted some agencies to shift management goals and strategies away from herbicides, although public concern of biocontrol remains. For jurisdictions that rely on a statewide biocontrol rearing and release program, collecting and distributing enough beetles for visible management results can be difficult. Additionally, there is currently no large stakeholder group that advocates for purple loosestrife management within the Great Lakes basin.

Parrot Feather (*Myriophyllum aquaticum*)



Although regulated in most Great Lakes jurisdictions, parrot feather remains a popular aquarium plant sold in trade. Removal from trade, public outreach and increased policy enforcement is critical in preventing spread. The species is not prevalent in many jurisdictions therefore, monitoring and outreach is often a low priority for many agencies.

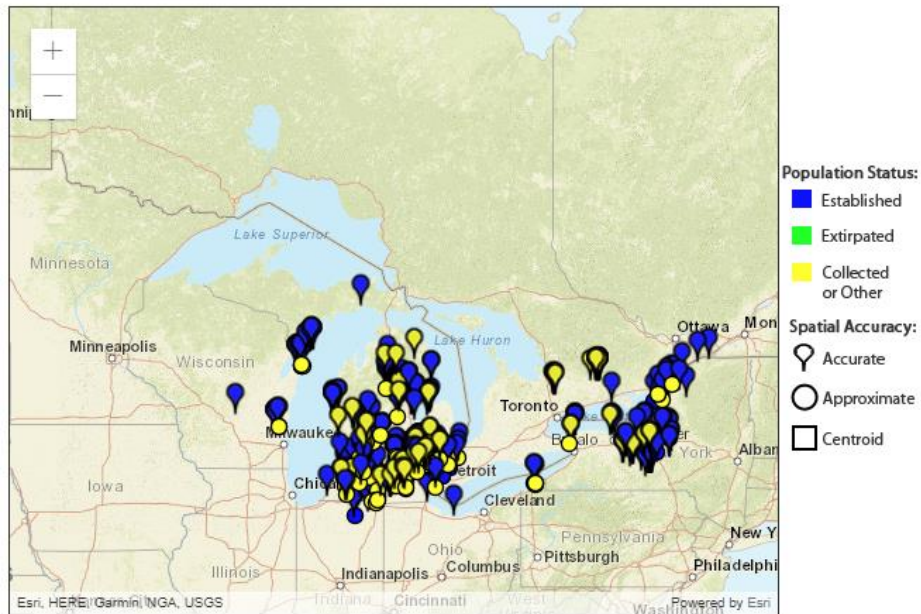
Brittle Naiad (*Najas minor*)



The general agreement from surveyed managers is that brittle naiad is “not a priority” at their agency (see Table 1 for more details).

Despite being relatively widespread, brittle naiad is not actively managed or the target species of management actions in many Great Lakes jurisdictions. The plant’s impact as an invasive species is not well documented throughout the Great Lakes basin and limited viable management options currently exist.

Starry Stonewort (*Nitellopsis obtusa*)



The general agreement from surveyed managers is that “uncertainty as to recommended use of management tools” is starry stonewort’s top management challenge (see Table 1 for more details).

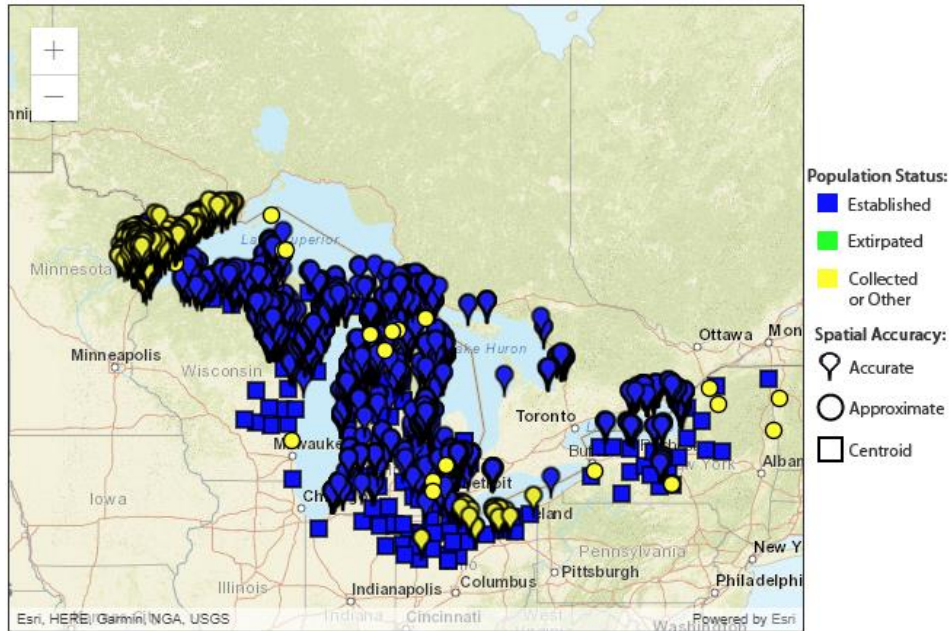
Great Lakes managers lack effective control methods for starry stonewort. When the species is managed, there is a paucity of knowledge concerning which control methods are most efficient and management is often not successful. Further research is needed to find a management approach that is effective at controlling starry stonewort in the Great Lakes Basin. Additionally, more information on regional long-term population trends and the ecological impacts of starry stonewort is crucial.

Yellow Floating Heart (*Nymphoides peltata*)



Yellow floating heart is not widespread throughout the Great Lakes basin, with many established populations remaining small or established on private land. Managing an established population is often expensive and labor intensive, with multi-year treatments needed for eradication. More information on yellow floating heart's life history traits (seed viability, reproduction methods, etc.) are necessary.

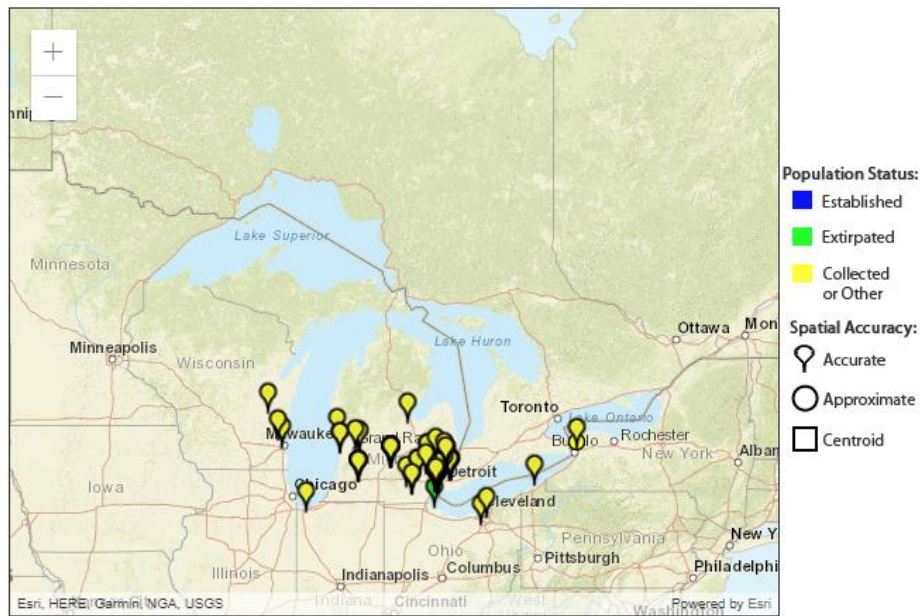
Reed Canarygrass (*Phalaris arundinacea*)



The general agreement from surveyed managers is that “insufficient time”, “insufficient funds”, and “insufficient staff” are reed canarygrass’ top management challenges (see Table 1 for more details).

Reed canarygrass has invaded a substantial portion of the Great Lakes basin and is not widely controlled. Due to the plant’s wide distribution and limited funding, reed canarygrass is often not prioritized among agencies. Due to the specific timing requirements needed for effective herbicide application and the need for multi-year applications and monitoring, agencies often lack the time, staff, and funds to properly treat the species. Invasive reed canarygrass can be hard to distinguish from other common grass species and landowners are often not aware that the species is invasive and should be managed.

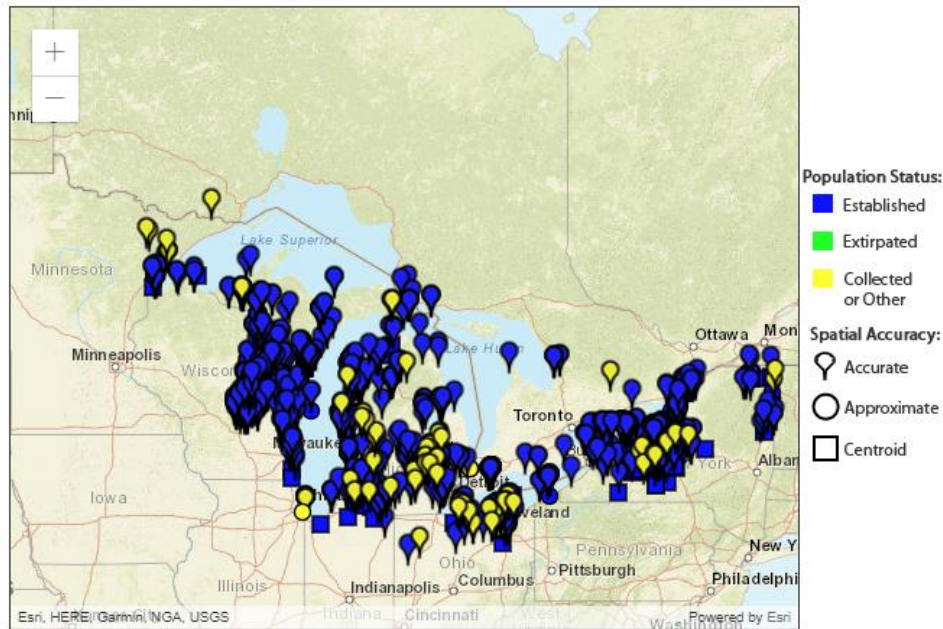
Water Lettuce (*Pistia stratiotes*)



The general agreement from surveyed managers is that “insufficient knowledge of this species” is water lettuce’s top management challenge (see Table 1 for more details).

Due to the lack of persistent populations in the region, knowledge of what tools and strategies are key for controlling water lettuce remain unclear to agencies. The species is not regulated in many Great Lakes jurisdictions, making it difficult to take certain management actions that are reserved for regulated species (coordinated action with neighboring jurisdictions, restricting sales in the pet trade or online, etc.). Due to the popularity of water lettuce in ponds and aquariums, the plant is often intentionally added to waterways for aesthetic reasons but has not been noted by Great Lakes agencies to survive overwinter. The rise of warmer winter temperatures due to climate change increases concern among Great Lakes agencies to better understand the plant’s cold tolerance.

Curly Leaf Pondweed (*Potamogeton crispus*)



The general agreement from surveyed managers is that “public concern over herbicide use” and “non-target impacts on wildlife and other plants” are curly leaf pondweed’s top management challenges (see Table 1 for more details).

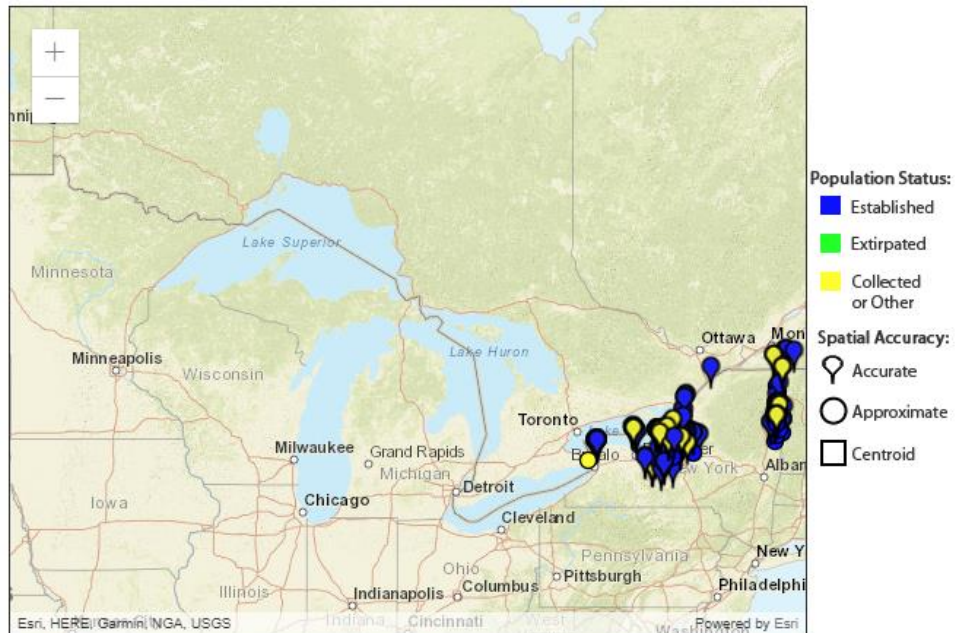
Curly leaf pondweed is found throughout the Great Lakes basin. Treatment of the plant through herbicide often takes multiple years, due to the plant’s robust turion seed bank and rapid growth. With the current management tools, full eradication and/or long-term control of the invasive is unlikely. As controlling curly leaf pondweed requires constant herbicide application, managers and the public hold concern over the impacts that cumulative treatments may have on non-target native plants and water quality. Additionally, due to the cost of multiple herbicide treatments and the extensive invasion range of the species, managers often lack funds to properly manage existing populations.

Water Soldier (*Stratiotes aloides*)



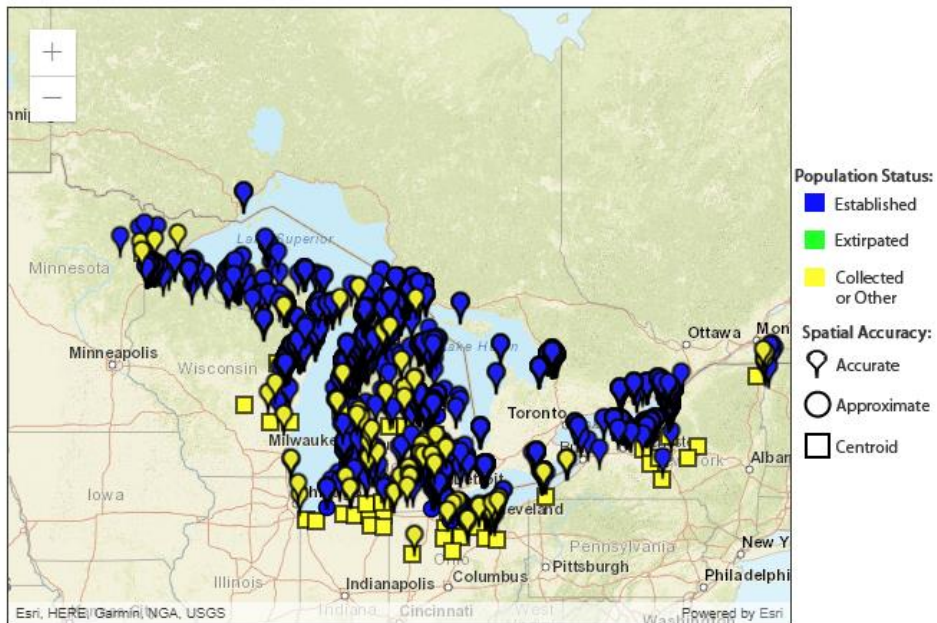
Water soldier, to date, has only been observed in Ontario, Canada. While not present in most Great Lakes jurisdictions, managers cite a need for more information on the species, should it expand its invasion range. Preventing water soldier from becoming established will be far more cost effective for agencies than rapid response and eradication actions, should the species be introduced into additional water bodies.

Water Chestnut (*Trapa natans*)



Due to the current range of water chestnut, many Great Lakes jurisdictions have little to no experience with the species, resulting in a low priority for many Great Lakes managers (see Fig. 3). Given that agencies in the western region of the Great Lakes basin likely have no direct experience managing water chestnut, clear management tools and control strategies need to be made available should the species spread. Management strategies should aid staff in treating floating aquatic plants, which may differ from treating the more common submerged aquatic invasives.

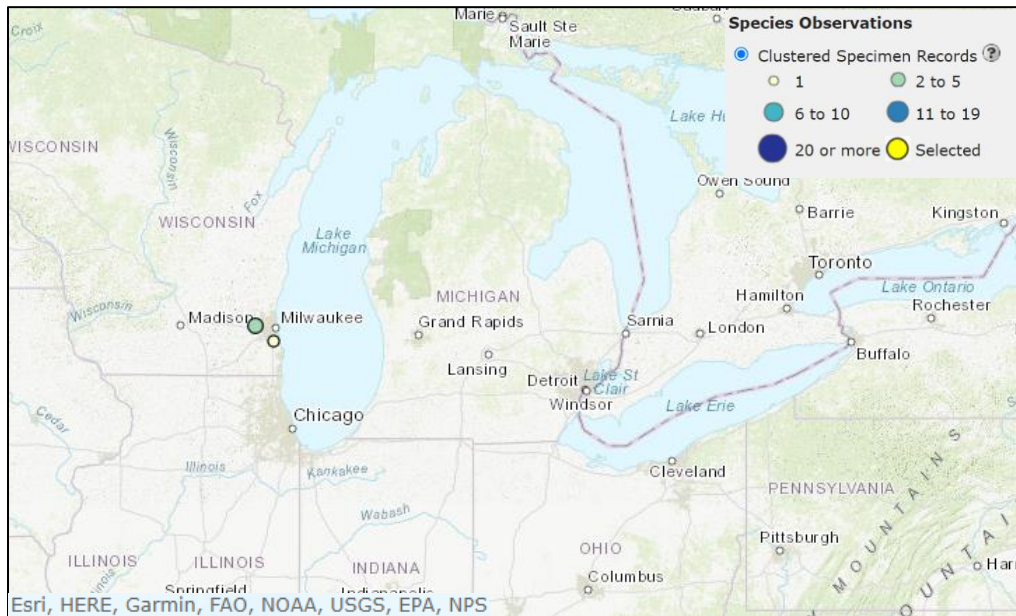
Narrow-leaved Cattail (*Typha angustifolia*)



The general agreement from surveyed managers is that “insufficient time”, “insufficient funds”, and “insufficient staff” are narrow-leaved cattail’s top management challenges (see Table 1 for more details).

For most Great Lakes agencies, narrow-leaved cattail is a low priority when allocating management attention. Insufficient funding to tackle such a widespread species and lack of attention and/or concern from citizens often keeps the invasive from garnering proper management attention. Additionally, the expansive invasion range and the difficulty identifying native from invasive and hybrid species is often too consuming for agency staff to keep on top of. Further research on narrow-leaved cattail management is necessary to mitigating non-target impacts on surrounding native emergent species.

Graceful Cattail (*Typha laxmannii*)



The general agreement from surveyed managers is that “insufficient knowledge of this species” is graceful cattail’s top management challenge (see Table 1 for more details).

Graceful cattail’s invasion into the Great Lake basin is relatively recent and to date has only been documented in Wisconsin. More research on plant’s ecological impacts and effective management and control strategies are necessary to prevent further invasion and provide management options to managers should graceful cattail arrive in additional Great Lakes jurisdictions.

Discussion and Next Steps

While not all Great Lakes tribes, states, and provinces responded to the managers' survey, for those who responded, management concerns varied by species, but common themes emerged. One exception was the Fond du Lac Band of Lake Superior Chippewa, where herbicide use is not permitted in aquatic environments on tribal land. Herbicide restrictions are also in place in other tribal nations, Ontario, and Québec, highlighting the value and importance of pursuing management and control strategies that are not entirely reliant on herbicide use. Future investments would benefit from engaging more Great Lakes jurisdictions, specifically increasing tribal responses, to create a more well-rounded insight into IAP management challenges across the basin.

From the listed choices of management concerns (see Appendix A), "insufficient time" was selected the most (25 times total) (Table 1). This response was heavily driven by species that have a widespread invasion range and are not seen as a top priority among agencies (i.e., reed canarygrass and narrow-leaved cattail). The second most common responses were "insufficient staff" and "insufficient knowledge on species" with a total of 24 selections each. Species that ranked high on "insufficient staff" were the same species that also ranked high for "insufficient time". Conversely, the high "insufficient knowledge on species" ranking response was largely driven by species that have a small invasion range or are a relatively new invader to the basin (i.e., graceful cattail, didymo, water lettuce).

The species that were ranked as receiving the highest management attention (Eurasian watermilfoil, curly leaf pondweed, and hydrilla) (Figure 3) all held very similar management concerns. The top IAPs all require heavy herbicide use as the primary management tool, prompting managers to conclude that non-target impacts to other species and water quality and public concern over herbicide use are the largest challenges. This solidifies the need that managers require more management options to help balance the fine line of controlling IAP with that of negative non-target impacts. Additionally, the species that were chosen by managers as the highest concern among their agency (Eurasian watermilfoil, *Phragmites*, curly leaf pondweed and starry stonewort) (Figure 1), overlap with these management concerns, with the exception of starry stonewort and *Phragmites* (which was not a listed option for Figure 3).

This survey, with the addition of the literature reviews, was critical in planning a stakeholder workshop on IAP control, research, and management needs. Combining the management gaps found in available literature with the manager responses from the survey, the project staff chose 12 priority plant species as the workshop's key focus. The species include: hydrilla, European frog-bit, water soldier, didymo, water hyacinth, water lettuce, yellow floating heart, yellow flag iris, Eurasian watermilfoil, starry stonewort, curly leaf pondweed, and purple loosestrife. The workshop will address some of the management concerns and gaps that have been identified through this managers' survey, including key information gaps in instances

where there is “insufficient knowledge” about a species, “other than herbicide” control options, balancing invasive species control with non-target impacts, etc. Ultimately, the workshop and the associated products will lead to the development of an applied research agenda that will inform future IAP research investment and activities.

List of Appendices

Appendix A: The Excel portion of the distributed managers' survey

Species scientific name	Species common name	How much management attention does this species receive? ¹	What are the biggest challenges to effective management of this species? ²	Please explain
<i>Cabomba caroliniana</i>	Carolina fanwort			
<i>Didymosphenia geminata</i>	Didymo			
<i>Egeria densa</i>	Brazilian waterweed			
<i>Eichhornia crassipes</i>	Water hyacinth			
<i>Hydrilla verticillata</i> (include mono/di types)	Hydrilla			
<i>Hydrocharis morsus-ranae</i>	European frog-bit			
<i>Iris pseudacorus</i>	Yellow iris			
<i>Lythrum salicaria</i>	Purple loosestrife			
<i>Myriophyllum aquaticum</i>	Parrot feather			
<i>Myriophyllum spicatum</i> (include hybrids)	Eurasian watermilfoil			
<i>Najas minor</i>	Brittle naiad			
<i>Nitellopsis obtusa</i>	Starry stonewort			
<i>Nymphoides peltata</i>	Yellow floating-heart			
<i>Phalaris arundinacea</i>	Reed canarygrass			
<i>Pistia stratiotes</i>	Water lettuce			
<i>Potamogeton crispus</i>	Curly-leaf pondweed			
<i>Stratiotes aloides</i>	Water soldier			
<i>Trapa natans</i>	Water chestnut			
<i>Typha angustifolia</i> (include hybrids)	Narrow-leaved cattail			
<i>Typha laxmanii</i>	Graceful cattail			

¹ Selection options (more than one can be chosen): receives no attention, receives some attention, receives moderate attention, receives major attention, receives the most attention, would receive more attention if we had effective tools

Appendix B: The fillable PDF portion of the distributed managers' survey

Invasive Aquatic Plant Managers' Survey

The need for multijurisdictional coordination and collaboration is essential to effectively implement invasive species prevention and control strategies across jurisdictional boundaries. Specifically, jurisdictions in the Great Lakes region identified the need for a collaborative project to improve coordination of invasive aquatic plant control method research and prioritize needs. The Great Lakes Panel on Aquatic Nuisance Species (GLP) has repeatedly expressed its interest in and support for advancing invasive aquatic plant (IAP) management and control as a priority issue and specifically the identification of research needs and/or recommendations. Through interjurisdictional grant funding from U.S. Fish and Wildlife Service, the GLP is supporting a project to:

1. Provide operational support to regional AIS coordination activities through the GLP and engagement with other regional entities
2. Establish a comprehensive, baseline understanding of IAP research and management activities and associated gaps in knowledge
3. Conduct a workshop focused on priority IAP to refine and prioritize targeted research and management needs
4. Develop an applied research agenda to inform future investments in IAP control

This managers' survey will directly contribute to Objective 2, above. Results from this survey will inform Objectives 3 and 4. **For the purposes of this survey, aquatic plant management refers to the control, containment, and/or removal of established aquatic plant species**, as opposed to management activities related to surveillance, prevention, etc.

This survey includes three parts. Section 1 (Current Species Under Management) asks each respondent to record any aquatic plant species that are currently receiving management/control attention in their jurisdiction. Section 2 (Identified Priority Aquatic Plant Species) ask each respondent to share challenges to effective management of priority aquatic plant species identified by the project team. Section 3 (Expert Knowledge Elicitation) gathers information about existing referential resources on aquatic plant control as well as the respondent's level of active participation in aquatic plant management activities.

Please fully complete each section before moving on to the next to minimize potential survey bias.

Section 1. Current Species Under Management

For the following questions, we would like to know a) what IAP species have been of most concern (in terms of your time/effort spent over the last 2-3 year) and b) What IAP species would be more of a management priority if effective control tools were available.

1. What species are of the highest management concern for your agency?

Please list your HIGHEST species of concern first and add other species in descending order of concern.

1.

2. For which species, if any, would you increase management efforts if you had unlimited time and resources?

-

3. If not captured above, please identify and list in order of priority any species that would be a management priority if effective management tools were available. Where possible, please identify the specific management need

1.

Section 2. Identified Priority Invasive Aquatic Plant Species

There are many potential challenges when managing invasive aquatic plant species. These may include: insufficient time, insufficient staff, insufficient funding, non-target effects on wildlife or native plants, public concern over herbicide use, lack of management tools, uncertainty as to effectiveness of management tools (including herbicide resistance), uncertainty as to recommended use of management tools (e.g., recommended concentration and exposure times for herbicides), and limitation/challenges due to administrative codes, policies, or authorities related to aquatic plant management.

We have identified 20 plant species that may represent important management priorities in all or parts of the Great Lakes basin, based on criteria such as impact or distribution.

Please use the dropdown list options in the companion spreadsheet to indicate 1) the status of these species in your own management activities and 2) the biggest challenges to effective management of these species

Section 3. Expert Knowledge Elicitation

1. Has your jurisdiction developed or maintained aquatic invasive plant management plans? If so, for which species?

A management plan is a document that defines management objectives, outcomes, and includes some evaluation of effort. If the plan is publicly available, please provide a link

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2. What challenges to invasive aquatic plant management do you face that are unique to your jurisdiction (i.e., the geographic scope of your authority)?

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3. Given the limited available resources and capacity, how do you and your jurisdiction prioritize aquatic plant management decisions and activities?

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4. What, if any, information or knowledge is lacking about invasive aquatic plants that would improve your management ability? This may be specific to a species or generalized to any aquatic plant.

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5. What ongoing aquatic plant management research project(s) are you supporting, have commissioned, or are agency grant supported? Why are these projects important to you/your agency? For each please explain why the project was funded.

-

6. Is there anything else you'd like to share regarding challenges to aquatic plant management?

-

Section 4. Respondent Demographics

7. How many years have you been involved in aquatic plant management in total? This may apply to one individual respondent or a collective group providing input on the contents of this survey. *Where you are providing a collective response, please provide the number of responders and their range of experience*

8. What sources do you use to find up-to-date information on species-specific aquatic plant management (e.g., databases, online/live training courses, websites, conferences)? Please list.

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9. Over the course of a year, approximately how much of your time is spent on general plant management or administrative activities (e.g., development of aquatic plant management plans) versus the management of specific species (e.g., response to new population of hydrilla)?

If you are providing a collective response, please select the option that best reflects the group as a whole

- a. 10% on general/90% on specific species
- b. 30% on general/70% on specific species
- c. 50% on general/50% on specific species
- d. 70% on general/30% on specific species
- e. 90% on general/10% on specific species