Great Lakes Panel on Aquatic Nuisance Species Meeting Summary
Virtual Meeting | June 1-3 – Virtual Meeting

Additional meeting information including a final agenda and presentations are available on the Great Lakes Panel website (https://www.glc.org/work/glpans/meetings)

Welcome and introductory remarks

Eric Fischer, Great Lakes Panel (GLP) Vice Chair, Indiana Department of Natural Resources

- Fischer called the meeting to order
- GLP members and observers introduced themselves and a quorum was confirmed
- Fischer reviewed the agenda and there were no changes made

GLP Business Items

Eric Fischer, GLP Vice Chair, Ceci Weibert, GLP Coordinator, Sarah LeSage, MI EGLE

Approval of October 2021 meeting summary

- One request for clarification for Octobers' GLP meeting summary was made regarding the role of the President's budget on the EPA budget and the GLLCISP recommendations to the ANS Task Force
    - Clarifications to these topics will be added to the summary
- Meeting summary was adopted with edits mentioned

Review of October 2021 action items

- Weibert reviewed the actions items that came out of the Fall 2021 GLP meeting and where their progress currently stands.
- Completed action items from the GLP Executive Committee (ExCom), the GLP staff, and GLP members were reviewed
- The actions that are in progress or ongoing include:
    - The ExCom will engage with the Great Waters Research Collaborative
    - The ExCom will consider solutions to address the apparent lack of social sciences expertise on the GLP membership
    - Staff will schedule a webinar to review new function features and data in the USGS-NAS database

GLP Nominating Committee report

- LeSage reviewed how the GLP nominating committee works and the steps involved
- In November, edits were made to the GLP Guidance Document updating the membership status of some at-large members to full-time members, thus opening at-large membership slots to new organizations
- An election ballot was distributed electronically and included the ExCom slate (vice chair and committee chair positions) and four at-large members

- The vote was held electronically, quorum was met via responses, and the slate and at-large members were approved via a majority vote
- The GLP officers are now officially installed (Vice chair Kelly Pennington, Information and Education Committee chair Doug Jensen, Research Coordination Committee Chair Lindsay Chadderton, Policy Coordination Committee Chair Patrick Kocovsky)

Committee reports

OIT Ad Hoc Committee

Greg Hitzroth, Illinois-Indiana Sea Grant

- The OIT ad hoc committee presented draft results from the BIOTIC symposium survey at the recent ANS Task Force meeting
- Committee members will assist in finalizing the syntheses notes from the symposium.
- The committee has engaged in conversation around the "Do Not Release" signage with Sara Stahlman at PA Sea Grant and that has involved some good interjurisdictional conversation
- Committee members contributed ideas for the interjurisdictional AIS projects
- Next steps for the committee will be to determine future activities and industry engagement

Information/Education Committee (I/EC)

Tim Campbell, I/EC Vice-Chair, Wisconsin Sea Grant

- The I/EC has continued to focus work on GLP priorities though the support of the OIT ad hoc
- The committee will continue to work on the GLP website redevelopment
    - GLP staff have already created a mock website and lead discussion with the I/EC, surveyed GLP members on their wants for the new website, and are working on creating the new page soon
- Committee members contributed interjurisdictional AIS project ideas for funding

Research Coordination Committee (RCC)

Lindsay Chadderton, The Nature Conservancy

- The main focus for the RCC has been on the interjurisdictional Regional Invasive Aquatic Plant Prioritization and Needs Assessment project
- The committee has submitted two interjurisdictional project ideas that have been accepted for funding
    - One of these projects is a genetic biocontrol perceptions study
        - The key focus of this study will be to conduct a landscape analysis working with regional governances and facilitating meaningful dialogue to understand where we are with the perception of biocontrol methods
    - The second project will be the continuation of work we are already doing to evaluate control of priority of established species in the Great Lakes basin but focus on invasive animals and the status of associated control tools
        - This will involve understanding what invasive animals are here in the Great Lakes region, how are they being managed, what tools are needed, and suppression methods are likely to best most efficient.

Interjurisdictional Project: Regional Invasive Aquatic Plant Control Prioritization and Needs Assessment update

Alisha Davidson, GLC Contractor, and Theresa Gruninger, GLC

- Gruninger reviewed the progress of the managers' surveys since the last GLP meeting. Surveys have been distributed and responses were received from seven Great Lakes jurisdictions
- A comprehensive summary report from the managers' survey will be made available soon; Theresa shared some main takeaways from the surveys:
    - Eurasian watermilfoil topped the surveys as the species managers were most concerned about and spend the highest effort on
    - Managers highlighted starry stonewort, purple loosestrife, yellow iris, and didymo as species that would receive more attention if more effective tools were available
    - Results from the manager surveys will help drive discussion at a workshop this fall
- Davidson highlighted progress on the literature reviews and initial conclusions for each species. Some highlighted conclusions are:
    - Many species, particularly starry stonewort, need more management tools and research
    - More work is needed to determine the efficiency of ProcellaCOR on some species
    - More data and better understanding of seed set and over-wintering is needed
- Members are asked to send any control case studies for yellow flag iris, didymo, or *Typha angustifolia* to Alisha

Programmatic Updates

GLANSIS

Rochelle Sturtevant, GLANSIS Program Manager, Michigan Sea Grant Extension

- There have not been any changes to the GLANSIS species list since the Fall 2021 GLP meeting but the review process has changed, as two reviewers are now needed. GLANSIS needs expert reviewers, so please reach out to Rochelle if you would like to help
- A U.S. Geological Survey hydrological unit code (HUC) boundary layer has been added to the GLANSIS Map Explorer
- There is now capacity to upload Canadian data into the database for it to be viewed on species profiles
    - Please send Rochelle all distribution data of established species (current and historic) from the Canadian Great Lakes watershed
- Regulations have been added to the risk assessment clearinghouse
    - Jurisdictions are asked to review and make sure their state regulations are represented accurately on the website.
- In February, GLANSIS created an animated video series focused on managing Great Lakes invaders. These videos can be utilized and distributed by anyone https://www.youtube.com/playlist?list=PLrRNRwudM7U90Y614QPP0xFpxGISedvQT
- A new widget was added to the GLANSIS website that highlights "Program Updates and News"
- A gap analysis of the holdings in the GLANSIS database (literature, species records) is now available. This analysis will help reflect distribution of sampling efforts and highlight what

taxonomic groups are underrepresented https://www.glerl.noaa.gov/pubs/tech_reports/glerl-176/tm-176.pdf

- The GLANSIS Data Dictionary is now public and can be found under "FAQ"
- Story Maps to help those using the GLANSIS MAP are in development. Feedback for the story map (https://storymaps.arcgis.com/stories/dfa9b8dfa1cd427fbc8ebc1d07cc3bc3) is requested and can be sent to El Lower
- Two new methodologies (bighead/silver carp and *Phragmites)* have been added to the habitat suitability maps form. Contact Austin with feedback and suggestions for map additions
- El Lower presented at the 2022 Joint Aquatic Sciences Meeting on invasive language. Contact El if interested in joining future discussions around invasive language in aquatic ecology

ANSTF

Susan Pasko, U.S. Fish and Wildlife Service (FWS)

- Pasko covered the history, structure, and strategic plan of the Aquatic Nuisance Species (ANS) Task Force
- An ANS Task Force meeting was held in May and Susan reviewed highlights of what was discussed. Notably, at this meeting, the ANS Task Force approved the revised "Minnesota Aquatic Nuisance Species Management Plan".
- Pasko reviewed the five action items that came out of the ANS Task Force meeting
- For 2022, the Prevention Subcommittee has been focusing on identifying priority pathways and species of concern and encouraging implementation of measures to manage high priority pathways and species
- The Early Detection and Rapid Response Subcommittee is focusing on ways to facilitate monitoring to detect and report new ANS sightings and aid in the development of capacities to respond rapidly to new invasions
- The Control and Restoration Subcommittee is working to coordinate the development and implementation of ANS management as well as identify gaps in available control and restoration measures
- The Research Subcommittee is working to establish ANS Task Force research priorities and identify prospective partners, facilitating activities that support priority ANS research needs and lastly, to track and disseminate study results to incorporate into ANS management decision
- Lastly, the Education and Outreach subcommittee is working to evaluate ANS communication, education, and outreach efforts to ensure they are consistent and effective and developing processes to share information and consistently implement ANS outreach strategies
- The ANS Task Force is currently working on updating their website
- Those interested in keeping up-to-date with the ANS Task Force can subscribe to their weekly newsletter and let Susan know if you would like to highlight anything in the newsletter

Great Lakes LAW Committee

Brenda Koenig, LAW Committee Chair, Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry

- Koenig presented a brief overview of the LAW Committee governance, mission, and timeline of previous key actions

- Since the LAW Committee has transitioned to virtual meetings during the time of Covid restrictions, many non-LAW Committee members have participated which has helped evolve exchange of information among enforcement staff, policy staff and science staff
- In 2017, a resolution was enacted by the Conference of Great Lakes and St. Lawrence Governors and Premiers. One of the objectives under it was to have all jurisdictions that are members of the Great Lakes Fishery Commission Law Enforcement Committee become part of the MOU on Regional Cooperative Enforcement Operations, an existing cooperative that facilitates interjurisdictional investigation and the timely sharing of information. There are currently 12 parties that are signed on, including jurisdictions that are not members of the Law Enforcement Committee
- The LAW Committee has been expanding AIS training among enforcement staff and promoting AIS enforcement units in each jurisdiction
- The Building Consensus to Identify and Address Priority AIS and Vectors in the Great Lakes initiative began in 2019. Since then, a comprehensive comparison of existing regulations across jurisdictions has been developed that can be utilized by law enforcement
- Current AIS prevention efforts have focused largely on information sharing and cross-jurisdictional support. Other efforts include:
    - Invasive crayfish dealers in several states were identified. A letter campaign was then enacted to inform them of the environmental harm and the regulations that they may be violating
    - A marbled crayfish court case in Ohio brought focus to the environmental harm of invasive crayfish that many states may not have been aware of
    - The LAW Committee will continue to provide an update on the "Interjurisdictional movement of baitfish" case
- Koenig finished the update by highlighting the current challenges in AIS prevention and enforcement and the LAW committee's priorities

GLP Member announcement and updates

- The Upper Midwest Invasive Species Conference is set for October 25-27, 2022, in Green Bay, WI
- This summer, U.S. Fish and Wildlife Service will be starting a metabarcoding effort working with the Whitney Genetic Lab and Lamar Fishery Center in Pennsylvania
- Mike Greer accepted a new position at the USACE as a program manager. He will continue to work with the GLP but will keep members updated as changes occur

Emerging issues and announcements public comment period

- No public comments received
- GLP Business Session was adjourned

Plenary Session: Progress on Crayfish Management

Welcome and introductory remarks

Lindsay Chadderton, RCC Chair

- Chadderton called the meeting to order and provided an introduction to invasive crayfish management, including advancements over the past 5 years. The agenda, objectives, and discussion prompt were reviewed

U.S. Fish and Wildlife Service crayfish work plan and projects

Amy McGovern and Kate Wyman-Grothem, U.S. Fish and Wildlife Service

- The interagency approach to invasive crayfish control includes agency participation in the Michigan Research and Control Collaborative and Great Lakes Invasive Crayfish Collaborative
- McGovern provided a background on crayfish invasion in the Great Lakes basin. Invasive crayfish were identified as a priority for all jurisdictions by the Great Lakes St. Lawrence Seaway Governors and Premiers
- There are currently critical limitations that need to be addressed including legislation, education, and options for eradication and control
- A three-phase structured approach to addressing invasive crayfish was implemented in the Great Lakes basin; currently in phase III
    - Phase I. Develop a management response plan template for invasive crayfish
    - Phase II. Increase collaboration to address critical life-history uncertainties and inform development and evaluation of novel response tools
    - Phase III. Expand the geographic scope and develop an action-oriented plan to strategically address invasive crayfish along the invasion curve
- During phase two, a strategy was drafted to facilitate increased communication and information transfer between Great Lake stakeholders

Lucas Nathan, Michigan DNR

- Beginning in 2013, red swamp crayfish (RSC) have been a priority for the State of Michigan when carcasses were found at several fishing locations. These findings prompted Michigan State University (MSU) to begin conducting a statewide survey and assessment between 2014-2016
- In 2017, the first live RSC was documented in Michigan, promoting the development of a statewide response plan. Michigan is currently working to develop, implement, and evaluate RSC response strategies that bridge the gap between management and research
    - Prevention, monitoring, and early detection efforts help to evaluate the risk of RSC
- Michigan utilizes an adaptive management framework to improve the efficacy of control strategies based on continued assessment
- There are currently 30 water bodies in the state that are infested with RSC, including man-made reservoir and ditches. This indicates that Michigan was able to respond early in the invasion history, increasing the likelihood of successful control
- Nathan reviewed Michigan's accomplishments since 2017, including effective outreach programs, establishing effective early detection, intensive trapping for control efforts, and tested and evaluated novel moths of control
    - Michigan has conducted pathway inspections and enforcement actions that have been published in multiple publications
    - Approximately 150,000 crayfish were removed from infested waterbodies during this time with significant population impacts

Ann Allert, US Geological Survey

- Allert reviewed novel control efforts including carbon dioxide (CO_2) and Pyrethrin

- CO_2 treatments interfere with crayfish oxygen (O_2) consumption (i.e., Bohr effect), which reduces the pH of RSC blood, resulting in an inability to absorb O_2. The CO_2 treatments are effective at moving crayfish to pond edges, at which time they can be collected for removal. The treatment is most effective in smaller ponds without freshwater inflows. Users need to be conscious of crayfish migrating to other nearby ponds
- Pyrethrin is a pesticide registered for terrestrial pest control. There are currently no pesticides registered for the control of crayfish, thus there is a need to seek emergency approval of Pyrethrin from federal and state regulatory agencies. The Pyrethrin treatments applied within ponds and RSC burrows were successful with limited adverse effects. However, there is a need to adjust treatments moving forward based on lessons learned

Jim Stoeckel, Auburn University

- RSC are burrowing organisms, thus the control methods need to be specific to this unique trait
- Auburn University (AU) is testing physical blockers as a control method for RSC. They are using Benseal® (clay) and Great Stuff® (polyurethane foam) to seal off the burrow to crayfish entry and exiting. Both products resulted in >50% mortality
- AU is also working with crayfish telemetry to better understand crayfish movement within a waterbody in a response to control measures including push/pull studies and chemical (CO_2) control applications

Brian Roth, Michigan State University

- Michigan State University also implemented crayfish telemetry to better understand treatment response. Researchers identified the need to consider close by ponds as a "complex" and independent of each other, as crayfish move freely within a complex
- Chemical control is not feasible at all locations so other control methods were explored, specifically fish predator stocking for biocontrol

Lucas Nathan, Michigan DNR

- The next steps for the interagency approach to invasive crayfish control include:
    - Evaluating and implementing additional chemical treatments and tracking the total number of annual treatments;
    - Exploring CO_2 treatment under ice in a lab setting;
    - Assessing predator biocontrol options and efficacy;
    - Developing and evaluating genetic biocontrol including the use of neo-females;
    - Pursuing interjurisdictional project funding to determine highest risk pathways for crayfish;
    - Determining ecological impacts of RSC

Greg Hitzroth, Illinois-Indiana Sea Grant

- Hitzroth introduced the Invasive Crayfish Collaborative (ICC). The original goals of the ICC were to establish a Great Lakes science trader and information exchange and create resources needed to address introduction, management, and communicate the latest science
- The ICC's next steps are to develop a 5-year strategic plan that address management needs and increase awareness of high-risk pathways through community science engagement

Rusty crayfish control on spawning reefs in northern Lake Michigan

Lindsay Chadderton, The Nature Conservancy

- The Nature Conservancy, Michigan Department of Natural Resources, and Central Michigan University have been working collaboratively on rusty crayfish control
- Rusty crayfish have known negative impacts including out competing or preying on native fish and invertebrates, causing regime shifts in stable state ecosystems, and destroying aquatic macrophytes. However, the impacts and biology of Great Lakes populations are poorly understood
- Suppression success is more common when the rusty crayfish populations being managed are small, reinvasion can be prevented, and the benefit of management outweigh the control costs
- Great Lakes spawning reefs support fish populations by providing spawning habitat. Increasing spawning success in these areas can be beneficial for the broader Great Lakes. Many fish are fall spawners and eggs need to be protected from crayfish predation during that time
- Some of the challenges for managing rusty crayfish populations on the reefs include the limited number of control methods that are effective on open water sites and the limited number of days for management
- The collaborative project's goal is to cost effectively suppress populations of rusty crayfish on shallow spawning reefs in fall immediately prior to lake trout and whitefish spawning to enhance egg survivorship and thus larval fish production
- The study took place in Lake Michigan within Little Traverse Bay
    - Intensive rusty crayfish trapping occurred in the fall of 2018 and 2019. Crayfish density was reduced following suppression events
- Gear comparisons were also conducted. One compared Gee minnow and Pyramid trap's ability to successfully trap crayfish and a second compared a fixed metal mesh and a modified fyke wing barrier. The Gee minnow cumulative catch was slightly higher and the modified fyke barrier proved to be more effective at redirecting crayfish
- Next steps are dependent on acquiring financial support
- Chadderton reviewed the conclusions from the gear comparisons and the spawning reef pilot project
- The group continues to work on mapping the spawning reef habitat and sharing rusty crayfish monitoring methods to collect consistent density data across Great Lakes reefs

Red swamp and rusty crayfish in Illinois waterways

Reuben Keller, Loyola University

- Keller described the distribution of crayfish in Illinois, which began being documented in 2015. Rusty and red swamp crayfish are the document invasive crayfish in the Lake Michigan region
    - Rusty crayfish were almost always the dominant crayfish species detected, likely because of its adaptability to a range of conditions. Alternatively, there was only one location where red swamp crayfish were present in high densities
- There has been very little historical sampling for native crayfish in Lake Michigan. A small survey was conducted from 1978-83, where only native virile and northern clearwater crayfish were detected
    - Current sampling from 2020 – present has been conducted in the same areas where the historical data is available. Rusty crayfish are the dominant species for most of the southern range of the study area and only native crayfish were found in the northern edge

    - Keller will continue to monitor the current distribution to better understand the invasion dynamic in that area
- Red swamp crayfish were detected and confirmed in 2015 and are likely a newer invader to the area
- The impacts of rusty and red swamp crayfish are not well studied; however, it appears that rusty crayfish, and more recently red swamp crayfish, are outcompeting and replacing native crayfish species. Increased turbidity and reduced macrophytes have also been noted as they expand their range
- Keller's lab investigated the food-web impacts of red swamp and rusty crayfish diets via stable isotope analysis to see what crayfish were eating
    - The group recently began another study looking at fish diets and will process larval samples over the next couple of months to determine which fish species are consuming invasive crayfish
- Keller's lab implemented crayfish control efforts including an experimental removal. The goals of this project are to improve trapping efficacy and reduce invasive crayfish population size
    - Hotdogs were found to be most effective at attracting and trapping crayfish when compared to beef liver, crayfish, dog food, and fish
    - They looked at how far crayfish are moving to determine trap spacing though a mark-recapture experiment. Most crayfish moved 0-5 meters but some crayfish moved over 100 meters after flood events. Based on the results, they decided to space traps 5 meters apart
    - The efficacy of Nylon mesh and steel traps were also compared. Nylon mesh traps captured more crayfish but are more difficult to work with than steel straps. The catch/unit effort was lower with the mesh traps. The lab created modified minnow traps by adding a low-tech modification and about doubled the number of crayfish captured
- Keller's lab has been conducting crayfish control and removal from 2018-present using steel minnow trapes baited with hotdogs. The average number of crayfish captured throughout the year decreased with removal efforts
    - They are getting better at trapping and controlling crayfish and have shown that reducing populations through removal efforts reduces the risks of future spread
    - Crayfish are mainly being found in rocky areas that are not suitable spawning habitat for many desirable fishes. However, the lab is also finding extremely high densities of round goby and quagga mussels in the same areas where crayfish are found

Rusty crayfish in northern Minnesota

Liz Anderson, Lake County Soil and Water Conservation District

- The Lake County Soil and Water Conservation District (SWCD) have been controlling crayfish since 2015
    - Anderson provided an overview of three different crayfish trapping efforts in Lake County, Minnesota
- The Lake County SWCD implemented an intensive trapping effort on North and South Kawishiwi Rivers utilizing citizen efforts
    - Initial trapping efforts in 2015 showed that native crayfish were still present, but the number of rusty crayfish had increased, and they were now the dominate crayfish in the area

    - Public awareness in the area has increased through collaboration with the local lake associations and through outreach booths at farmer's markets and festivals
    - Follow up surveys are planned for 2022 and 2023
- The Lake County SWCD and the White Iron Chain of Lakes Association implemented trapping efforts in the White Iron Chain of Lakes where members are given crayfish traps and encouraged to set them on their shoreline property. Members are very dedicated to trapping crayfish and have removed thousands of rusty crayfish so far
    - Utilized survey123 this year for trappers to report trapping results throughout the season
- The Lake County SWCD worked with a local youth development organization to trap rusty crayfish in Burntside River in St. Louis County
    - Trapping efforts prevented the movement of rusty crayfish upstream to an unestablished lake
- Anderson reflected that intensive trapping can be effective when the scale is manageable and the work is sustainable. Trapping can also be effective at pinch points in narrow waterways and at discrete locations, such as lengths of shoreline. Partnerships with community organizations are crucial to having the manpower, maintaining momentum, and promoting awareness

Q&A and Discussion

GLP Members

- How can the Great Lakes Panel (GLP) work to ensure collaboration between efforts and leverage the relevant experience/need across the region?
    - There are likely opportunities for future crayfish funding through the Great Lakes Restoration Initiative to support control efforts
    - The GLP may be a pathway to communicate information between those actively engaged in crayfish control. Can also utilize the Great Lakes Invasive Crayfish Collaborative
    - There is an opportunity to standardize trapping and control techniques across the region, which may benefit from GLP involvement
- There are considerations being made for listing red swamp crayfish as injurious in Ohio. However, there is push back that it may not be worth the effort since they are already established within the state
    - RSC are regulated as restricted in Illinois, which has been shown to be effective at preventing additional spread
    - RSC carry white spot diseases that can affect a variety of crustations and is another reason to discourage spread and regulate them. A lab at Auburn University is doing some limited testing for white spot disease
    - Managers are now in a position where some effective and approved control methods are on the horizon, so even though populations are established, not all hope is lost when new populations are detected
    - There is a lot of pushback from the live food market, as people want to have crayfish boils. This pathway is also where law enforcement has been effective
    - RSC are not a consistently regulated species throughout Great Lakes jurisdictions
- Michigan State University is doing a lot of life history studies on RSC, looking at how their biology and behavior differs between their native and invaded ranges. Additionally, beginning to

better understand their movement between ponds and their use of underground pipes as refugia. Looking at burrowing habitats and impacts it may have infrastructure
- Temperature may be one of the limiting factors for RSC distribution and spread, however, more work is needed to explore this theory
    - Burrow scoping to look at seasonality of the species is shedding light on the impacts, or lack thereof, of winters on the crayfish
- Trapping efforts result in more males trapped earlier in the season and more females trapped later in the year. Tube traps may be an option to select for brooding females

Plenary Session: Five-year update on collaborative efforts

Welcome and introductory remarks

Eric Fischer, Great Lakes Panel (GLP) Vice Chair, Indiana Department of Natural Resources

- Fischer called the meeting to order. The agenda and meeting format were reviewed

Great Lakes *Phragmites* Collaborative

Sam Tank, Great Lakes Commission

- The Great Lakes *Phragmites* Collaborative (GLPC) has been established for 10 years and was initially created out of the need to manage non-native *Phragmites* on a binational scale
- A large part of the success of the GLPC has been due to the collaborative's structure, specifically, having an advisory committee that has members from a wide range of agencies
- The GLPC is currently supporting four different work groups made up of advisory committee members and experts in the field. The workgroups are focusing on *Phragmites* monitoring and reporting, restoration after treatment, funding, and management and development
- The GLPC utilizes the collective impact approach, which includes the creation of GLPC's Common Agenda. The common agenda helps align regional goals and promotes a shared vision of change and is broken up into four focus areas (regional coordination and collaboration, best management and restoration planning, advancement of research and technology, and funding for *Phragmites* management)
- One of the most well utilized GLPC products is the website, which supports a wide array of resources (webinars, blog posts, ID guides, etc.)
- The GLPC has been increasing social media presence to connect to managers
- Additionally, the GLPC sends out monthly "Research Round-up" emails that collect published academic research relating to *Phragmites.*
- The GLPC also supports the "Collaborative for Microbial Symbiosis and *Phragmites* Management" subgroup
    - The symbiosis collaborative created a multi-institution research collaborative to collectively address microbiome research gaps and novel microbe based *Phragmites* management
    - This effort has been very successful, and they have produced about 15 papers to date
- Another highlight of the GLPC is the *Phragmites* Adaptive Management Framework (PAMF)
    - PAMF came about to help address the uncertainty of the efficacy of *Phragmites* management techniques

    - The PAMF predictive model uses monitoring data to give managers guidance and learns about which management techniques are working to reduce *Phragmites* infestations and which ones are not.
    - PAMF has managers from all Great Lakes states and Ontario
- Anyone managing *Phragmites* can reach out to Sam (sam@glc.org) on how to get involved in PAMF or learn more about the resources available through the GLPC

Invasive Mussel Collaborative

Sam Tank, Great Lakes Commission

- Recent advancements in biocontrol technology (a new biopesticide, Zequanox) presented options to control invasive mussels, but there were still a lot of questions regarding this new method. The Invasive Mussel Collaborative (IMC) wanted to explore the idea of utilizing these new control efforts more collectively and to communicate and coordinate researchers' work
- The IMC has a set structure with a core team, a steering committee that holds decision-making authority, workgroups, and backbone support from the GLC
- Over the last several years, the IMC has created a mission, common goals, and a comprehensive strategy to advance management
- Recently, the IMC developed a dreissenid mussel control demonstration project
    - The IMC created a subgroup to scope out the project and the project was completed in 2019 in Good Harbor Bay at Sleeping Bear Dunes National Lakeshore
    - The pilot project included the application of Zequanox in open water under benthic barriers and was very successful from a control perspective
        - More info on the project can be found on the IMC website
- Three work groups (research, coastal site priorities, and dreissenid toxicity testing) are all working on different invasive mussel issues
    - Recently, the research work group released a new mapping tool, which serves as a warehouse of ongoing and completed invasive mussel research to enhance collaboration and prevent duplication of efforts. Visit mapping tool here
    - The toxicity testing workgroup has reviewed and compiled reports and are in the processes of finalizing a publicly available database that will summarize recent studies. Additionally, they have created a best practices document and a review of lessons learned from open water treatments
    - The coastal site priorities workgroup is focusing on developing a site-screening tool that will provide a basin-wide coastal screening approach that will help managers help find priority control areas based on five specific criteria and will be available to the public soon
- Beyond these projects, the IMC keeps up with engagement through the IMC website, an email listserv, quarterly newsletter, and a webinar series
- For the future, there is still a strong interest on advancing mussel control and development in coastal restoration but also to understand how the removal of mussels will impact our water quality and fisheries
- Looking forward, the IMC hopes to create a new "planning and implementation" workgroup, which will work to provide guidance on funding decisions and priorities to organizations funding dreissenid research

European Frog-bit Collaborative

Sam Tank, Great Lakes Commission

- In 2018, EFB was identified as a priority invasive species of concern in the Great Lakes, which initiated the formation of the EFB Collaborative
- Initially, the EFB Collaborative was headed by Central Michigan University (CMU) and had a Michigan-centric focus
    - In 2020, Michigan Department of Environment Great Lakes and Energy and CMU agreed that CMU would no longer host the collaborative
    - The GLC was approached to help provide administrative support and be a neutral entity in supporting the EFB Collaborative moving forward. At the end of 2022, pending funding, the GLC will take over that role
- The EFB Collaborative has created an adaptive management framework strategy and named priority management needs, all of which will help the collaborative reach the common goal of preventing EFB spread and reducing ecological, environmental, and socio-economic impact where it is established
- The EFB Collaborative currently has three workgroups (Delimitation, Education and outreach and Management assessment)
    - The delimitation workgroup has developed standard operating procedures and data collection app for EFB surveys. Additionally, they have built a GIS-based prioritization tool for identifying high-risk location for EFB monitoring
    - The education and outreach workgroup has been working on a consistent outreach campaign and plan to host a webinar series that features the latest information on regional EFB distribution, research, and control efforts
    - The management assessment workgroup is planning to review the previously established Standard Treatment Impact Monitoring Protocols (developed by Central Michigan University to assess EFB treatment efficacy efforts) and expand it to meet the needs to participating Great Lakes jurisdictions beyond Michigan
- Future work includes plans to enhance and expand the EFB Collaborative to be representative of all Great Lakes jurisdictions, re-establishing the website, creating a communication network, and identifying priority sites for EFB management

New Zealand Mudsnail Collaborative

Jeremy Geist, Trout Unlimited/Ducks Unlimited

- Geist briefly reviewed the invasion history of the New Zealand mudsnail (NZMS) and their morphological traits that contribute to their invasion success. NZMS are a global invader and are found on 6 continents and within 21 U.S. states, including the Great Lakes region
- The NZMS Collaborative was created in 2017 due to an increase of NZMS detections and their potential ecological impacts
    - Main function of the collaborative is to mediate discussion and information sharing among stakeholders in the region
- There are four overarching goals associated with the collaborative. Goals are highlighted below:
    - Goal 1: Improve understanding on the current and future status of NZMS in the Great Lakes and tributaries

        - The NZMS Collaborative holds semi-annual partnership meetings to share work and coordinate effort across the region
        - A Great Lakes NZMS Collaborative website was created that contains a lot of information about the mudsnails and education and outreach materials
        - They have created a status and review paper with a key emphasis on Great Lakes issues
    - Goal 2: Assist in regional management strategies and actions
        - The NZMS Collaborative has been helping to coordinate and assist with regional monitoring and strategies. Additionally, they are working with watershed groups to place an emphasis on NZMS monitoring across the region
        - They have created a clearinghouse of NZMS occurrence data (presence/absence, methodology) of Great Lakes sightings
    - Goas 3: Minimize the spread of NZMS in the Great Lakes region
        - The NZMS Collaborative is helping to minimize the spread of NZMS through decontamination. Several decontamination methods were tested through trials evaluating NZMS mortality. Formula 409 proved the most effective decontamination agent. The trials were paired with surveys distributed to anglers to see what methods they are most likely to use to decontaminate their gear. Survey results are currently in review
    - Goal 4: Increase awareness and education on NZMS related issues to the public
        - The collaborative has developed various educational material (signage, pamphlets, video, etc.) to share across the Great Lakes region. Additionally, they host presentations at public outreach event as well as webinar series
- In the future, the NZMS Collaborative will focus on continuing to share current and ongoing research, monitoring and management efforts and are collaborating with the National NZMS Task Force

Invasive Crayfish Collaborative

Greg Hitzroth, Illinois-Indiana Sea Grant

- The Invasive Crayfish Collaborative (ICC) was convened due to high interest from the public, lack of proper crayfish regulation in trade, and the rising invasion of invasive crayfish in the Great Lakes regions
- For the period of 2017-2020, the ICC established three goals, which are detailed below
    - Goal 1: Establish Great Lakes wide invasive crayfish collaborative
        - The ICC has recruited members and created an established email group
        - They used the Delphi method to survey the needs of the 68 members and from that survey, the collaborative created a list of research needs for invasive crayfish. The highest ranked needs were for more information on the biology of native and invasive crayfish and accurate crayfish distribution maps
            - Additionally, they surveyed members on the most pressing outreach needs for citizens, managers, and policy makers. Survey respondents rated handling and disposal guideline and outreach to trade as the highest priority
        - Following the survey, the ICC held a workshop and three meetings to go through the results from the surveys
    - Goals 2: Create means for science transfers and information exchange

        - The ICC created the InvasiveCrayfish.org website with topics including invasive crayfish facts, prevention methods, management, and research
        - The ICC has hosted four webinars, all of which are available on their website. Additionally, in 2018, the ICC hosted a session at the International Association for Great Lakes Research conference
    - Goal 3: Resource creation
        - The ICC has established a framework for creating an invasive crayfish BMP, which is currently in draft form
        - They have created an outreach tool for buyers/sellers
        - The ICC piloted a community science program for educators with an emphasis on early detection. A draft manual for the program and training has been created and have so far, the collaborative has completed four separate trainings
- Future work for the ICC will align with USFWS and the Michigan Research and Control Collaborative efforts to increase collaboration, address critical life-history uncertainties and expand the geographic scope and develop a plant to address invasive crayfish along the invasion curve
- The ICC is in the process of developing a five-year strategic plan and looking to collect foundational information. After, a steering committee for the ICC will be established
    - Future focus of the collaborative will be on the organisms in trade sector and community science engagement

Great Lakes Hydrilla Collaborative

Mike Greer, U.S. Army Corps of Engineers

- The Great Lakes Hydrilla Collaborative began in 2012/2013 after hydrilla was found in Cayuga Lake in New York.
- The purpose of the collaborative is to foster cooperation, share hydrilla management knowledge, provide technical assistance, and connect to stakeholders
- The collaborative has a website that allows relevant information to be housed and for users to easily share resources
- The Great Lakes Hydrilla Collaborative has completed three demonstration projects and is currently managing over 500 acres of hydrilla across the Great Lakes basin. The demonstration projects allow for innovation in terms of management approach and developing effective control methods
    - This has allowed the collaborative to investigate and document phenology of monecious hydrilla. Importantly, they found that synchronous sprouting of tubers occurred at 20^{o}C in late June/July
    - They are managing projects in the Erie Canal and Cayuga Lake, New York, and the Pymatuning Reservoir on the border of Pennsylvania and Ohio
- The Great Lakes Hydrilla Collaborative has developed education and outreach material focused on the impacts of hydrilla and how it can be effectively managed through the use of aquatic herbicides
- The Great Lakes Hydrilla Collaborative often provides technical assistance to those who are managing hydrilla and will continue to do so
- A risk assessment has been completed to better understand areas that are vulnerable to hydrilla invasion across the Great Lakes. The risk assessment has helped identify that the potential

economic loss if hydrilla if not managed and left to spread, is between $70-500 million in damages

Great Waters Research Collaborative

Jennifer Maki, University of Wisconsin-Lake Superior Research Institute

- The Great Waters Research Collaborative has developed a Great Lakes Ballast Water Research and Development Plan to decrease the environmental risk from propagules in ballast water as stated in the Vessel Incidental Discharge Act
- Data that the collaborative collects is used to inform the revision process as the EPA reviews ballast water regulations
- The Research and Development (R&D) Plan includes three research areas, which are described in greater detail below
- Research area 1: Finding effective ballast water management strategies
    - Project 1 in this research area focuses on where ballast water is being picked up and released for vessels that are doing trade within the Great Lakes
    - The collaborative is working on a second project for testing ballast water treatment systems that are already approved by U.S. Coast Guard to see if treatment systems meet the discharge standards in the EPA's Environmental Testing Verification protocol
        - Maki described the Great Waters Research Collaborative's procedure for testing the efficacy of different ballast treatment systems
    - Moving forward, the collaborative will be testing new systems on their land-based facility and are performing shipboard tests, which will begin this summer
    - Additionally, the Great Waters Research Collaborative will work with Dr. Dennis King, to investigate the bio-economic possibility of having ballast water reception facilities within the Great Lakes
- Research area 2: Developing Great-Lakes specific ballast water sample analysis methods
    - One project in this research area is to develop a viability assessment method that can be used in the Great Lakes. This includes developing a method that will assess "can" organisms reproduce and examine viability analysis techniques
    - This research area also includes looking at resting stages (eggs, embryos, etc.) of plankton to determine what proportion of a population in the ballast are in this resting stage by using as stain to indicate deceased organisms
- Research area 5: Assessing the risk of aquatic nuisance species transfer
    - Research areas includes work on eDNA and microscopy comparison of different invasive species across the Great Lakes

Habitattitude™ Collaborative

Doug Jensen, DAJ Consulting

- The Habitattitude™ Collaborative was formed as part of a larger initiative by the Great Lakes Sea Grant network to spearhead a pilot of surrenders/re-homing events in the Great Lakes region

- Jensen gave a brief overview of what the Habitattitude™ Collaborative accomplished from 2016-2019. This including many outreach events and progress on the AIS Organisms in Trade (OIT) pathway
    - The collaborative coordinated with Wisconsin Sea Grant to hold the Great Lakes Briefs on Invasive Organisms Traded in Commerce (BIOTIC) Symposium II in 2018 and 2020
    - The collaborative created the *Adopt a Habitattitude™* Curriculum for grades 4-12, and the Habitattitude™ day camps for teachers
    - Additionally, they have helped to host invasive crayfish boils to educate locals about the spread of invasive crayfish
- Wisconsin, Minnesota, and Pennsylvania will continue to hold various surrender events and additional Great Lake states will continue with promoting Habitattitude™ outreach

Q&A and Discussion

GLP Members

- Are there any partnerships/collaboratives that were formed in the past few years that have now disbanded? If so, what was the rational
    - It was mentioned that the Round Goby "Club" and the Starry Stonewort Collaborative are both no longer active
        - The Round Goby "Club" did not have adequate funding to continue, and they lacked members who wanted to drive the organization forward
        - The Starry Stonewort Collaborative was very active for five years, but at some point, they did not receive further funding and they disbanded. Their website is still accessible, and still serves the goal of sharing relevant information for managers
            - A member asked if collaboratives are fluid enough to continue to serve the purpose they were developed for, or do they need a start and end point? This concept is particularly important if there is one person driving the collaborative forward
            - When creating a collaborative, it also raises the question, "is this problem big enough to warrant a collaborative?"
- It was noted that the collaboratives that are the easiest to engage with are collaborative that have a lot of outreach methods (i.e., webinars you can watch at a later date) and easily allow for research sharing

Great Lakes Panel Closing Session

Kelly Pennington, Great Lakes Panel Vice Chair, Minnesota Department of Natural Resources

- Pennington called the meeting to order and reviewed agenda

Committee reports

Committee chairs

- Committee chairs reviewed outcomes and discussions held during committee meetings; committee meeting notes are available separately

Fall meeting plans

GLC Staff

- If the fall Panel meeting is in person, it would likely be hosted in Ann Arbor
    - The rule that was preventing us from having an in-person meeting has been lifted. As of now, an in-person Fall meeting will likely be possible
- Date restrictions for the Fall meeting include:
    - Sea Grant Week, September 12-16
    - MRBP, September 12-15
    - First week of October is a Jewish holiday
    - MISAC, October 6
    - U.S. Symposium on Harmful Algae, October 23-28
    - UMISC, October 25-27
    - NAISMA, November 7-10
    - US midterm elections, November 8

<u>Member round robin: What is the feasibility to meet in-person?</u>

GLC Staff

- There should not be a lot of challenges for Canadians to enter the U.S., however agencies approvals may be the barrier
- A member noted that they would like to keep sub-committee meetings separate even if we move to an in-person Fall meeting. This would likely require the meeting to run over 2 days. Other options include hosting the committee meetings virtually before/after or shortening the meetings to run concurrently
- An in-person meeting may allow field trips to be integrated back into the meeting format
- There still seems to be a range of what people are comfortable with in terms of in person interactions. Thinking about how to facilitate low COVID risk interactions outside of the meeting can also probably make people more comfortable attending in person, such as providing masks
- <u>Members were encouraged to complete the Microsoft Forms survey regarding hosting an in-person meeting</u>