Great Lakes Panel Member Updates
Spring 2021

Meeting of the Great Lakes Panel on Aquatic Nuisance Species
June 14-16, 2021 | Virtual Meeting

U.S. Federal

U.S. Fish and Wildlife Service
No update provided.

Contact: Amy McGovern, U.S. Fish and Wildlife Service, 612-713-5109, amy_mcgovern@fws.gov

National Oceanic and Atmospheric Administration
NOAA Update Spring 2021 Meeting

GLERL/Muskegon Field Station [POC: Ashley Elgin, Steve Pothoven]

Recent work: Researchers at MFS continued their long-term research sampling of Lake Michigan at Muskegon last fall along a nearshore to offshore gradient, which includes collection of quagga mussels and plankton. They collected mussels in April and will repeat this sampling in July and October in order to assess density, biomass, body condition, and reproductive status.

Upcoming work: Researchers will conduct high frequency sampling of mussel veligers to evaluate their importance to the plankton community, their production, and to begin to understand mussel recruitment dynamics. They will also coordinate with EPA and Buffalo State College to conduct whole lake benthic surveys on Lake Michigan. The surveys will largely be conducted onboard the EPA R/V Lake Guardian and some supplemental southern basin sites will be collected by NOAA vessels.

NOAA publications with connections to GL Invasive Species that published online in the last 6 months:

- A Review and Secondary Analysis of Competition-Related Impacts of Nonindigenous Aquatic Plants in the Laurentian Great Lakes. Sturtevant, R. E. Lower, A. Bartos, A. Elgin. Plants. https://www.mdpi.com/2223-7747/10/2/406
- Lake morphometry determines Dreissena invasion dynamics. Karatayev, A.Y., V.A. Karatayev, L.E. Burlakova, K. Mehler, M.D. Rowe, A.K. Elgin, and T.F. Nalepa. Biological Invasions. https://link.springer.com/article/10.1007/s10530-021-02518-3
- Dreissena in Lake Ontario 30 years post-invasion. Karatayev, A.Y., L.E. Burlakova, K. Mehler, A.K. Elgin, L.G. Rudstam, J.M. Watkins, and M. Wick. Journal of Great Lakes Research. https://doi.org/10.1016/j.jglr.2020.11.010
- Six decades of Lake Ontario ecological history according to benthos. Burlakova, L.E., A.J. Karatayev, A.R. Hrycik, S.E. Daniel, K. Mehler, L.G. Rudstam, J.M. Watkins, R. Dermott, J. Scharold, A.K. Elgin, and T.F. Nalepa. Journal of Great Lakes Research https://doi.org/10.1016/j.jglr.2021.03.006

Contact: Felix Martinez, National Oceanic and Atmospheric Administration, 734-741-2254, felix.martinez@noaa.gov

National Park Service
AIS prevention

NPS has purchased multiple boat-washing stations for deployment at Voyageurs National Park (two stations operated in cooperation with local counties), Isle Royale launch points (Houghton, MI area, operated in coordination with Keweenaw Invasive Species Management Area), and near Pictured Rocks National Lakeshore (Kingston Lake, in cooperation with MDNR). An additional unit may be purchased for deployment near Apostle Islands, in cooperation with local marinas.

At Voyageurs National Park, boat inspections got underway in early May.

At 10 national parks, NPS will employ AIS prevention educators to prevent spread and introduction.

Invasive species early detection and monitoring

NPS and academic partners plan snorkel-based surveys for invasive mussels in marina settings at Voyageurs National Park, scuba-based dock surveys at Grand Portage, and scuba-based surveys of reef, dock, and nearshore habitats at Apostle Islands and Isle Royale,

NPS will deploy passive samplers and conduct veliger sampling for invasive mussels at Isle Royale, Pictured Rocks, and Voyageurs. At Apostle Islands, three types of passive samplers will be deployed at various sites, including rock bags, artificial substrate samplers, and mesh banners.

NPS is facilitating volunteer based AIS early detection efforts on nine inland lakes at Sleeping Bear Dunes, targeting 17 invasive species from the State of Michigan aquatic invasive species watch list. NPS staff will also be conducting aquatic vegetation surveys in two additional lakes, four total.

Invasive mussel removal

NPS, state, and academic partners are continuing follow-up monitoring at invasive mussel removal sites at Sleeping Bear Dunes' Good Harbor Reef, including sites of the 2016 manual removal experiment and the 2019 Invasive Mussel Collaborative-sponsored Zequanox experiment.

NPS worked with partners from the Invasive Mussel Collaborative on a joint project press release and other outreach related to the 2019 Zequanox experiment at Good Harbor Reef, including a project video: https://www.youtube.com/watch?v=BK9MeC0_GYY.

Round goby research

NPS and UWM partners are planning a larger scale goby exclusion experiment at Sleeping Bear Dunes' Good Harbor Reef.

Invasive mussel rapid response

Voyageurs National Park purchased barriers for deployment in marina settings in the event of an invasive mussel detection. Park staff are drafting an invasive mussel rapid response strategy.

Invasive species impacts

Voyageurs continues to collaborate with the University of Minnesota, the Minnesota Department of Natural Resources, and Natural Resources Research Institute on a study titled, "Sustaining Walleye Populations: Assessing Impacts of AIS." That project produced a publication on effects of zebra mussel and spiny water flea on walleye and yellow perch growth (http://link.springer.com/article/10.1007/s10530-020-02198-5), and a manuscript on food web effects of zebra mussel and spiny water flea is in prep.

Ongoing invasive species control efforts at multiple parks with GLRI funding:

Additional high priority areas at 7 national park sites are targeted for aquatic and terrestrial invasive species treatments.

Contact: Brenda Lafrancois, National Park Service, 715-682-0631, brenda_moraska_lafrancois@nps.gov

U.S. Army Corps of Engineers
No update provided.

Contact: Mike Greer, U.S. Army Corps of Engineers Buffalo District, 716-879-4229, michael.j.greer@usace.army.mil

U.S. Coast Guard
GL ANS PANEL UPDATE
Ballast Water Regulation
The Coast Guard published its ballast water discharge standard regulation in the Spring of 2012. The standard aligns with the IMO D-2 standard and require the installation of type-approved ballast water management systems (BWMS) on "salties". The use of type approved ballast water management methods are required on those new ships constructed after 1 DEC 2013 and will be implemented on existing ships during the vessel's first scheduled drydock after 2014 or 2016 depending on the vessel's BW tank capacity and availability of type approved systems.
The Coast Guard anticipates that more than 3,000 United States domestic vessels in various classes will be required to install an approved ballast water management system (BWMS). In addition, about 9,000 foreign vessels that enter U.S. waters each year will be subject to the rule. The IMO estimates that more than 60,000 vessels worldwide will need to comply with the Ballast Water Management Convention when it enters into force.

CG Type Approval
The multi-faceted type approval process consists of land-based and shipboard-based testing (by independent labs) focused on the biological efficacy of the BWMS. For those systems whose performance could be affected by the cold and pure fresh water of the Great Lakes, additional testing may be necessary. Assessment of the BWMS' ability to properly operate in the harsh marine environment is also undertaken and all of the system's components are examined to ensure compliance with marine engineering, electrical, and mechanical standards. This testing and certification is usually conducted by vessel classification societies. The Coast Guard has certified five Independent Labs (IL) that are involved in the type approval process. Duluth-Superior's Great Ship Initiative is part of a certified IL.
Since 2013, the Coast Guard Marine Safety Center has received **59** of Letters of Intent from BW treatment system manufacturers stating they intend to pursue type approval for their ballast water treatment system. The Coast Guard's Marine Safety Center has type approved **42** BW treatment systems.

Ballast Water Working Group (BWWG)
The Ballast Water Working Group has completed the 2020 annual report and it is posted on this website; 2020 Summary of Great Lakes Ballast Water Management (greatlakes-seaway.com)
In 2020, 100% of vessels bound for the Great Lakes Seaway from outside the Exclusive Economic Zone (EEZ) received ballast management exams on each Seaway transit. In total, all 10628 ballast tanks were assessed during the 536 vessel transits. Vessels that did not exchange their ballast water or flush their ballast tanks were required to either retain the ballast water and residuals on board, treat the ballast water in an environmentally sound and approved manner, or return to sea to conduct a ballast water exchange. Vessels that were unable to exchange their ballast water/residuals and that were required to retain them onboard received a verification exam during their outbound transit prior to exiting the Seaway.

Vessel Incidental Discharge Act (VIDA)
On December 4th, 2018, the Vessel Incidental Discharge Act was signed into law as part of the Coast Guard Authorization Act. The title provides for a uniform, national standard to govern discharges that are incidental to vessel operations, such as ballast water discharges. It makes the Environmental Protection Agency the lead for establishing these standards, and it makes the Coast Guard the lead for monitoring and enforcing the standards. The Coast Guard and the EPA are working on their respective regulatory mandates.
On Monday, October 26th, 2020 the EPA published its "Vessel Incidental Discharge National Standards of Performance" proposed rule in the *Federal Register*. This proposed rule would establish national standards of performance for discharges incidental to the normal operation of a vessel that will apply primarily to commercial vessels 79 feet in length and above that discharge into waters of the United States or waters of the contiguous zone. The proposed rule also includes procedures for states to petition EPA for additional requirements as provided for under the VIDA. Public comments on the proposed rule were accepted for 30 days and the EPA is currently reviewing the comments from the docket.
VIDA requires the USCG to promulgate implementation, compliance, and enforcement requirements for EPA's national performance standards:

- The USCG program will be no less stringent than the EPA's current VGP, to ensure, monitor, and enforce compliance with the EPA's national performance standards.
- Implementing regulations will include vessel management practices, design and construction, testing, approval, installation, and use of marine pollution control devices.
- VIDA includes additional requirements such as developing an intergovernmental workgroup with Federal and State agency cooperation, submitting annual invasive species reports to congress, and developing an invasive species contingency plan.

The Coast Guard established a working group in December 2019 to help implement several of state coordination requirements. The Ballast Water Reporting and Enforcement Data Working Group with interested State partners, the CG's Navigation Center, EPA, and members of the Smithsonian's National Ballast Water Information Clearinghouse (NBIC) continues their work virtually. This workgroup's current focus has been on ensuring States have access to the Marine Traffic Automatic Identification System, as well as information on how to receive commercial vessel BW reporting information from NBIC. The participating states now have direct access to the NBIC data.

Contact: Lorne Thomas, U.S. Coast Guard Ninth District, 216-902-6022, Lorne.w.thomas@uscg.mil

U.S. Forest Service
No update provided.

Contact: Amanda Kunzmann, USDA Forest Service, 414-297-3431, akunzmann@fs.fed.us

U.S. Department of Agriculture-APHIS

No update provided.

Contact: Vacant

U.S. Department of State
No update provided.

Contact: Nadia Sbeih, U.S. Department of State, 202-647-3228, SbeihND@state.gov

U.S. Environmental Protection Agency
No update provided.

Contact: Kevin O'Donnell, U.S. EPA- Great Lakes National Program Office, 312-353-0813, ODonnell.Thomas@epa.gov

U.S. Geological Survey
USGS updates

Great Lakes *Phragmites* Collaborative
The GLC and USGS are jointly leading a regional partnership – the Great Lakes *Phragmites* Collaborative (GLPC) – to improve communication and collaboration leading to more coordinated, efficient and strategic approaches to managing non-native *Phragmites* across the Great Lakes basin. The GLPC provides educational resources tailored to diverse interest groups, connects invasive species managers with the latest research and technology, encourages the use of adaptive management, and facilitates alignment of partner efforts across jurisdictional barriers.

- Continued to provide information via the high-traffic website www.greatlakesphragmites.net
- Hosted several webinars, including 5 as part of a Students of Phrag Webinar Series
- Continued to draft audience-specific outreach materials across various multi-media formats
- Maintained a database and dynamic map of regional organizations (including CISMAs, CWMAs and PRISMs) working on invasive species in the Great Lakes
- Created 32 case studies of *Phragmites* management in both Canada and the U.S.
- Shared the work of the GLPC at many national and international conferences

Phragmites Adaptive Management Framework (PAMF)
The GLC and USGS are working to promote effective *Phragmites* management and track the effectiveness and resource efficiency of management activities through the PAMF program (http://www.greatlakesphragmites.net/pamf/). PAMF engages a variety of land managers across the basin, from state and federal employees to private citizens, in a strategic attempt to help and learn from people actively managing *Phragmites*. The program needs your participation to develop data-driven best management practices as quickly as possible.
• In 2021, leadership of PAMF transitioned to the GLC, which works daily with PAMF participants (representing over 50 different organizations) to coordinate efforts effectively
• Since 2017, PAMF conducted 33 total training sessions (hosted 1 live virtual training session in 2021) reaching over 300 people across the Great Lakes basin to educate *Phragmites* managers about PAMF and encourage their participation. In response to the COVID-19 pandemic, PAMF transitioned to live virtual trainings in summer 2020, and in 2021 introduced a self-paced online training course through the Moodle platform
• Increased total enrolled management units to 229 across all eight Great Lake states and Ontario; provided management guidance to 111 enrolled management units for the 2020/21 cycle
• In 2020, PAMF staff assisted with monitoring 26 management units that managers were unable to monitor due to COVID-19 travel or budget restrictions
• Since 2018, PAMF staff promoted PAMF or presented at >20 scientific meetings or conferences
• The animation "*Phragmites* Adaptive Management Framework: Participation Cycle" won a USGS Shoemaker Award for Communications Product Excellence in 2019
• Developed the PAMF Strategic Plan to guide successful implementation of PAMF by setting program-specific goals, objectives, and measures for the next five years (2020-2026)
• Currently enrolling new management units for the 2020/2021 PAMF cycle year – contact the PAMF Coordinator at pamf@glc.org

USGS *Phragmites* research update
The USGS Great Lakes Science Center is conducting research into innovative control measures for non-native *Phragmites australis* (common reed), a highly invasive species with wide-ranging social, economic, and ecological impacts, based on the bacteria, fungi, and other microbes that it supports. A USGS-led group developed a science agenda (Kowalski et al 2015, https://pubs.er.usgs.gov/publication/70147339) that is guiding a nation-wide effort to develop new management approaches that

promote the microbes that are harmful to this invasive plant and inhibit those that help it outcompete native plants. There have been many publications on this topic since 2015, all of which are highlighted in the Published *Phragmites* Research section of the GLPC web site (https://www.greatlakesphragmites.net/research/).

Close partnerships with the University of Michigan, Rutgers University, Tulane University, Louisiana State University, and other organizations are identifying the key microbes and microbial processes to target for manipulation as a form of plant control. Field and greenhouse studies over the past few years have tested the virulence of harmful microbes on *Phragmites* plants, cataloged the microbes associated with this invasive plant, and evaluated how the application of non-toxic antimicrobial treatments affect plant growth. These and other studies are helping identify the mechanisms associated with plant-microbe mutualisms and leading to the development of new management tools for managers of *Phragmites* and other non-native plant species. Field studies are underway in Michigan and New Jersey to test potential treatments.

USGS continues to work closely with colleagues at the U.S. Army Corps of Engineers Engineer Research and Development Center to develop genetic biocontrol treatments for non-native *Phragmites australis*. Based on the natural plant process of RNA interference, the research team is developing species-specific treatments that limit the expression of plant traits (e.g., high growth) and offer managers additional treatment options. This work is being informed by genomic and transcriptomic analyses by USGS, Louisiana State University, and Tulane University, including the first published full genome description of non-native *Phragmites*.

The USGS Great Lakes Science Center is partnering with the U.S. Fish and Wildlife Service to explore the impacts of Great Lakes water levels on the growth, spread, and management of *Phragmites*. After several years of prolonged high water, many existing *Phragmites* populations in the coastal zone of the Great Lakes are being stressed or drowned. Additionally, land managers are taking advantage of the high water and cutting *Phragmites* below water to drown the plant as a control strategy. However, very little data have been collected on the viability of rhizomes following natural drowning or the efficacy of cut-to-drown management. We are combining field and greenhouse studies as well as cataloging geographic zones where retreat or expansion may occur under future water-level patterns. This work is funded by the USGS-FWS Science Support Partnership Program.

Grass Carp research in Lake Erie

Early Life History

We are working with the University of Toledo to continue monitoring of Grass Carp spawning through the collection of fertilized eggs in known (Maumee and Sandusky) and potential [Cuyahoga, Huron (OH), Portage, and Black] spawning rivers in the Lake Erie basin. We are also sampling the Tittabawassee River, a tributary to Saginaw Bay in Lake Huron, and the St. Joseph River, a tributary to Lake Michigan, where adult Grass Carp have been captured. To better understand abiotic conditions related to spawning activity we have worked with the regional Water Science Centers to add stream temperature sensors and real-time monitoring in the Maumee River, Portage River, Cuyahoga, and Tittabawassee Rivers. Temperature and flow data will be required to model spawning locations if eggs are collected.

Acoustic Telemetry

Forty-eight receivers have been deployed and downloaded in US nearshore areas of Lake Erie. An additional 18 were deployed in Canadian in 2021 (COVID restrictions prevented deployment in 2020). We will download data from all 66 nearshore receivers before winter 2021. We are also updating 3 of the receivers in hotspot areas of GC movement with near-realtime receivers whose data can be downloaded without removing from their mooring. With our colleagues at Michigan State University, I am also analyzing the entire timeseries of Grass Carp tag detections examining basin wide movement patterns and exploring abiotic drivers. Within the Sandusky River, we have two fine-scale telemetry receiver arrays deployed to examine local habitat (<1 m accuracy) use of Grass Carp during spawning and non-spawning periods and the response of individual fish during removal efforts. Initial results from this research are being used by strike teams to maximize efficacy of Grass Carp removal efforts.

FluEgg Modeling

The FluEgg drift model was successfully used to identify a primary grass carp spawning area in the Lower Sandusky River prior to the removal of Ballville Dam at Fremont, OH. However, the dam removal in September 2018 and subsequent capture of well-developed grass carp eggs at the previously known spawning site in 2019 necessitated identifying potential spawning sites upstream of Fremont. The underlying hydraulic model of the Sandusky River was extended about 37 km upstream to Tiffin, OH, and FluEgg modeling is currently underway to determine the most probable spawning sites of approximately 960 staged grass carp eggs captured during four spawning events in 2019. Spawning areas will be identified once all FluEgg simulations are complete and the results are compiled and fully analyzed (results expected by the end of FY21). Publication of the results of this work is expected in FY22.

Probable grass carp spawning areas in the Maumee River were identified in early FY21 using the FluEgg drift model and 2017-2019 grass carp egg and larvae samples. A total of twelve probable grass carp spawning areas were identified over a 77-km reach of the Maumee River between Independence Dam near Defiance, OH, and the Ohio Turnpike bridge near Perryburg, OH. Nine of the

spawning areas are located downstream of the Grand Rapids and Providence Dams. Additional FluEgg modeling is underway to determine the river conditions (e.g. discharge, mean velocity, and water temperature) and spawning sites that have the highest risk of recruitment based on in-river egg hatching probability. This large FluEgg modeling effort includes simulations of other invasive carp species (bighead and silver) as well as several native species to support individual-based bioenergetics modeling by NOAA. FluEgg modeling is expected to be completed in FY21 with analysis and publication of the results in FY22.

Efficacy of an Oblique Bubble Screen System as a Two-Way Dispersal Barrier for Invasive Carp
The goal of this project is to develop a two-way oblique bubble screen (2WOBS) system to both entrain and inhibit downstream dispersal of invasive carp eggs and larvae and deter the upstream movement of adult carp attempting to reach spawning areas. While bubble screens/curtains have proven to substantially inhibit passage of adult invasive carp with 80% or greater efficacy (Zielinski and Sorensen 2016, Dennis et al. 2019), work to date has exclusively been one-directional, designed to stop either upstream or downstream movement. Oblique bubble screens, deployed across a channel at an angle to the flow, are an emerging technology in the fight against plastic pollution. Recent pilot studies have demonstrated a mean efficacy of 86% in trapping and collecting plastic particles > 1mm from flowing rivers and canals.

Beginning in Q4 of FY21, a series of laboratory experiments will be conducted in collaboration with the University of Illinois at Urbana-Champaign (UIUC) to identify the optimum 2WOBS configuration for capture of invasive carp eggs and larvae using size- and density-matched synthetic particles. Efficacy will be assessed based on the percentage of particles entrained and captured by the 2WOBS system for a wide range of flow conditions, representative of known spawning events. Proof of satisfactory efficacy (> 50%) of 2WOBS technology as an invasive carp egg and larval dispersal barrier is essential to justify funding for live fish experiments in FY22.

Assessing Spawning Risk
A University of Toledo graduate student, Sabrina Jaffe, used USGS-University of Toledo data from egg sampling between 2015-2019 to develop an empirical model for likelihood of spawning based on flow and temperature. Using a Bayesian approach, she first established the likelihood of spawning as a function of discharge and water temperature in the Sandusky River. Those results suggested spawning is most likely to occur when discharge is above 10 m^3/s and water temperatures below 25℃. Using stream-specific discharge-velocity relationships, the Sandusky River model results were extrapolated to determine the risk of grass carp spawning in eight other tributaries of Lake Erie. The Maumee, Grand, and Cuyahoga rivers in Ohio have the highest risks of spawning. The model provides a mechanism for setting research and management priorities to develop management strategies aimed at preventing the establishment of a breeding grass carp population in Lake Erie. Furthermore, the Bayesian model can be updated with data from another river to incorporate river-specific features to identify likely spawning locations.

Sea Lamprey
A journal manuscript titled “Gut bacteria associated with larval, juvenile, and adult sea lamprey (working title),” is in revision. The work is a product of collaboration between USGS-GLSC (Murulee Byappanahalli and Nick Johnson) and the University of Minnesota (Prince Mathai and Michael Sadowsky). The main goal of this research was to identify and characterize bacterial communities in sea lamprey during their different physiological stages using high throughput sequencing. Our working hypothesis was that bacterial communities would differ among life stages and become less complex and more specialized in parasitic juvenile sea lamprey because they feed exclusively on blood and bodily fluids. We found significant differences in the gut bacterial communities among the larval, parasitic juvenile, and adult life stages; the transition from larval to the parasitic juvenile stage was marked with a significant shift in bacterial community structure and reduction in alpha diversity (i.e., species richness). In summary, understanding the role of host-associated microbes (bacteria, fungi) in sea lamprey fitness may provide new insights into the rearing of lamprey and the development of new lamprey control strategies.

Contact: Patrick M. Kočovský, U.S. Geological Survey, 419-625-1976, pkocovsky@usgs.gov

State/Provincial

Illinois
No update provided.

Contact: Kevin Irons, Illinois Department of Natural Resources, 217-557-0719, kevin.irons@illinois.gov

Indiana
No update provided.

Contact: Eric Fischer, Indiana DNR, 317-234-3883, efischer@dnr.in.gov

Michigan

No update provided.

Contact: Sarah LeSage, Michigan DEQ, 517-243-4735, lesages@michigan.gov

Minnesota

June 2021

- Plant grants: The MN DNR awarded 175 grants to support management of invasive aquatic plants by partners, and offered up to $530,000 in reimbursements in 2020. The MN DNR has awarded 148 grants, and will be offering up to $430,000 in reimbursements in 2021.
- The DNR, with funding from the Great Lakes Restoration Initiative administered by the U.S. Fish and Wildlife Service, began a project in June 2019 focused on trade pathways for AIS. The DNR's trade pathways specialist supported through this funding is working with a contractor to conduct an assessment of the availability of invasive species at pet stores and seafood markets in Minnesota. We conducted targeted outreach to restaurants and crayfish distributors regarding regulations associated with using invasive crayfish in crayfish boils. We are also contributing to multiple trade-related efforts at the Great Lakes Regional level.
- The DNR facilitated discussions of the Western Lake Superior AIS Working Group and developed a general framework for response communications that incorporates regional-level processes.
- We have updated the DNR's AIS response plan and are working on updating our state invasive species management plan.
- The DNR is continuing the statewide nonnative Phragmites control effort started in the fall of 2020. The DNR's control efforts are focused on areas of the state where it occurs in a limited number of small infestations. This fall the DNR worked with local partners to treat nonnative Phragmites in several small sites in Stearns and Kandiyohi counties. DNR staff are working with MAISRC researchers to coordinate treatment throughout Minnesota in 2021.
- The DNR is funding continued research on starry stonewort by Mankato State University researchers. Current research is focused on starry stonewort phenology and carbohydrate allocation to help pinpoint the most effective times for treatment.

Contact: Heidi Wolf, Minnesota DNR, 651-259-5152, heidi.wolf@state.mn.us

New York

- Seasonal hydrilla control efforts are slated to begin in early June/July in Cayuga, Erie, Niagara, Tioga, Tompkins, and Westchester Counties.
- NYS Watercraft Inspection Steward Program officially begins its seasonal outreach on May 28, 2021. For the first time the program will cover some marine launches.
- NYSDEC continues to collaborate with NE states on Asian clam/zebra mussel eDNA project.
- NYSDEC will continue outreach efforts to pet trade and aquatic gardeners.
- NYSDEC is collaborating with SePRO and University of Hartford on herbicide testing for treatment of European frogbit.
- NYSDEC, in collaboration with USFWS and the State University of New York at Stony Brook, will be conducting a pilot treatment of Ludwigia peploides in the Peconic River this season.

Contact: Catherine McGlynn, New York State Department of Environmental Conservation, 518-408-0436, catherine.mcglynn@dec.ny.gov

Ohio

Ohio GLP Report

• Continued following the Lake Erie Grass Carp Response Strategy (2019-2023) with the deployment of multiple Grass Carp Strike Teams through the University of Toledo dedicated to the eradication of Grass Carp from the western basin of Lake Erie. Over 300 adult Grass Carp have been removed to date. We continue to track tagged Grass Carp with the GLATOS system and real-time receivers, and we are working through the University of Toledo to determine Grass Carp catchability and population size. Partners also include Michigan DNR, GLFC, USFWS, and USGS.

• Working with the GLFC, Michigan DNR, and USGS to develop a seasonal Grass Carp behavioral barrier on the Sandusky River to prevent their movement to spawning habitat. We are working through the USACE Great Lakes Fishery and Ecosystem Restoration program on design and construction funding.

• Continue closure for the three of the four Great Lakes Mississippi River Interbasin Study connections in Ohio at the Ohio Erie Canal, Little Killbuck Creek, and Grand Lake St Marys: 1) The USACE completed the closure of the Ohio Erie Canal connection in March 2020; 2) We completed the appraisals for the Little Killbuck Creek and started landowner negotiations in late 2021; 3) The preliminary design for the final phase to close the connection at Grand Lake St Marys has been completed and final design will be completed in 2022.

• Continue the surveillance of Ohio's bait supply chain to determine if AIS, including Bighead and Silver Carp, are being transported

through the bait trade.
• Continue the AIS outreach campaign through Wildlife Forever to target anglers moving bait. This outreach program includes billboards, print media, and items for distribution at events with the slogan “Trash Unused Bait”.
• Participated in the following groups: Great Lakes Panel, Ohio Aquatic Invasive Species Committee, and Asian Carp Regional Coordinating Committee.

Contact: John Navarro, Ohio DNR Division of Wildlife, 614-265-6346, john.navarro@dnr.state.oh.us

Ontario
No update provided.

Contact: Francine MacDonald, Ontario Ministry of Natural Resources, 705-755-5136, Francine.macdonald@ontario.ca

Pennsylvania
No update provided.

Contact: Jim Grazio, Pennsylvania DEP, 814-217-9636, jagrazio@pa.gov

Quebec
Quebec MFFP published its strategic management plan on invasive species on May 25th. This plan details the broad axis of actions, the multiple challenges, and potential solutions to advance management of invasive species in Quebec. Copies of the plan (only available in French) are available upon request to Olivier Morissette.

Tench - We recently published an article in the Canadian Journal of Fisheries and Aquatic Sciences about migratory capacity of tench, assessed by otolith chemistry. The study show tench is displaying migratory behaviour in the system, with consistent connectivity between different colonized habitat.

Morissette, O., Lecomte, F., Vachon, N., Drouin, A., and Sirois, P. 2021. Quantifying migratory capacity and dispersal of the invasive Tench (Tinca tinca) in the St. Lawrence River using otolith chemistry. Canadian Journal of Fisheries and Aquatic Sciences. https://doi.org/10.1139/cjfas-2020-0460

Spiny waterflea – We published a technical report on Quebec surveillance network for spiny water flea and fishhook water flea, summarizing detection effort from 2015 to 2019. Network operate by simultaneous use of eDNA and zooplankton net surveys and detection spiny water flea in the St. Lawrence River (since 2015) and Temiscamingue Lake (2018) and fishhook water flea in the Upper Richelieu River (2019).
https://mffp.gouv.qc.ca/documents/faune/RA_detection_cladoceres%202015-2019.pdf

Contact: Olivier Morissette, Quebec Ministère des Forêts, de la Faune et des Parcs, 418-627-8694 x7519
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Wisconsin
No update provided.

Contact: Carroll Schaal, Lakes & River Section Chief, Bureau of Water Quality, Carroll.Schaal@Wisconsin.gov

Regional/Binational

International Joint Commission
No update provided.

Contact: Mark Burrows, International Joint Commission, 519-257-6709, burrowsm@windsor.ijc.org

Great Lakes Fishery Commission
No update provided.

Marc Gaden, Great Lakes Fishery Commission, 734-662-3209 x14, marc@glfc.org

Great Lakes Commission
GLP member update
Invasive Mussel Collaborative

- Produced a video summarizing the invasive mussel control project on Good Harbor Reef.
- Continued to support two work groups surrounding priority issues identified at the September 2019 annual meeting.
- Established a process for invasive mussel research coordination and prioritization under the Research Work Group.
- Continued to develop and improve a summary document of available control methods and associated literature, case studies, and permitting information.
- Worked with the U.S. FWS to develop protocols and procedures for disposal of invasive mussel-infested moss balls sold at aquarium shops.
- Hosted two webinars, the first discussing approaches and guidance for socially-distance boater interactions in accordance with COVID-19 safety guidelines, and the second reviewing recent invasive mussel control studies.
- Maintained an active communication network, including a comprehensive website, email list with over 400 subscribers, and a biweekly newsletter.

Great Lakes *Phragmites* Collaborative

- Prepared a communications plan to distribute the GLPC Common Agenda in fall 2020.
- Established a process to evaluate the progress of the GLPC.
- Regularly convened an Advisory Committee to guide the work of the GLPC and foster interjurisdictional partnerships.
- Hosted an ongoing webinar series where guest speakers shared successful models for *Phragmites* management, public outreach, and collaborative governance.
- Convened the *Phragmites* Symbiosis Collaborative, a forum for researchers to share and collaborate on their microbial or genetic research.
- Planned a *Phragmites* symposium at the Upper Midwest Invasive Species Conference with invited speakers from across the Great Lakes.
- Updated the GLPC website (www.greatlakesphragmites.net) to meet the needs to our stakeholders.
- Distributing a biweekly newsletter that shares news, upcoming events, and relevant information to *Phragmites* management.
- Developed audience-specific outreach materials across various multi-media formats.

Phragmites Adaptive Management Framework

- Maintained ongoing communication with USGS and program partners to effectively coordinate efforts.
- Prepared a communications plan to distribute the strategic plan fall 2020.
- Prepared abstracts for presentations at upcoming conferences.
- Distributed PAMF newsletters featuring a blog post and upcoming events.
- Updated the PAMF Web Hub (https://www.ismtrack.org/pamf/) to improve the user experience and ensure the collection of high-quality management data.
- Adapted the 2020/21 outreach plan to shift all planned in-person engagement to a remote format and included offering two remote training sessions, monitoring assistance and video assistance.
- Published a virtual learning experience for PAMF participants that includes recorded presentations, helpful guides, FAQ documents, and quizzes all structured in easy-to-follow modules (https://www.greatlakesphragmites.net/pamf/training/).
- Distributed the first Annual Management Unit Summary documents that provide an annual progress report of *Phragmites* management efforts for each management unit enrolled in PAMF.
- Developing an alternative management guidance structure that will make PAMF guidance more achievable to a portion of participants.
- Enrolling new management units for the 2021/2022 PAMF cycle year.

Interstate Aquatic Invasive Species Prevention, Early Detection, and Response (Phase III)

- Convened a virtual meeting of project team members to present options for formalizing the regional communications plan.
- Finalized the regional communications plan to be used with the existing response framework developed as part of Phase II of this project.
- Integrated the communications plan into the existing surveillance and response plans developed under previous phases of this project.

Interstate Aquatic Invasive Species Prevention, Early Detection, and Response (Phase IV)

- Coordinated and hosted a virtual Great Lakes regional surveillance coordination meeting.
- Upcoming work includes assisting The Nature Conservancy in planning and holding a series of workshops to improve and refine the Great Lakes surveillance site prioritization system.

Great Lakes Detector of Invasive Aquatics in Trade

- Provided sale information at the request of managers and other partners.
- Investigating functionality of novel web tools in the marketplace and potential role in assisting collection, analysis, and dissemination of Great Lakes AIS information.
- Identified third-party web scraping tools that may be used to support GLDIATR and contracted with those companies to support project activities.

Blue Accounting – Aquatic Invasive Species issue

- Held webinars with the Blue Accounting AIS work group in December 2020 and February 2021

- Developed a prototype dashboard related to the organisms in trade (OIT) pathway to track progress on regional consistency in regulatory policies.
- Participated in refining the prototype web platform for Blue Accounting 2.0
- Upcoming activities include refining the OIT dashboard with guidance from the work group, and scoping development of data visualizations to track progress on the control of established species.

Additional Activities

Continued support for the annual "AIS landing blitz" event that was held in June-July 2020 and finalized an event summary fact sheet and story map to educate boaters, anglers and other recreational users on steps they can take to prevent the movement of AIS (https://www.glc.org/work/blitz).

Contact: Tom Crane, Great Lakes Commission, 734-971-9135, tcrane@glc.org

Canadian Federal

Fisheries and Oceans Canada

No update provided.

Contact: Lynn Bouvier, Fisheries and Oceans Canada, 905-336-4981 Lynn.Bouvier@dfo-mpo.gc.ca

Ballast Water Research

No update provided.

Contact: Sarah Bailey, Fisheries and Oceans Canada, 905-336-6425 Sarah.Bailey@dfo-mpo.gc.ca

Contact: Becky Cudmore, Fisheries and Oceans Canada, 905-336-4474, becky.cudmore@dfo-mpo.gc.ca

Transport Canada

No update provided.

Contact: Chris Wiley, Transport Canada, 519-464-5092, chris.wiley@tc.gc.ca

LOCAL COMMUNITIES

United States

No update provided.

Contact: Vacant

Canada

No update provided.

Contact: Vacant

Private Environmental/User Groups

Great Lakes Sport Fishing Council

No update provided.

Contact: Dan Thomas, Great Lakes Sport Fishing Council, 630-941-1351, dan@great-lakes.org

Tribal Authorities

Great Lakes Indian Fish & Wildlife Commission

No update provided.

Contact: Miles Falck, Great Lakes Indian Fish & Wildlife Commission, 715-682-2124, miles@glifwc.org

Chippewa Ottawa Resource Authority

No update provided.

Contact: Mike Ripley, Chippewa Ottawa Resource Authority, 906-632-0043, mripley1@chippewaottawa.org

PRIVATE/COMMERCIAL

Council of Great Lakes Industries
No update provided.

Contact: Vacant

Lake Carriers' Association
No update provided.

Contact: Tom Rayburn, Lake Carriers' Association, 440-333-9994, rayburn@lcaships.com

University/Research

Great Lakes Sea Grant Network-Research and Extension
No update provided.

Contact: Rochelle Sturtevant, NOAA Great Lakes Sea Grant Network, 734-741-2287, Rochelle.Sturtevant@noaa.gov

Cooperative Research Unit
No update provided.

Contact: Tom Johengen, Cooperative Institute for Limnology and Ecosystems Research, 734-741-2203, johengen@umich.edu

At-Large

Invasive Species Centre
Since the last GLP meeting, the ISC has continued working on meeting the deliverables of our 4-year agreement with Fisheries and Oceans Canada for the Asian Carp Canada program. Some of the completed projects include updating www.asiancarp.ca with a new design and new webpages including economic and ecological impacts, as well as a test your knowledge quiz page. We have completed digital awareness campaigns through social media, angling influencers, and angling specific websites. We have also hosted virtual information sessions that target anglers, and highlighted Canadian research. The program finalized the creation of a digital Asian carp media kit housed on our website and we continue to promote work related to Asian carps through our webinar series.

We have also taken on zooplankton diagnostics work where we analyze water samples for presence or absence of invasive mussel veligers and spiny water flea in in-land lakes across Ontario. In addition to this work, we have launched a volunteer-based pilot program, IsampleON, where Lake Associations collect samples that they will then send to our lab to be tested for presence or absence of veligers.

The ISC is also working with many partners to develop a Phragmites framework for Ontario through our Green Shovels program.

Finally, the ISC is the conference secretariat for the International Conference on Aquatic Invasive Species (ICAIS), and is currently planning for the 22nd ICAIS, which will be a hybrid in-person and virtual conference taking place April 18-22, 2022 in Belgium. Details can be found on www.icais.org.

Contact: Rebecca Schroeder, Invasive Species Centre, rschroeder@invasivespeciescentre.ca

Minnesota Aquatic Invasive Species Research Center
No update provided.

Contact: Nick Phelps Minnesota Aquatic Invasive Species Research Center, 612-624-7450 phelp083@umn.edu

Invading Species Awareness Program, Ontario Federation of Anglers and Hunters

Ontario's Invading Species Awareness Program (ISAP) is a collaborative initiative led by the Ontario Federation of Anglers and Hunters (OFAH) to prevent the introduction and spread of invasive species to Ontario's forests and waters and to protect Ontario's biodiversity. In partnership with the Ministry of Natural Resources and Forestry (MNRF), the program engages and assists industry, citizens, communities, and government agencies to undertake prevention, monitoring, control, and outreach activities.

Program staff have been busy developing new programs and resources to increase public awareness and reporting. Staff completed a new fact sheet that provides anglers with more focused information on the identification of a suspected Grass Carp, as well as

specific information on what to do with a fish that is suspected to be a Grass Carp. This fact sheet was circulated to approximately 47,000 OFAH members through an e-blast, and hard copies were offered to OFAH affiliated conservation clubs in the Great Lakes watershed.

The ISAP continued to utilize Facebook, Twitter, and Instagram to engage the public in invasive species awareness. Overall, between April 2020 and February 2021, the program gained many new followers on Facebook, Twitter, and Instagram. Through these social media platforms, the ISAP achieved over 1.6 million digital impressions with our posts and got the conversation going with over 104,000 engagements. The ISAP YouTube channel had 6.9 thousand views, resulting in 224 total hours watched.

The ISAP hired an Outreach Liaison in November who is focused on the recreational boating pathway through the delivery of a new Water Steward Program. This program promotes aquatic ecosystem stewardship by engaging volunteers in the Clean, Drain, Dry messaging through training workshops, as well as volunteer handbooks, tool kits, and resources, for use by volunteers in their community. Participants become trained stewards and assist the ISAP with encouraging recreationalists, such as boaters, to take deliberate actions to prevent the spread of invasive species.

Program staff have been working with the Coalition of Haliburton Property Owners' Associations (CHA) to share knowledge regarding Chinese and banded mystery snails, including identification, impacts, and what people can do. Staff worked with the Bancroft MNRF office to acquire a scientific collector's permit, which enables on-the-ground management by volunteers, while being supported and guided by ISAP expertise.

Contact: Sophie Monfette, Ontario Federation of Anglers and Hunters, 705-748-6324 ext. 274, sophie_monfette@ofah.org

The Nature Conservancy
No update provided.

Contact: Lindsay Chadderton, The Nature Conservancy, 574-217-0262, lchadderton@tnc.org

Wildlife Forever

- The past year was one of the most challenging in recent history. Tragically, over 500,000 Americans lost their lives as the pandemic rippled through nearly every element of our society and as millions of people sheltered in place, a few glimpses of hope emerged. In record numbers, people used the outdoors as a safe place to escape and recreate. Fishing license and equipment sales rose an estimated 30-40% generating one billion dollars of excise tax revenue for state fish and wildlife management. Boat sales were in such demand that dealers could not find new or used inventory to sell. Nearly every sector of the outdoors saw record increases in participation, including hunting. Unfortunately, the threats from invasive species spread followed nearly every trend. While COVID-19 significantly halted on-the-ground state and federal invasive species prevention programs, Wildlife Forever and many partners forged ahead to ensure Clean Drain Dry program materials were on the landscape.
- A few highlights since our last GLP meeting include:
- $1.1 million invested to build boat ramp cleaning stations, develop new state and local marketing campaigns, create marketing tools for coalition partners, and manage the spread on the ground covering hundreds of acres.
- 85 million media impressions through TV, print, social media and more.
- Advocated federal leadership and increased invasive prevention activities on 2.3 million acres of newly opened public land/water. Connections between the pandemic and invasive species prevention are undeniable. Best practices (Clean Drain Dry) supported by science, diligent hygiene, and a heightened sense of awareness, can have tremendous impacts on slowing the spread. Our science community does, can, and will develop new tools for control and eradication of invasive species. But we need the entire outdoor community to be engaged. Prevention investments and industry engagement must become national priority. States can and should leverage greater partnerships and utilize excise and tax revenues paid by users to vigorously protect our public lands and waters. Investments in prevention and education to new and old recreational users are needed today if we are to maintain new use trends and sustainable resources.

Contact: Pat Conzemius, Wildlife Forever, 763-253-0222, pconzemius@wildlifeforever.org

Minnesota Sea Grant

- St. Louis County AIS Check-In Check-Out Webhub Project: Developing a new program at water accesses using a webhub app, signage and markers to help improve boater compliance using Stop Aquatic Hitchhikers! Clean-Drain-Dry messages. Will teach boaters how to use app, inspect specific areas based on watercraft type, and pilot F2F survey and observation guidance.

- BWCAW AIS Signage Project: Developing new AIS signage with a watershed message for trailheads and water accesses to help prevent spread of AIS into the BWCAW. Coordinating national signage inventory in a concurrent project with ANSTF to populate the Stop Aquatic Hitchhikers! campaign graphics portal (https://stopaquatichitchhikers.org/campaign-resources/).
- Don't Pack A Pest virtual student focus groups (5) were held for Duluth, Crookston and Morris campuses, which provided valuable information concerning their knowledge, risks and packing behaviors. Data organization ongoing. Phase 2 for private colleges approved for funding.
- Zebra Mussels and Moss Balls Risk – Supported USFWS's efforts to develop national guidance for retail outlets and hobbyists concerning moss ball disposal and equipment treatment. Good cohesive response nationally, but not locally. As such, Sea Grant engaged Duluth CISMA to assess risk for NE MN area retailers (pet, water garden, garden centers, floral, home décor). Good news! None sold them via those retailers, other than at PETCO, PetSmart and Walmart.
- MN State Plan Revision: Very favorable pre-review comments from ANSTF, NOAA and in-state organizations that will help strengthen plan. Goal: ANSTF approval at fall meeting.
- Western Lake Superior AIS Collaborative: Established communication framework.
- Gathering Partners Conference (May): Presented Silent Invasion of the Great Lakes.
- IAGLR (May): Presented Reporting Underreported Aquatic Invasive Species Sightings in Northeastern Minnesota at the Int'l Conference on Great Lakes Research Conference.
- ICAIS 22: Serving on technical planning committee for Int'l Conference on AIS, April 18-22, in Belgium. More info: here.

Contact: Doug Jensen, Minnesota Sea Grant, 218-590-7164, djensen1@umn.edu

Saint Lawrence Seaway Development Corporation

Seaway News
As of December 31, 2020 the SLSDC's name was revised. "Great Lakes" was added to the
beginning of the name to make it "Great Lakes St. Lawrence Seaway Development Corporation." The acronym "SLSDC" was changed and shortened to "GLS."

The Ballast Water Working Group and the 2020 Joint Ballast Management Exam Program

The Great Lakes Seaway Ballast Water Working Group (BWWG) is comprised of representatives from the U. S. Coast Guard (USCG), the Great Lakes St. Lawrence Seaway Development Corporation (GLS), Transport Canada - Marine Safety & Security (TCMSS), and the Canadian St. Lawrence Seaway Management Corporation (SLSMC). The group's mandate is to develop, enhance, and coordinate binational compliance and enforcement efforts to reduce the introduction of aquatic invasive species via ballast water and residuals. To that end, the BWWG conducts the Joint Ballast Management Exam Program and has been actively engaged in providing an energetic response to calls for tougher ballast water regulation of ocean-going vessels transiting the Seaway.

Since 2006, ballast water management regulations in the Great Lakes and St. Lawrence
Seaway system have been the most stringent in the world, requiring ballast water exchange, saltwater flushing of ballast tanks that have only residual amounts of ballast water (fully implemented in 2008), detailed documentation, and increased inspections. Civil penalties may be issued for non-compliance. Independent research by the Fisheries and Oceans Canada (Science) found that the risk of a ballast water mediated introduction of aquatic invasive species into the Great Lakes has been reduced significantly since these requirements were fully implemented.

The Joint Ballast Management Exam Program is a comprehensive approach involving detailed vessel inspections. The inspection begins with a thorough review of ballast water reports, logs, records, and ballast water management plans. The crew is interviewed to assess their understanding of the requirements of the vessel's Ballast Water Management Plan as well as answer questions on actual practices. Finally, ballast tanks are sampled (GLS, SLSMC, TC) for the required minimum salinity (30 ppt) or the presence of mud, which would suggest that a satisfactory management practice was not employed.

For vessels fitted with Ballast Water Management Systems (BWMS), the USCG updated its policy in 2017 and transitioned from conducting physical tank sampling for confirmation of saltwater exchange or flushing on such ships, to, instead, verifying compliance of the BWMS with USCG Approved or Alternate Management System requirements. Under this revised policy, USCG officials normally 1) determine the vessel's ballast water management system compliance date, 2) verify the vessel's ballast water management method(s), 3) verify required reporting and recordkeeping requirements, and 4) ensure the vessel is in compliance with regulatory requirements in 33 CFR 151, Subparts C and D. Note that all tanks the USCG does not physically sample due to the presence of a BWMS are tested for salinity compliance by the other cooperating agencies.

Due to COVID-related border restrictions, the U.S. Coast Guard was unable to travel to Canada during 2020 and had to conduct Ballast Water Compliance Exams administratively. In spite of the COVID emergency, the Seaway administrations and Transport

Canada were able to maintain physical testing of all ballast tanks on all ships entering the Great Lakes during 2020. To do so safely, the ballast management exam procedures were adapted to minimize chances for COVID exposure and spread among the inspectors and crew. Details related to the COVID-19 procedures can be found in Chapter 3 of the 2020 BWWG report (see link below).

It is notable that during the 2020 shipping season, the BWWG was able to maintain the vessel inspection program in spite of the logistical challenges brought by the COVID emergency.

2020 Results Summary:

During the 2020 shipping season:
o 100% of ballast tanks were assessed via sampling or administrative review
o Total tanks capable of carrying ballast water – 10,628
o Total tanks physically sampled – 10,453 (98.4%)
o Total tanks evaluated by administrative review – 175 (1.6 %); of these, 75 tanks could not be tested on 37 vessels due to the COVID-19 protocols (sounding tubes were within the vessels' accommodation spaces).
o Total tanks with a satisfactory ballast water exchange – 10437
o A Letter of Retention was issued for 191 tanks on 55 vessel transits
> 39 tanks had low salinity
> 152 tanks had improper reporting, carriage of liquids (other than ballast water) or were not accessible for testing.

The current effectiveness of ballast water exchange/salt water flushing, the installation of Ballast Water Treatment Systems, and the BWWG's detailed screening efforts to support aggressive enforcement of current regulations have produced a high compliance rate within industry and have proven to be effective means of managing ballast on the Great Lakes Seaway system.

The complete 2020 Summary of Great Lakes Seaway Ballast Water Working Group, was released in February 2021 and is available at: https://greatlakes-seaway.com/wp-content/uploads/2021/03/2020_BW_Rpt_EN.pdf.pdf

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National Wildlife Federation
No update provided.

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