

2019 Minnesota Aquatic Invasive Species Research and Management Showcase

Breakout session descriptions



Tools of the trade: Create your own AIS monitoring equipment

Megan Weber and Pat Mulcahy

You don't need a college degree or fancy title to help search for aquatic invasive species. Join this session to learn more about how you can build your own aquatic plant sampling rakes and zebra mussel samplers, best practices for your monitoring activities, and how to report what you find! We'll have some of the materials on-hand so you can see firsthand how it's done. We hope you'll leave the session with all you need to start up a personal monitoring program for your cabin, favorite lake, or wherever you like to visit Minnesota's beautiful lakes and rivers.



Phragmites: Effective strategies to reduce the statewide threat

Sue Galatowitsch and Julia Bohnen

Researchers in the MNPhrag Project have synthesized their findings into a framework for a strategic response to invasive *Phragmites*. The framework is detailed in the report: "An assessment to support strategic, coordinated response to invasive *Phragmites australis* in Minnesota." To facilitate effective control, different regions of Minnesota can be classified into four response levels that reflect the amount of effort and coordination that will be needed to achieve control. Regions with no known populations of invasive *Phragmites* will need to establish surveillance programs, while regions with many known populations will require significant control effort and ongoing monitoring, as well as surveillance for new populations. Efforts to control invasive *Phragmites* have begun or are ongoing in some regions, while in other regions more coordination is needed to create and implement a management plan. Multiple state agencies, including the Department of Natural Resources, The Department of Agriculture, and the Pollution Control Agency are each engaged in the eradication effort.

The role of baitfish in the spread of AIS: Identifying hazards and quantifying risks

Meg McEachran



Every year, millions of live fish are harvested from the wild, moved overland to retail stores, and sold for use as bait by recreational anglers in Minnesota, who may release or dump them into the water at the end of their fishing trip. The illegal release of live baitfish has been identified as a pathway for the introduction of aquatic invasive species and fish diseases that may be lurking in the bait supply, so it's important to understand these hazards and how they may present a risk to the health of wild fish in Minnesota. Come to this talk to understand how MAISRC researchers are identifying the riskiest hazards and determining if these small fish could be a big problem.

On the horizon: New projects launched this summer by MAISRC

Jake Walsh, Wes Glisson, Mikael Elias



Jake Walsh will discuss how a new Eurasian watermilfoil project – Will property values cool as AIS heat up? – aims to provide more information for making decisions about Eurasian watermilfoil in Minnesota by evaluating its economic impact on property values and predicting its abundance under current and future climate conditions.

Wes Glisson will present on how MAISRC researchers are collaborating with the Minnesota, Wisconsin, and Indiana DNR to compile and analyze data from the first starry stonewort control efforts in these states. This project will evaluate the efficacy of past starry stonewort treatments and translate findings into a readily usable form for stakeholders such as agency staff, lake associations, AIS management professionals, and policymakers.

Mikael Elias will present on his new zebra mussel control project that is investigating the importance of microbial signaling in complex biological processes, including biofouling. Using tailored, engineered enzymes, we show that disruption of microbial communication leads to profound changes in community structures and inhibition of biofouling processes. (*Note: this is in the 9:15 session only.*)

Narrowing our focus for biocontrol of common carp: KHV outbreaks in our own backyard

Nick Phelps and Isaiah Tolo

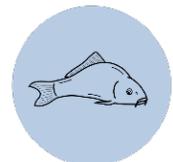


Since 2017, Minnesota has been the focus of international attention for outbreaks of emerging viruses, koi herpesvirus (KHV) and carp edema virus (CEV), in common carp mortality events. We have confirmed the presence of KHV in thirteen lakes, CEV in two lakes and co-infections in four lakes in the region – a dramatic increase in the known distribution of these viruses in North America and the first ever report of co-infections in wild carp. While these viruses may be bad news for the carp, they may be good news for AIS managers, offering a potential strategy for pathogenic biocontrol. We will discuss our long-term and conservative approach to evaluating the use of viruses to control carp, including lessons learned, recent results, and next steps.

Note: this session is only offered once.

New common carp management techniques

Przemek Bajer



This session will describe two methods for managing common carp. 1) We will talk about carps' intricate social feeding behaviors and how they can be exploited to train these fish to aggregate using bait, and then remove them from lakes. We will show carps' underwater feeding videos and demonstrate equipment used to remotely monitor carps' feeding aggregations at the bait. 2) We will explain how salmon-like spawning migrations that the carp exhibit each spring can be used to remove these fish using low-voltage electric guidance systems and the "Whooshh" system, repurposed as an automated carp cannon.

AIS values, perceptions, and willingness to pay: Lessons from summer lake surveys

Amit Pradhananga and Lucy Levers

We have very little information about Minnesotans' values regarding AIS, as well as their willingness to pay for AIS management and prevention. To fill this gap, MAISRC researchers conducted surveys of recreationists at four Minnesota lakes this summer. This session will discuss preliminary results from these surveys, as well as future steps for understanding how best to manage AIS.



Direct and indirect effects of zebra mussel and spiny waterflea on walleye

Gretchen Hansen

Minnesota lakes experience ecosystem-level changes following the introduction of zebra mussels and spiny water fleas. However, the effects of these AIS on fish are poorly understood and vary among lakes. We evaluated the impacts of zebra mussels and spiny water fleas on walleye and yellow perch in Minnesota's nine largest walleye lakes. We used stable isotope analyses to understand which habitats and food resources support walleye and other fish and to assess their position in the food web in each lake. Attend this session to learn what changes we found in walleye and perch that are living in lakes invaded by AIS, and what this means for future management.



Starry stonewort invasion in Minnesota lakes: Spread and plant community impacts

Carli Wagner

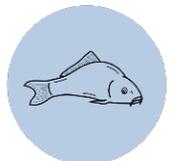
The invasive alga starry stonewort has become an increasing problem in Minnesota lakes since it was first identified here in 2015. In several lakes, starry stonewort is widely established and can grow abundant and dense. This growth certainly has recreational impacts, but the ecological effects of starry stonewort in Minnesota lakes are unknown. Potential impacts to native aquatic plants are of particular concern since they are an integral part of lake ecosystems. I examined the impacts of starry stonewort on native aquatic plants in three lakes: Koronis, Moose, and Winnibigoshish. I found that starry stonewort negatively affected multiple aspects of native aquatic plant communities – from individual species to functional groups to overall diversity and abundance. Starry stonewort can quickly expand and alter plant communities. These impacts are likely to have cascading effects in aquatic systems. These findings fill knowledge gaps related to the impacts of starry stonewort in lakes and can be used to guide response efforts. (Additional funding provided by the Minnesota Department of Natural Resources.) *Note: this session is only offered once.*



Engineering barriers to sexual reproduction: Applications for control of invasive carp

Mike Smanski

In this talk we introduce a novel method for biocontrol of invasive carp. Using genetic engineering, we aim to produce carp that are genetically incompatible with wild carp. The engineered males are released to mate with wild females, the fertilized eggs will not survive and the wild population will decrease over time. In this talk we introduce the strategy, describe the specific challenges to enable the technology in carp, and share our current progress. We will also share the results of a public opinion survey on using GE biocontrol methods to control invasive carp.



Factors influencing spiny waterflea entangling of various fishing gear

Donn Branstrator



Spiny water flea can dramatically diminish the abundance and biodiversity of native zooplankton. Although human recreational equipment is widely considered to be the most threatening vector of spiny water flea spread, we know little about the relative risk of fouling associated with alternative forms of recreational equipment. We simulated usage of fishing lines, downrigger cables, bait buckets, anchor ropes, and live wells in Island Lake Reservoir and Lake Mille Lacs in order to measure their susceptibility to fouling by spiny water flea. Gear was deployed during daytime hours and twilight hours on consecutive, 1 kilometer long transects. Anchors were deployed at the ends of transects. Results indicate that ensnarement risk associated with anchor lines is very low compared to most other gear types, and that ensnarement risk for some equipment can be dependent on time of day. Our results have the potential to inform recreationalists, managers, and AIS personnel on which gear needs the most vigilant decontamination attention.

Using big data to inform local decisions: Optimizing the location of watercraft inspectors

Bob Haight and Amy Kinsley

MAISRC collaborators Bob Haight and Amy Kinsley have been developing decision optimization models and visualization tools for use by counties to allocate limited inspection resources among various lakes and landings. The decision optimization models incorporate estimates of boat movements among lakes in each county and help managers make decisions such as: how many inspectors to hire, where to place inspection stations, and what time of day or week is ideal for scheduling, to achieve optimal intervention to slow the movement of aquatic invasive species. The visualization tool implements a heuristic model using an interactive web app, R Shiny, to allow users to explore a variety of options on their own. In this session, Bob and Amy will describe the models' utility in three case studies of Crow Wing, Ramsey, and Stearns County.



Restoring native plants after curlyleaf and milfoil control: What's holding them back?

Mike Verhoeven



Methods to control curlyleaf pondweed and Eurasian watermilfoil invasions are well-developed. We know that with the right dosing of the right chemical at the right time we can seriously knock back the populations of these two species. But why do we find ourselves returning year after year to kill the same plants? Why aren't the native plants rushing in to fill the open spaces, and soak up the light and nutrients following control efforts? We'll discuss the results of the first year of a new MAISRC project that seeks to find out where and when invader control will be sufficient to restore plant communities, and where more active measures will be required.

Low-dose copper-based control: Zebra mussel settlement and non-target impacts

Matthew Barbour and Angelique Dahlberg



In partnership with the Minnesota Aquatic Invasive Species Research Center, USGS researchers made a series of five, low-dose EarthTec® QZ (copper) applications to St. Albans Bay in Lake Minnetonka to target the early life stages of zebra mussels in July 2019. The goal was to maintain a concentration of 60 µg/L-Cu for a 10-day treatment period. The treatment was applied to the water above the thermocline (approximately 6.5 m) to reduce the total amount of molluscicide required thereby reducing cost and environmental risks. Five locations within both St. Albans (treated) and Robinsons (control) Bays were used to assess impacts to non-target species (zooplankton, benthic invertebrates, native mussels, and fish). Water chemistry and copper concentrations were monitored throughout the treatment period at each of these locations. Zebra mussel settlement samplers were deployed to assess treatment-related impacts on zebra mussel recruitment. If successful, this treatment approach may be a useful management tool to mitigate the impacts of zebra mussels by suppressing veliger recruitment.

The latest on hybrid watermilfoil in Minnesota

Ray Newman



Invasive Eurasian watermilfoil hybridizes with native northern watermilfoil. Surveys in Minnesota indicate that the hybrid is widespread, but more common in the metro area and that there is much more genetic diversity in the hybrid than pure Eurasian watermilfoil. Work elsewhere indicates that this greater diversity can allow genotypes that are more invasive or resistant to herbicides to emerge and become problematic. This session will review our past results and current plans to identify and assess hybrid genotypes that may become problematic. *Note: this session is only offered once.*

Using multibeam SONAR to detect zebra mussels

Jessica Kozarek and Daniel Buscombe



Zebra mussels pose a serious threat to Minnesota lake and river ecosystems. However, monitoring zebra mussel populations is challenging because current methods for detecting and counting zebra mussel colonies rely on time-consuming and expensive diving surveys, video imaging, or sampling of veligers (larvae), which limits the areas surveyed. Remote sensing techniques have been shown to quickly and efficiently gather spatially extensive information. Using this technology to detect zebra mussels would likely be much more efficient and more effective than traditional methods and could be used for early detection and warning in rivers, lakes and reservoirs and to track changes in zebra mussel density. We will present the preliminary results and future research plans for a two-phase project designed to test the utility of a swath mapping system, multibeam sonar, for detecting the presence and abundance of invasive mussels. In Phase I, laboratory experiments were conducted to test the feasibility of using multibeam sonar to distinguish zebra mussel containing substrates. Phase II is designed to further develop and test multibeam sonar monitoring approaches in the field. *Note: this session is only offered once.*

Findings: Cost-effective monitoring of lakes newly infested with zebra mussels

John Fieberg

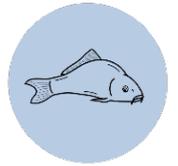
The current lack of standardized methods for surveying zebra mussels during their earliest stages of lake colonization limits our ability to track changes in density over time or to evaluate effectiveness of treatment programs (e.g., as required by DNR permits). We evaluated 5 different survey designs for estimating zebra mussel density (2 designs in 2017 and 3 designs in 2018), employing methods that utilize counts by two divers to estimate the probability of detecting mussels in the surveyed area. During this presentation, we will highlight our main findings and offer recommendations for survey methods useful for estimating distribution and abundance of mussels that can be implemented in recently infested lakes. *Note: this session is only offered once.*



Enhancing fish surveys: A novel technology for environmental DNA capture

Abdenour Abbas

In this talk I will be presenting our recent research on the development of a new sorbent for environmental DNA. The new sorbent allows the capture of large amounts of DNA from surface waters in a short period of time, surpassing the performance of commercially available filters. Such development is expected to enhance PCR analyses and significantly improve accuracy in fish surveys. *Note: this session is only offered once.*



Tour the state-of-the-art MAISRC Containment Lab

Note: you must have pre-registered for a lab tour.

Your assigned lab tour time is printed on your nametag.

MAISRC's on-campus lab and holding facility underwent a total renovation in 2016, making it one of the most state-of-the-art aquatic research facilities in the country. Attend this session to get an inside-peek at real research projects and hear from researchers who are doing the work. You will learn more about the Whooshh fish removal system (back by popular demand!), how researchers use sediment cores to determine how long spiny waterflea have been in a lake, and using koi herpesvirus to control invasive carp populations.

Note: This session is approximately a five-minute walk from the Conference Center. Please meet in the lobby (under the maroon sign) and a leader will walk everyone to the lab.

Research conducted at the Minnesota Aquatic Invasive Species Research Center is made possible through the support of the Environment and Natural Resources Trust Fund, the Minnesota Legislature, watershed districts, lakeshore associations, and other private and public sources.

Make a gift to support this work at www.maisrc.umn.edu.



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