



MINNESOTA AQUATIC INVASIVE SPECIES RESEARCH CENTER

2023 AIS Research and Management Showcase

Wednesday, September 20, 2023 Presentation Descriptions

Web Room 1

9:15 - 10 AM	Genetic Biocontrol of Invasive Species - Understanding Attitudes and Risk Perceptions Kiley Davan and David Fulton Recent advances in applied synthetic biology techniques hold promise for genetic biocontrol of aquatic invasive species (AIS) such as zebra mussel and common carp. If such techniques are developed, public attitudes and risk perceptions may influence if and how they are implemented. This project provides baseline information about Minnesota residents' attitudes and risk perceptions toward the use of genetic modification techniques for managing aquatic invasive species.
10:15 - 11 AM	Costs and benefits of AIS prevention in Minnesota Nick Phelps Managers have many options and limited resources for AIS prevention. To support their decision making, we have quantified the effectiveness of common AIS prevention methods and estimated the associated costs. The results have been built into a new application on the AIS Explorer that allows managers to develop plans and visualize the reduction in risk for a given budget. The development of the new tool and how to use it will be presented.
11:15 - 12 PM	Low Dose Copper to Reduce Zebra Mussel Recruitment Diane Waller and Matthew Barbour Zebra mussels occur in high densities in many lakes throughout Minnesota. One approach to management of these established populations is to reduce and maintain the population at a low level

	<p>by suppressing recruitment. We previously demonstrated that low-dose copper (60 µg/L Cu, as EarthTec QZ™) treatment in St. Albans Bay, Lake Minnetonka, reduced annual settlement for 2 years. In 2022, we conducted a similar low-dose copper treatment in a larger bay (Maxwell Bay) of Lake Minnetonka to determine the reproducibility of the first study and to further characterize the response of native communities to copper treatment. We will present the short-term effects of the treatment (2022 data) on zebra mussel settlement and native communities and preliminary results from 1-year post-treatment monitoring.</p>
<p>1:15 - 2 PM</p>	<p>Beyond the sign: Observing angler behaviors to inform prevention message development Ingrid Schneider</p> <p>Minnesota statute requires boaters and anglers perform a variety of cleaning and draining behaviors to prevent the spread of aquatic invasive species. Incomplete and inconsistent performance of these behaviors leaves Minnesota waterways at-high risk for infestation. To better understand behaviors and inform future prevention messaging, we observed anglers who fish from a boat and compared their behaviors with required behaviors. Learn about the results of these observations and how we plan to incorporate these findings into the development of augmented reality-based prevention messages for the next phase of our project.</p>
<p>2:15 - 3 PM</p>	<p>Lightning Round 3:</p> <ol style="list-style-type: none"> 1. Evaluating CO2/sound bigheaded carp deterrents in model lock/dam: Al Mensinger <ol style="list-style-type: none"> a. A model lock and dam has been constructed at the MAISRC containment lab. A combined carbon dioxide and acoustic deterrent is being tested to block the upstream passage of bigheaded carp in lock chambers. 2. Effective Rusty Crayfish Removals to Protect Wild Rice: Amanda Weberg and Liz Anderson <ol style="list-style-type: none"> a. This presentation will discuss the first season of a two-year study of testing trapping methods for the best removal of invasive rusty crayfish in six arrowhead region lakes. 3. Cultivating resilience: native revegetation for AIS resistance: Abha Panda <ol style="list-style-type: none"> a. Actively restoring native plant communities following invasive plant management in lakes may be a means to prevent re-invasion and build more invader-resistant plant communities. Our ultimate goal is to broaden the

	<p>AIS management toolbox by increasing capacity to establish more invader-resistant native plant communities.</p>
<p>3:15 - 4 PM</p>	<p>Acoustic Conditioning in Common Carp to Accelerate Removal and Reduce Cost Rebecca Bullers and Przemek Bajer</p> <p>Acoustic conditioning has the potential to be a useful tool in common carp (<i>Cyprinus carpio</i>) management. Bait and removal strategies have proven to be effective in carp removal, however, there are limitations in the number of carp that can be caught at once due to carp feeding at different times. The efficiency of these strategies may be significantly increased through acoustic conditioning by making feeding aggregations larger and more synchronized.</p>



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Web Room 2

9:15 - 10 AM	<p>County collaborations for watercraft inspection planning Amy Kinsley and Selina Cai</p> <p>Recreational watercraft have been shown as an important pathway of AIS spread. As a result, watercraft inspections have become an important component of AIS prevention, with programs operating at the state level by the Minnesota Department of Natural Resources and the local level primarily by counties funded through the AIS Prevention Aid. However, the sheer number of recreational boats moving across the landscape and the large number of waterbodies that can be a source or recipient of AIS make watercraft inspection a particularly difficult program to manage efficiently.</p>
10:15 - 11 AM	<p>Lightning Round 1:</p> <ol style="list-style-type: none">1. Attitudes toward RNAi methods for controlling invasive carp: David Fulton:<ol style="list-style-type: none">a. RNA interference (RNAi) methods suggest promising means for controlling invasive carp species as well as zebra mussels and other aquatic invasive species but people's attitudes towards such methods are unclear. Understanding attitudes toward RNAi are necessary for effective implementation.2. Zebra mussel impacts on fish mercury concentrations: Gretchen Hansen<ol style="list-style-type: none">a. Invasive dreissenid mussels (zebra and quagga mussels) can increase mercury concentrations in fish tissues via multiple interacting pathways. Dreissenid mussels form dense mats in the nearshore zones of lakes that lead to anoxia in sediments, leading to increased mercury methylation. Furthermore, food web

	<p>and habitat changes caused by invasive zebra mussels lead to fish relying more on nearshore food resources, which can increase exposure of fish to methylated mercury.</p> <p>3. Surveillance and control of Chytrid fungi in Minnesota amphibians: Amy Kinsley</p> <p>a. Amphibians play a critical role in maintaining ecosystem health. The global spread of the chytrid fungus <i>Batrachochytrium dendrobatidis</i> (Bd) has been associated with amphibian population declines and local extinctions, representing the greatest recorded biodiversity loss ascribable to a disease. However, an emerging chytrid fungus, <i>Batrachochytrium salamandrivorans</i> (Bsal), has been responsible for high levels of mortality in salamander populations in Europe, and an introduction into the United States could cause significant threats to amphibian biodiversity. In this proposed project, we aim to generate a risk model of Bsal across Minnesota and, in turn, inform management opportunities. We will use these outputs to inform surveillance and targeted science communication activities that serve as a basis for a statewide response plan.</p>
<p>11:15 - 12 PM</p>	<p>Optimizing eDNA monitoring for multiple aquatic invasive species Christopher Rounds and Anna Tosch</p> <p>Traditional monitoring for Aquatic species is time and resource intensive. Environmental DNA (eDNA) has the potential to alleviate key issues related to traditional monitoring, but questions persist about how eDNA detection probability can be optimized when sampling for multiple species. We tackle the optimization of eDNA sampling in 2 ways, by determining the best time to sample for AIS and the best field methods to capture eDNA. Our study focuses on four key AIS; Common Carp, Rusty Crayfish, Spiny Waterflea, and Zebra Mussels, but we believe our results are applicable to numerous AIS impacting Minnesota waterbodies.</p>
<p>1:15 - 2 PM</p>	<p>Developing RNA-interference based genetic biocontrol tools for invasive zebra mussels Daryl Gohl</p> <p>Zebra mussels (<i>Dreissena polymorpha</i>) are highly invasive in freshwater ecosystems where they cause significant ecological and</p>

	<p>economic damage. Eradication efforts using copper sulfate or other chemical methods are often unsuccessful, and chemical or physical controls generally lack specificity and impact many other species. To address the need for effective and specific inhibition of zebra mussels, we are working to develop RNA interference (RNAi)-based biocontrol tools.</p>
2:15 - 3 PM	<p>Can mechanical removal of invasive cattails benefit fish communities? Amy Schrank</p> <p>Nearshore aquatic vegetation in lakes provides crucial spawning, nursery, and feeding habitat for fishes, and essential habitat for prey such as aquatic invertebrates. Over the last century, invasive narrow-leaf and hybrid cattails have moved into nearshore regions of lakes across Minnesota. Invasive cattails form dense, homogenous stands that displace native vegetation and may have detrimental effects on fishes.</p>
3:15 - 4 PM	<p>Genetic method for control of invasive fish species Julie Badger</p>



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Web Room 3

9:15 - 10 AM	Frameworks for Modeling AIS Distribution and Spread John Fieberg and Alex Bajcz Improved understanding of the true distribution of aquatic invasive species (AIS) and more effective surveillance efforts are needed to support AIS prevention, rapid response, and control efforts. We will highlight two modeling frameworks we have developed for these purposes.
10:15 - 11 AM	Visitor and business perspectives about aquatic invasive species Amit Pradhananga A survey of visitors in Alexandria, Brainerd, and Ely was conducted to better understand their perspectives about aquatic invasive species (AIS). We also conducted a survey of Minnesota business owners/managers, as well as interviews with business owners/managers to examine their perceptions of AIS and AIS management. Findings suggest that both visitors and businesses perceive ecological risks of AIS, but may not necessarily perceive direct impacts of AIS on tourism.
11:15 - 12 PM	Lightning Round 2: 1. Culturing Microalgae to Support Aquatic Invasive Control Species: Ben Minerich a. Providing live algae as a food source for laboratory reared zebra mussels has resulted in better survival and growth compared to mussels fed concentrated and

	<p>preserved algae. We are exploring the impacts of different species of cultured freshwater algae to best support ongoing laboratory work on zebra mussel control methods.</p> <p>2. Developing streamlined detection assays for invasive fish pathogens: Isaiah Tolo</p> <p>a. This work addresses the overdue need for streamlined fish pathogen surveillance tools. There are many fish pathogens affecting fish in Minnesota, some have been here a long time, others have only recently emerged, some have not been observed but are suspected to be here already. These pathogens also vary in their relevance to fish health testing requirements. Keeping pace with the changes in fish diseases means that we need to continuously update the tools for screening fish especially in the case of regulatory significant invasive fish pathogens. This work introduces a simple scheme of consolidating quantitative PCR assays into multiplex assays that can be flexible to those changing needs.</p> <p>3. Genetic control of Grass Carp through RNA interference: James Wamboldt and Chris Merkes</p> <p>a. The goal of this project is to develop environmentally safe control technologies for the management, suppression, and removal of Grass Carp (GRC) in Minnesota waters using genetic tools incorporated in a selective bait. Upriver expansion of GRC in the Mississippi River threatens the regional ecology and economy of the Upper Mississippi River (UMR). Their overgrazing can damage aquatic vegetation communities, disrupt food webs, increase risk of wave erosion, and increase the risk of harmful algal blooms.</p>
<p>1:15 - 2 PM</p>	<p>Building a centralized database of watermilfoil strain geographic distribution and herbicide response for use in management decision-making Ray Newman, Ryan Thum, and Ashley Wolfe</p> <p>Non-native Eurasian watermilfoil (<i>Myriophyllum spicatum</i>) and its hybrids with native northern watermilfoil (<i>M. sibiricum</i>) are among the most commonly managed invasive aquatic plants in Minnesota. Some strains of watermilfoil, often hybrid watermilfoil (<i>M. spicatum</i> x <i>M. sibiricum</i>), are more difficult to control or less susceptible to particular herbicides.</p>

2:15 - 3 PM	Interference in Microbial Signaling to Mitigate the Spread of AIS Mikael Elias Microbes are present in all ecosystems, and their importance is key in numerous biological processes. We investigate how microbes and larger organisms, such as sessile aquatic invasive species coexist and cooperate. We found that interfering in microbial communication can result in reduced biocorrosion, biofouling, and adhesion of Zebra mussels. This can be achieved with biological additives, that could advantageously replace current chemicals used in coatings, and provide potent solutions that preserve the aquatic environments.
3:15 - 4 PM	Multibeam sonar zebra mussel mapping: Method development Jessica Kozarek We will present a summary of three phases of research to test the feasibility of utilizing sonar tools to map zebra mussel distribution in lakes and rivers. We will highlight lessons learned, best practices, challenges, and available tools.