WISCONSIN AQUATIC INVASIVE SPECIES

Management Plan

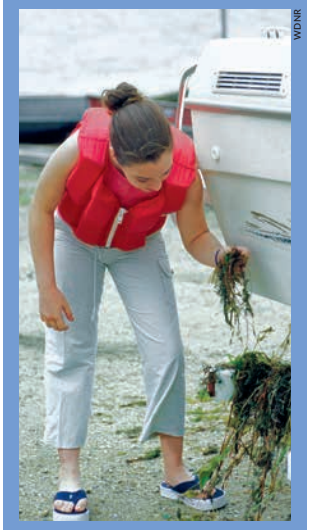
River Alliance of Wisconsin. Inset photo, WDNR

WISCONSIN GOALS:

- Prevent introduction of new species
- Contain the spread of existing species
- Control existing populations to minimize harmful impacts

JULY 2018

Jeffrey J. Strobel



WDNR

Alison Mikulyuk

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WDNR

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UW Sea Grant

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Executive Summary

Wisconsin's aquatic ecosystems are experiencing significant negative effects from aquatic invasive species (AIS) that are already present, and the state's waters and cultural resources are continually threatened by new invasions. The introduction of AIS into the Great Lakes and inland state waters is a source of biological pollution that has significant negative effects on natural resources, human health, recreational opportunities and other ecosystem services throughout the state and region. AIS may compete with native species for food and habitat and can directly and indirectly harm or displace native species, degrade habitat and alter food webs and energy flow. AIS can also have significant economic effects on waterfront property values, tourism, utilities and other industries.

Zebra mussels aggressively colonize hard surfaces, including the shells of native mussels.

AIS enter and disperse in Wisconsin waters through various human-assisted pathways, including maritime commerce, recreational activities, non-recreational fishing and aquaculture, canals and diversions, the trade of live organisms and tourism and development activities. Actions taken to date to prevent the introduction of new AIS include regulatory and voluntary efforts and educational programs to increase awareness and compliance with AIS prevention practices. Monitoring, surveillance, management and control efforts by a variety of partners have contained the spread and reduced negative impacts of AIS already in Wisconsin. However, much work remains to protect Wisconsin's waters from new introductions and to contain and control existing AIS populations so that valuable ecosystem services are retained.

Wisconsin has had an AIS management program since 2001 and drafted its first statewide AIS management plan in 2003. Since then, new invasive species have been found in Wisconsin, new technologies and methods have been developed to manage invasions and new regulatory programs have provided additional resources to the Wisconsin Department of Natural Resources (WDNR) and its partners to aid in AIS management. These changes have necessitated a revision of the current Wisconsin AIS Management Plan, which began in 2014 and ended in 2018.

Spiny water fleas can clog fishing lines.

This plan retains three main goals:

GOAL 1: Prevent the introduction of new AIS into Wisconsin

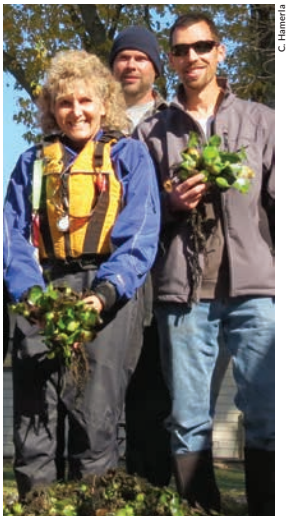
GOAL 2: Contain the spread of AIS in Wisconsin

GOAL 3: Control existing populations of AIS to minimize harmful impacts

One important difference in the new plan, however, is that it implements an approach that organizes strategies and actions by invasion pathway. This new approach will maintain the plan's relevance even as specific AIS threats change and will allow for effective action across a number of different species.

PATHWAYS:

- Maritime commerce
- Canals, dams and diversions
- Recreational activities and service providers
- Non-recreational fishing and aquaculture
- Aquatic survey and monitoring activities
- Transportation and utility corridors
- Organisms in trade



C. Hameria

Susan Graham

Amanda Perdzock

Photos: mussels and water fleas – WDNR

WDNR

Korin Doering, Fox Wolf Watershed Alliance

Bayfield County AIS Project

Wisconsin's continued success at AIS prevention, containment and control requires the establishment of priorities. The broad spectrum of challenges and limited resources requires that Wisconsin take a strategic approach and establish priorities to guide its AIS actions. A set of overarching priorities, as well as priorities that correspond to the plan's three goals, has been developed and is discussed below. Some priorities are continuations from the previous plan while others are new to the updated plan.

Overarching Priorities – *Prevent, Contain, Control*

Rusty crayfish displace Wisconsin's native crayfish and reduce aquatic biodiversity.

- Develop communication tools and strategies that promote sustainable behaviors among the state's water users
- Implement the AIS program through strong partnerships
- Maintain or increase funding levels and staffing
- Strive to find opportunities to strengthen interstate partnerships for consistent messaging and program implementation

Pathway Priorities – *Prevent, Contain*

Starry stonewort algae produce dense mats that disrupt aquatic communities and recreation.

- Expand recreational water user outreach beyond summer recreational boaters to waterfowl hunters, trappers, wading anglers, etc.
- Increase efforts to address organism in trade (OIT) invasion pathways by expanding outreach to industry and consumers and by developing collaborative solutions to prevent pet release and water garden disposal introductions

Management Priorities – *Contain, Control*

- Expand capacity within local organizations for citizen-based monitoring
- Use targeted, random and convenience approaches to AIS monitoring
- Work with other state and local organizations to implement the state's Response Protocol to ensure consistent responses to new invasions

Control Priorities – *Control*

New Zealand mudsnails outcompete native species that are a vital part of some aquatic food webs.

- Continue to refine existing AIS control technologies to make them more effective and/or to reduce non-target impacts
- Support research to develop new AIS control technologies
- Promote the use of Integrated Pest Management (IPM) principles in all management plans and efforts

Photos: crayfish – WDNR; stonewort – Brad Steckart; mudsnails – Paul Skawinski - Extension Lakes

Introduction

BACKGROUND

The introduction and spread of AIS into and throughout the state is a major concern to the residents of Wisconsin. Time and again, surveys and evaluations of the state's water users – including boaters, anglers, riparian owners, lake association members and others – indicate that AIS are a top concern and are considered a threat to the environment, the economy and quality of life. In general, AIS may:

- Outcompete native species for food and habitat, causing displacement or reduced populations of native species
- Change the composition and structure of aquatic communities, which can have negative cascading effects throughout aquatic food webs
- Alter sportfishing opportunities, negatively affecting the recreation and tourism industries
- Impede navigation and recreational boating activities
- Reduce aesthetic appeal and impact swimming opportunities
- Degrade habitat and negatively affect wildlife and water quality
- Degrade shorelines and beaches, affecting the recreation and tourism industries
- Negatively affect human and wildlife health through the spread of new diseases and pathogens
- Decrease property values
- Negatively affect commercially valuable species
- Increase costs to utilities and municipalities

Large-scale economic analyses show that invasive species cost the nation $120 billion per year (Pimentel et al. 2005) while ballast-borne invasive species cost Great Lakes states $230 million per year (Rothlisberger et al. 2012). More locally, the cost to regain water quality lost in Lake Mendota (Dane County, Wisconsin) due to the spiny water flea (*Bythotrephes longimanus*) was calculated to be millions of dollars per year (Walsh et al. 2016). In other lakes, the presence of AIS has been shown to lower waterfront property values (Halstead et al. 2003; Horsch and Lewis 2009; Zhang and Boyle 2010).

To help mitigate these issues, the WDNR and AIS partners across Wisconsin have been successful in competing for federal grant funding to work on AIS issues. An AIS management plan that guides the implementation of activities to prevent, contain and control the harmful impacts of AIS is vital to citizens of Wisconsin and the Great Lakes and the Upper Mississippi River Basins. Wisconsin also invests approximately $4 million of state funding each year to address AIS issues.


Sam Soulek


Alan Klein


Lester Public Library


Jonah Westrich

PURPOSE

This update to the 2003 Wisconsin AIS Management Plan is intended to guide the implementation of prevention, containment and control activities directed at the seven pathways identified as most responsible for the introduction and movement of AIS around the state. Since 2003, many new challenges and opportunities have emerged in Wisconsin and the nation to warrant an updated Wisconsin AIS Management Plan.

- **THE INVASION LANDSCAPE HAS CHANGED –** previously limited invasive species, like zebra mussels, are present in 239 waterbodies in Wisconsin. Species that were once restricted to the Great Lakes, like the round goby and spiny water flea, are now present in inland waters. New management and control priorities are needed to limit the spread and impact of these invasive species.
- **NEW PATHWAYS HAVE EMERGED –** only one new ballast water invader has been discovered in the Great Lakes since 2006, and most recreational boaters across the state are aware of AIS regulations and claim to comply with them. A focus on alternative primary invasion pathways (initial invasion pathways into Wisconsin), such as the release of prohibited species obtained from the Internet, and secondary invasion pathways (pathways that spread existing AIS throughout the state), including various segments of the boating community, will help Wisconsin fill gaps in our AIS prevention strategy.
- **NEW PARTNERS, PROGRAMS AND FUNDING OPPORTUNITIES ARE AVAILABLE –** a network of WDNR grant-funded AIS partners has established itself across the state. These partners have helped implement prevention and monitoring programs like Clean Boats Clean Waters (CBCW) and the Citizen Lake Monitoring Network that have grown from pilot programs to programs with thousands of participants. The Great Lakes Restoration Initiative (GLRI) has also bolstered efforts within the basin. An updated strategy will help Wisconsin benefit from these partnerships and resources.
- **NEW TECHNOLOGIES HAVE BEEN DEVELOPED –** new prevention technologies, like the Great Lakes Commission's Detector of Invasive Aquatics in Trade (GLDIATR), which identifies websites where prohibited species are being sold; new monitoring strategies, like testing water for the presence of DNA; and new control technologies, like microparticle control of invasive carps and mussels, are tools that were barely fathomable when the 2003 plan was completed. Additionally, 10 years of research on the efficacy of herbicide treatments has led to a better understanding of the outcomes of these treatments. New strategies in the plan will position Wisconsin to better leverage these and other new technologies to help manage AIS.


David Jude

Round goby are aggressive competitors that first appeared in the Great Lakes in the 1990s and have since moved into dozens of Wisconsin's inland lakes and rivers.

- **NEW RESPONSIBILITIES HAVE BEEN REALIZED –** AIS are a national issue and Wisconsin's AIS can be transported out of the state, causing new invasions elsewhere. Wisconsin has a responsibility to close those pathways.

The Wisconsin AIS Management Plan fulfills the requirements of the National Invasive Species Act (NISA) of 1996, which reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990 and provides guidance for the development of state program documents. This management plan is designed to meet the specific requirements of Section 1204 (a) of NANPCA, which relates to the development of a comprehensive management plan. It makes Wisconsin eligible to request federal assistance for up to 75% of the cost incurred to implement the AIS programs detailed here. The plan also provides specific details to the overarching Wisconsin Invasive Species Strategic Plan that was drafted by the Wisconsin Invasive Species Council.

In addition to meeting new challenges and fulfilling federal requirements, the Wisconsin AIS Management Plan will provide guidance to anyone in Wisconsin working to address AIS issues. Updated guidance for all AIS partners, ranging from what the WDNR prioritizes in its surface water grants program to what local partners develop for their work plans, will help increase efficiencies and reduce redundancies for everyone managing AIS.

GLDIATR
Great Lakes Detector of Invasive Aquatics in Trade

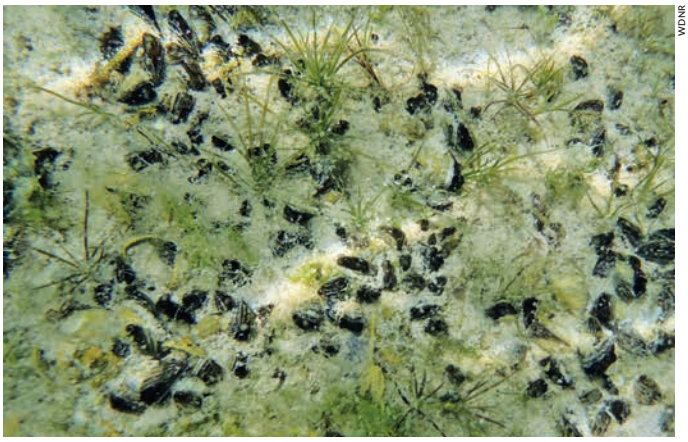
REGIONAL TIMELINE

AIS have a long history in the Great Lakes region. A comprehensive history of AIS in the Great Lakes, including notable invasions, policy developments and other events, is available from the Great Lakes Commission in its Great Lakes Aquatic Invasions booklet available on the commission's website (www.glc.org/wp-content/uploads/GLP-2007-aquatic-invasions-whole.pdf).

WISCONSIN AIS PROGRAM TIMELINE – MAJOR MILESTONES

2000-2009

AIS have long been recognized as a serious problem in Wisconsin. A rapid increase in the spread of Eurasian watermilfoil in the 1990s coupled with the growing threat of zebra mussels moving inland from the Great Lakes helped galvanize the recognition by citizens and decision-makers that AIS had become a significant issue for Wisconsin's water resources and action was needed. A federal AIS management program through the U.S. Fish and Wildlife Service (USFWS) started in 1994, with funding for states being available in 1997. Beginning in 2001 the Wisconsin legislature responded by establishing a comprehensive invasive species law (Section 23.22, Wis. Stats) that authorized the WDNR to create and implement a program to prevent and control the spread of invasive species. WDNR followed with establishing a cost-sharing program specific to AIS, appropriating funding for a permanent AIS program coordinator and providing a budget for CBCW watercraft inspections, education and research. The law also authorized the creation of the Wisconsin Invasive Species Council, which conducts studies and provides recommendations for program implementation and grant funding to WDNR and other agencies. At the same time, funding was made available to states with an approved Aquatic Nuisance Species (ANS) Management Plan through the U.S. Fish and Wildlife Service (USFWS) providing additional impetus for Wisconsin to develop its first AIS management plan and begin implementation.


WDNR
A lake bottom invaded by zebra mussels.


Michigan Sea Grant
Eurasian water milfoil tangled on a boat motor prop.

Through state funds made available in the 2003-2005 biennial budget, contract positions were established with the University of Wisconsin-Madison Division of Extension to coordinate AIS outreach, citizen monitoring, watercraft inspections and biocontrol for purple loosestrife. Existing water resource biologists and environmental grant coordinators assumed the responsibility for the $4 million WDNR grant program that funds up to 75% of the costs for local prevention, planning and control efforts. The agency initially used funding from the USFWS to support a limited-term employee to assist with program implementation and provide outreach to the bait fish industry, which saw tighter restrictions resulting from viral hemorrhagic septicemia. In later years it was used for program supplies and outreach activities.

2009-PRESENT

The WDNR promulgated WI Administrative Code NR 198 Aquatic Invasive Species Prevention and Control Grants in 2005 and amended it in 2009 to guide the grant program.

In 2009 it promulgated NR 40 Invasive Species Identification, Classification and Control (also referred to as Wisconsin's Invasive Species Rule), which establishes prohibited and restricted species lists and the rules governing their possession, transportation, transfer and introduction.

In 2010 the availability of federal funding through the Great Lakes Restoration Initiative (GLRI) allowed Wisconsin to significantly expand its AIS program and direct resources to the portions of the state bordering lakes Superior and Michigan. This infusion of funding has allowed the WDNR to expand its network of watercraft inspections on the Great Lakes and connected waters; contact and educate businesses whose trade may include AIS about NR 40; develop procedures and methods for identifying and responding to pioneer populations of AIS; and develop a monitoring program to quantify the rate at which AIS are spreading across the state.

GLRI funding allowed the WDNR to hire a statewide AIS monitoring coordinator, three regional AIS monitoring project specialists and several limited-term and seasonal employees, which greatly expanded the state's capacity. In the first two years, federal funding was used to augment the NR 198 grants program to establish AIS coordinator programs in counties in the Great Lakes Basin.

The investment of federal GLRI funds facilitated the completion of a five-year monitoring project that established a baseline condition of AIS in Wisconsin's lakes and measured the rate of spread – the only effort of its kind in the country. GLRI funding also increased Wisconsin's ability to respond to new invasions with the creation and implementation of an AIS response framework.

In 2014 the framework was expanded department-wide to include terrestrial species and was adopted as the response framework for the entire WDNR in 2016. GLRI funding was used to develop a Wetland Invasive Species Strategic Plan (see link to complementary AIS management plans in Appendix 7) and implement a nonnative Phragmites control project that removed pioneer populations along the western front of its invasion. New decontamination guidelines for WDNR staff, contractors and permittees was also created with the help of GLRI funding.

CURRENT AIS STAFFING IN WDNR

- 2 FTE (AIS statewide coordinator and AIS monitoring coordinator)
- 2.5 FTE (contract) UW–Madison Division of Extension outreach, communication, purple loosestrife biocontrol coordinator staff
- 1 FTE Extension Lakes contract for the Clean Boats Clean Waters program and volunteer monitoring training and coordination
- 3 FTE project WDNR positions for early detection monitoring and response (GLRI – Great Lakes Basin only)
- About 10 LTEs for monitoring and response support and program assistance (5 GLRI-funded)

WDNR AIS ANNUAL BUDGET

- $431,300 state segregated funds for program operations: contracts, supplies and LTE
- $4,029,100 state segregated funds for cost-share grants to local partners
- About $1 million GLRI funds: staffing, travel, supplies and contracts
- $20,000 to $40,000 ANS plan implementation: supplies, services and LTE
- $64,000 AIS research and boat registration check-off funds

In the last 15 years, the WDNR has progressively built a comprehensive AIS Prevention and Control Program. The WDNR, in cooperation with many of its partners, has prepared the following plan to coordinate responses to and address the problems associated with AIS for the next 15 years. It outlines the future directions of our programs. While the initial plan's basic goals of prevent, contain and control still apply, they have been expanded and adjusted based on progress made, lessons learned and changes in the law and social landscape.

We believe that it is difficult to accurately predict the cost of implementing all of the actions that are outlined in this management plan at this stage of implementation. Because of this, we did not assign a cost to each action outlined in the plan. However, we do believe that our existing program funded at the annual levels described above will be able to accomplish many of the actions outlined in this plan over the course of the next years. Additional funding could help actions be accomplished quicker and could fund evaluation efforts that could help apply these efforts in other states.

GEOGRAPHIC SCOPE

This management plan is designed to provide guidance to all WDNR staff and partners working on AIS issues in Wisconsin. This includes those working on Wisconsin's more than 15,000 lakes, 13,500 miles of navigable streams and rivers and approximately five million acres of wetlands. It also includes Wisconsin's border waters, which consist of more than 800 miles of Great Lakes coastline and nearly 200 miles of Mississippi River shoreline. (See map on page 10 of known invaded bodies of water in Wisconsin.) Nearly 86% of Wisconsin's 1,730-mile border consists of water, increasing the need to collaborate with neighboring states.

Specific water resources of interest in Wisconsin include the Great Lakes, the Lake Winnebago System and the Mississippi River. Both of Wisconsin's border systems are important for commerce and recreation, and both are also primary invasion pathways into Wisconsin's inland waters. Preventing new invasions into these systems benefits not only the Mississippi River and the Great Lakes but inland waters and the nation as a whole.

The Lake Winnebago System is home to Wisconsin's largest inland lake and the largest recreational fishery for the culturally important lake sturgeon. Lake Winnebago and its connected waterbodies contain 14% of Wisconsin's water resources and are an economic driver in the region. Given the use of the Lake Winnebago System by both inland water users and Great Lakes users, Lake Winnebago is an important secondary vector of aquatic invasive species. Great Lakes species often appear in Lake Winnebago and then other inland lakes, making prevention efforts at Lake Winnebago important.

Brandon Jones/USFWS

Pool 10, Upper Mississippi River National Wildlife and Fish Refuge.

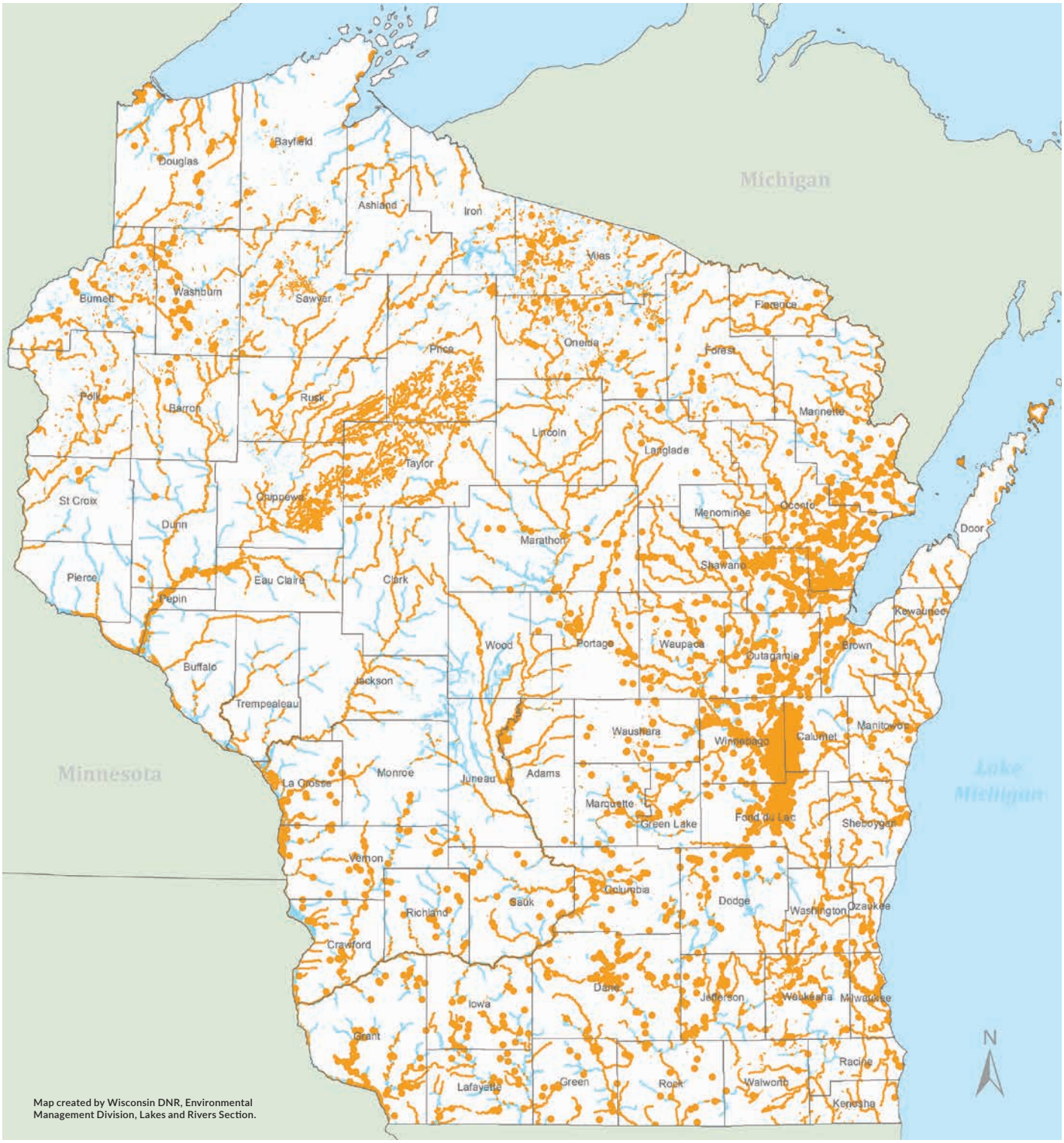
Wisconsin's wetlands are an integral part of each of these water systems, but they are already disadvantaged since only half of the pre-settlement acres of wetland remain to help provide clean water, safe streamside communities and crucial habitat for wildlife. If further compromised by invasive species, they will allow more nutrients and pollutants into streams and lakes and may cause additional flooding. Since most native fish and wildlife require time in diverse native wetlands, they are also threatened as monocultures of invasive plants provide less cover and food. Protecting our remaining wetlands from exotic species is crucial for clean water, livable landscapes and biotic systems that we depend on and enjoy. It will take special effort and the assistance of many citizens since three-quarters of the state's wetlands are in private ownership.

David Roisum

Neenah lighthouse with Lake Winnebago at left and the Fox River at right.

AIS PRESENCE – STATEWIDE

December 15, 2017 map



This map shows all of Wisconsin's water resources and indicates the invasion status for inland waters. The gold darker-colored waters signifies that at least one aquatic invasive species is present. There are no known aquatic invasive species present in other waters shown, except overall Great Lakes and the Mississippi River waters both have known populations of invasive species.

WORKING WITH OTHER ENTITIES, PLANS AND JURISDICTIONS

WISCONSIN INVASIVE SPECIES COUNCIL

The Department receives guidance and direction from the Wisconsin Invasive Species Council (WISC) on the classification of invasive species, and on procedures for awarding grants to eligible applicants that desire to control AIS. The WISC also conducts studies to examine the impact the bait industry, and pet industry have on the introduction and spread of invasive species and the acquisition of invasive species through the internet. Department staff frequently provide the WISC with information on the status of invasive species, their management and needs the Department may have. The Department also works closely with WISC to recognize both professionals and volunteers for outstanding work in the invasive field through the "Invader Crusader Awards" given out every year.

ST. CROIX RIVER STRATEGIC PLAN

The state of Wisconsin is fortunate to share the St. Croix River with Minnesota. This border water is a National Scenic Riverway and includes the Namekagon and St. Croix Rivers. Prior to the 2018, Minnesota, Wisconsin and the US Fish and Wildlife Service had been operating under the impression that there was an ANSTF approved AIS strategic plan for the St. Croix River. Upon close examination, a final approved plan has not been found.

In 2016, the St. Croix River Association completed the St. Croix River Basin Aquatic Invasive Species Strategic Plan (Plan). The 2016 Plan is a product of key stakeholders that shared an interest in preserving the integrity of the St. Croix River Basin. The St. Croix River Association developed the Plan and facilitated the contributions of key partners including: lake associations, community AIS groups, the WDNR, Minnesota Department of Natural Resource (MN DNR), National Park Service (NPS) and many of the counties from within the watershed.

The Plan addresses some elements of a federally acceptable strategic plan. The plan discusses the unique characteristics of the basin, and the importance of maintaining the quality of the two main rivers (Namekagon and St. Croix Rivers) for ecological, economic and recreational values. The plan clearly identifies goals which align with the department's AIS Strategic Plan and clearly states strategies and actions needed to meet those goals. Aquatic Invasive Species problems and threats experienced in the basin are described and impacts are also summarized. The Plan identifies species of concerns and used professional feedback to categorize them into one of four categories which helped to prioritize their importance in the basin. The Plan provides a map of the basin and a summary of past and current AIS management practices in the basin. A unique feature of the Plan is a summary of how it agrees with other AIS strategic plans that exist in the basin and have been completed by many of the key stakeholders (e.g. Counties, Minnesota and tribes).

The Plan includes implementation tables which identifies which partners are expected to participate in the implementation of an action, the funding status and the timeline for completion. The Plan goes on to define AIS in Wisconsin and Minnesota, Wisconsin and Minnesota's AIS laws, and a list of regulated species in both states.

Wisconsin will work with Minnesota to complete an AIS strategic plan that meets the federal requirements. While the St. Croix River Association AIS Strategic Plan is an excellent start to a federally approvable plan there are elements that are missing that would enhance its effectiveness.

WORKING WITH JURISDICTIONS

Aquatic invasive species management is a national issue, and as such, we will need to work across jurisdictions to effectively manage AIS. Wisconsin will continue to do its part by being an active participant in the Great Lakes and Mississippi River ANS Panels. These two working groups provide an excellent forum to work with neighboring states on AIS issues. Wisconsin will also continue to participate on ANSTF committees which will allow for national collaboration.

For more specific work, Wisconsin will continue to collaborate with other states and organizations on regional collaboratives, the mutual aid agreement, and mock response exercises. For other issues, Wisconsin has demonstrated an ability to work with states on issues on an ad hoc basis and will continue to do so.

DRAFTING THE WISCONSIN AIS MANAGEMENT PLAN UPDATE

A core team of state agency representatives, university staff, local AIS partners and nonprofit representatives was formed to lead the update to the Wisconsin AIS Management Plan. They were responsible for attending planning meetings, representing various stakeholder groups and soliciting feedback from the groups they represented.

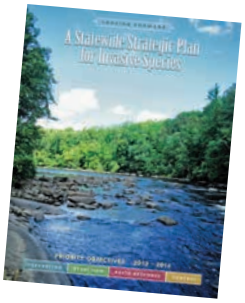
There were six full core team planning meetings, plus 10 subcommittee meetings, that helped develop activities for the pathway approach. Core team members were responsible for updating their assigned stakeholder groups and receiving feedback as they saw fit. Those comments were then brought back to the larger core team and incorporated into any changes made at the next meeting.

In an attempt to make this update sensitive to other state AIS management plans, the core team spent time reviewing the contents of existing AIS management plans. The core team incorporated elements of the Michigan, Illinois and Minnesota AIS Management Plans. The core team also incorporated elements of the Lake Superior AIS Prevention Plan.

CORE TEAM MEMBERS:

Christal Campbell – UW–Madison Division of Extension
Tim Campbell – UW–Madison Division of Extension and Sea Grant
Mike Engleson – Wisconsin Lakes
Miles Falck – GLIFWC
Maureen Ferry – Wisconsin DNR AIS
Chris Hamerla – Golden Sands Resource Conservation and Development
Jon Hansen – Wisconsin DNR Fisheries
Jeremy Jones – River Alliance of Wisconsin
Brian Kuhn – DATCP
Laura MacFarland – River Alliance of Wisconsin
Erin McFarlane – Extension Lakes
Samantha Olsen – Wisconsin DNR Law Enforcement
Amanda Perdzock – River Alliance of Wisconsin
Michele Sadauskas – Oneida County
Paul Skawinski – Extension Lakes
Bob Wakeman – Wisconsin DNR AIS
Brock Woods – UW–Madison Division of Extension

The core team made specific efforts to construct our plan in a way that is consistent with the existing **Wisconsin Invasive Species Council Invasive Species Strategic Plan.** The overarching goals are similar (prevent, contain, control vs prevention, detection, response control), with nearly all the strategies listed in the Wisconsin Invasive Species Council plan being identified in this plan.



The Wisconsin Invasive Species Council strategic plan addresses both aquatic and terrestrial invasive species.

The plan will be reviewed and edited on a regular basis. See Appendix 3 for more information on how the core team will keep the plan relevant through its lifespan.

The core team believes these efforts, combined with Wisconsin's participation in the Great Lakes and Mississippi River ANS Panels, represent a regional approach to AIS management that also incorporates actions that will enable Wisconsin to better manage AIS.

REVIEW AND APPROVAL

The Wisconsin AIS Management Plan had multiple layers of review and approval. Opportunity for key stakeholder groups to review and comment on the management plan were presented multiple times throughout the drafting process, including at four Wisconsin AIS Partnership meetings. Those comments were integrated into the draft plan.

Once a draft was completed, the management plan went through a series of internal and external reviews. The order and timeline of these reviews can be found in Appendix 2.

A survey was sent to stakeholder groups at the beginning of the process to determine how involved people would like to be and to learn about any concerns upfront. In general, stakeholders were more interested in the final product than involvement in multiple steps. Respondents who wanted to be more involved generally wanted to hear about proposed actions for certain pathways, especially recreational activities, maritime commerce and non-recreational fishing.

GOALS

GOAL 1: PREVENT THE INTRODUCTION OF NEW AQUATIC INVASIVE SPECIES INTO WISCONSIN

PROBLEM DESCRIPTION

In addition to the impacts listed in the introduction, the response to new invasions is itself costly. Once AIS are present in an environment, the impacts are at best technically challenging and often impossible to reverse, resulting in ongoing management costs (e.g., $4 million of state AIS program funding). Although at least 182 nonnative aquatic species already have been introduced into the Great Lakes ecosystem, new introductions are still highly likely (NOAA 2011). Thirty-seven species classified as invasive are currently present in Wisconsin. Given limited resources and the extreme difficulty of eliminating established AIS, the prevention of new introductions is critical. The unpredictable and unanticipated nature of effects from AIS and their long-term costs highlight the importance of prevention as a top priority for AIS management. While a lofty goal, Wisconsin's AIS program is working towards no new aquatic invasions in Wisconsin.

COMBINING GOALS 1 AND 2: THE PATHWAYS APPROACH

To accomplish Goal 1 (Prevent) and Goal 2 (Contain), Wisconsin's AIS program will work to manage AIS invasion pathways. Managing these vectors is an efficient way to reduce invasion risk.

While some invasion pathways may be associated with either Goal 1 or Goal 2, most have the potential to be primary or secondary invasion pathways. For example, recreational boaters can both bring AIS from outside of Wisconsin or further distribute AIS throughout Wisconsin. The same set of preventative actions can achieve both goals. Because of this, the Wisconsin AIS Management Plan will address Goals 1 and 2 together using a pathways-based approach.

Seven overarching invasion pathways were determined to exist in Wisconsin, and each overarching pathway consists of subpathways that are addressed in implementation tables later in the plan.

GOAL 2: CONTAIN THE SPREAD OF AQUATIC INVASIVE SPECIES IN WISCONSIN

PROBLEM DESCRIPTION

While natural dispersal and range expansion exist, nearly every problematic biological invasion has been human mediated, meaning that human behavior was responsible for the initial introduction of a species to a new habitat. Since human behavior can change and actions can be taken to reduce or eliminate risk of invasions resulting from that activity, almost every invasion is theoretically preventable. Wisconsin will work with federal partners and neighboring states to prevent new invasions into the state. Movement of AIS within Wisconsin is something over which the state has more direct control and will work to stop.

Recreational activities, primarily boating, are the most common secondary invasion pathway in Wisconsin, but the other invasion pathways described in this management plan also contribute to the secondary spread of AIS in Wisconsin. Decreasing the risk of AIS transport through these pathways is the best way to keep Wisconsin's waters free from any one AIS. Again, while a lofty goal, Wisconsin's goal is no new secondary invasions in Wisconsin.

GOAL 3: CONTROL EXISTING POPULATIONS OF AIS TO MINIMIZE HARMFUL IMPACTS

→ See implementation strategies on page 45

PROBLEM DESCRIPTION

Once an AIS is established in Wisconsin, it is difficult, if not impossible or cost prohibitive, to eliminate it from the state. While eradication efforts in most cases are unfeasible, tools exist to manage existing populations of AIS to reduce impacts. When used appropriately and within the context of an AIS management plan, these tools can protect ecosystems and reduce societal impact. Control activities not only benefit the waterbody where they occur but can also contain the spread of AIS to other waterbodies. New control options (e.g., Zequanox, microparticle control) combined with a better understanding of existing options (e.g., hand pulling, 2,4-D) will make management of problematic populations more effective. Wisconsin's control goals include reducing propagule pressure of existing invasive species, reducing impacts to acceptable levels, and where possible, eradicating pioneer populations.

Problem Definition and Ranking

OVERALL PERSPECTIVE AND PROBLEM RANKING

Wisconsin's continued success at AIS prevention, containment and control requires the establishment of priorities. The broad spectrum of challenges and limited resources requires that Wisconsin take a strategic approach and establish priorities to guide its AIS actions. A set of overarching priorities, as well as priorities that correspond to the plan's three goals, have been developed and are detailed on this page. The listed priorities may not appear exactly as written in the implementation tables since they may encompass multiple actions within the tables.

OVERARCHING PRIORITIES

- Develop engaging, uniform and user-friendly communication tools and strategies that promote sustainable behaviors among the state's water users.
- Implement the AIS program through strong partnerships.
- Maintain or increase funding levels and staffing.
- Strive to find opportunities to strengthen interstate partnerships for consistent messaging and program implementation.
- Stop NR 40 prohibited species from entering the state and prevent the spread of NR 40 restricted species to new parts of the state.

PATHWAY PRIORITIES

- Expand recreational water user outreach to waterfowl hunters, trappers, wading anglers, etc.
- Increase efforts to address organism in trade (OIT) invasion pathways by expanding outreach to industry and consumers and by developing collaborative solutions to prevent pet release and water garden disposal introductions.

MANAGEMENT PRIORITIES

- Expand capacity within local organizations for citizen-based monitoring.
- Use targeted, as well as random and convenience, approaches to AIS monitoring.
- Work with other state and local organizations to implement the state's Response Framework to ensure consistent responses to new invasions.

CONTROL PRIORITIES

- Continue to refine existing AIS control technologies to make them more effective or to reduce non-target impacts.
- Support research to develop new AIS control technologies.
- Promote the use of integrated pest management (IPM) principles in all management plans and efforts.

SPECIES OF CONCERN – REGULATED SPECIES

The WDNR NR 40 administrative rule defines invasive species as nonnative species whose introductions cause economic or environmental harm or harm to human health. It further classifies AIS as either prohibited or restricted in Wisconsin. NR 40 Species listed as prohibited are either not currently present in the state or have a very limited distribution. Prohibited species are the highest priority for prevention, containment and control. This includes outreach, monitoring and control activities. Restricted species are invasive species that are known to be present in Wisconsin and are often the focus of management actions and citizen activities. At the more local scale, controlling the impact of restricted species on resources is a priority.

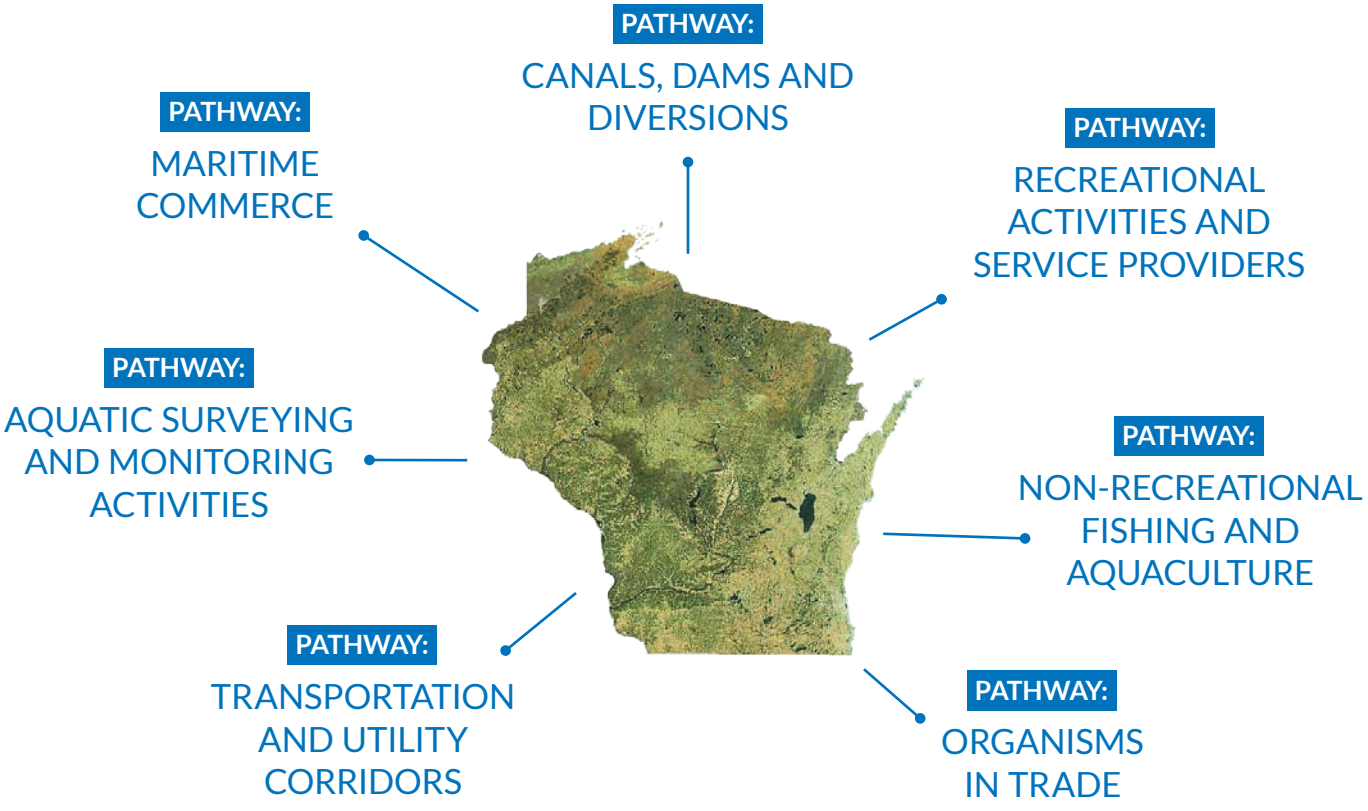
Both prohibited and restricted species are illegal to transport, transfer (buy/sell) and introduce, with limited exceptions and permits for certain activities. Prohibited species are also illegal to possess, and the state has a legal authority to mandate control actions for prohibited species when they do appear. For a complete list of NR 40 regulated species, visit dnr.wi.gov/topic/invasives/classification.html and navigate to the "Species list" tab.

Wisconsin has agreed to the Great Lakes and St. Lawrence Governors and Premiers "least wanted" list, which defines 21 least wanted AIS for the Great Lakes Basin. A full list of both NR40 species and the "least wanted" can be found in the supplemental materials document.

PATHWAYS APPROACH

There are numerous invasion pathways that contribute to the introduction and spread of AIS in Wisconsin. To systematically deal with the growing list of invasion pathways, individual vectors were grouped into one of seven general pathways. A description of these pathways and their current management status is included in this section.

AQUATIC INVASION PATHWAYS:



Satellite image: WisconsinView – University of Wisconsin Space Science and Engineering

PATHWAY: MARITIME COMMERCE

➜ See implementation strategies on page 46

Maritime commerce and ballast water have historically been the predominant primary invasion pathways into the Great Lakes and Wisconsin. Fifty-five percent of the nonindigenous species that established populations in the Great Lakes during the period following expansion of the St. Lawrence Seaway (from 1959 onward) are attributed to ballast water discharge (Kelly et al. 2009), although this number could be as high as 70% (Holeck et al. 2004).

AIS can be moved by maritime commerce through ballast water transport and biofouling. The use of ballast water to stabilize vessels can result in the accidental transport of organisms from port to port. Ballast water is typically drawn into tanks from surrounding port water without treatment and routinely contains diverse organism assemblages, from viruses and bacteria to macroinvertebrates and fish. There is tremendous temporal and spatial variation in the concentration of organisms present in a ship's un-exchanged ballast water, with numbers as high as 300 million cysts of invasive dinoflagellates in a single tank (Hallengraeff and Bolch 1992). The eventual discharge of the ballast water is the point of AIS introduction.

WISCONSIN'S BALLAST WATER PROGRAM

- 303 vessels operating under a general permit.
- Total ballast inspections done by year by WDNR:
  - 2015 – 34 inspections
  - 2016 – 70 inspections
  - 2017 – 37 inspections
  - 2018 – 53 inspections

Biofouling occurs when organisms such as snails, mussels, sponges, algae and other small-bodied organisms attach to structures like hulls, anchors and other exterior surfaces, fouling oceangoing shipping vessels, Great Lakes shipping vessels (lakers), barges or other vessels. Sea chest grating, a rectangular recess in the hull of a vessel that provides an intake reservoir from which piping systems draw raw water, has been identified as a hot spot for biofouling (Sylvester and MacIsaac 2010). Once a vessel is at port, organisms can release their larvae into the water or attach themselves to port infrastructure (Ruiz et al. 2015). Foreign organisms attached to exterior surfaces can also become dislodged when a ship is cleaned, is in dry dock for repairs or painting or is tied dockside (due to rubbing against the dock).

Voluntary ballast water exchange standards implemented by the International Maritime Organization (IMO) in 1993 followed by mandatory regulations from the United States Environmental Protection Agency (EPA) and the United States Coast Guard have largely slowed, if not stopped, new invasions via this pathway. No new invasive species in the Great Lakes have been attributed to ballast water discharge since the discovery of bloody-red shrimp (*Hemimysis anomala*) in 2006. Federal regulators are looking to further reduce invasion risk by requiring treatment systems be present on all new and existing oceangoing shipping vessels. In addition, the IMO Ballast Water Management Convention is scheduled to take effect in late 2017, and treatment systems will be required on a worldwide basis. All treatment systems in the U.S. will need to be approved by the Coast Guard. The Coast Guard issued its first approval certificate for a ballast water treatment system in late 2016, meaning that dates for implementation of these requirements may soon be established.

The Great Lakes states have been working together on their EPA Vessel General Permit Water Quality Certifications and have been active in the Ballast Water Collaborative (a collaboration between states, federal agencies, researchers and shipping companies to work on invasive species and ballast water issues) to come to closer agreement on discharge limits. The shipping industry is in favor of one regulating agency and one set of regulations, but many states have unique water resources and water quality standards to protect those resources.

The WDNR ballast water program was created after a legal challenge determined the WDNR was not able to certify that the EPA General Vessel Permit met Wisconsin's water quality discharge standards. The WDNR issued its first ballast water permit in 2010 and second permit in 2015. In addition to requiring treatment systems on oceangoing vessels, the new permit requires treatment systems on lakers beginning in 2018. The WDNR, following the Minnesota DNR, included this stipulation in its permit because the lakers play a role in the secondary spread of AIS throughout the Great Lakes. It is not only important to stop the introduction of new species into the Great Lakes, but also to stop or slow the spread of invasive species and pathogens throughout the Great Lakes. Since the program's inception, the WDNR has issued permits to more than 400 vessels from more than 100 shipping companies. Two WDNR inspectors have conducted inspections on more than 250 vessels, including education and outreach to crew members during each inspection.

PATHWAY: CANALS, DAMS AND DIVERSIONS

➜ See implementation strategies on page 48

Canals are manmade waterways used for transporting goods, commodities and people between waterbodies. Some canals connect previously separated waterbodies, while others were created on natural waterways to improve the passage of ships (e.g., channelization and deepening of rivers). Most canals provide recreational opportunities and serve other important roles. Lift locks are found on many major canal systems and provide a mechanism for transporting boats between waterways with different water levels, typically around navigational obstructions. Canal and lock systems can facilitate the dispersal of AIS along and between waterways because they may provide artificial connections across previously unconnected basins.

Most of the major Great Lakes canal and lift lock systems, including the Erie Canal, Welland Canal and Chicago Area Waterway System (CAWS), are not located within Wisconsin, and the state has no direct authority over their management or operations. Wisconsin participates in many binational and regional advisory bodies, however, including the Council of Great Lakes Governors, the International Joint Commission, the Great Lakes Commission, the Great Lakes Fishery Commission and the Asian Carp Regional Coordinating Committee. These groups have wide-ranging roles, but in a general sense, they all strive to protect and restore the Great Lakes through coordinated planning and implementation of activities, including management, assessment and communication. Each group has identified AIS prevention and control as a major priority for the Great Lakes and has issued recommendations or position statements and/or conducted feasibility studies related to the Chicago Sanitary Shipping Canal and the CAWS.

Structures that could prevent the spread of AIS into Wisconsin consist of dams, culverts and other structures that are the first barriers to the passage of fish and aquatic organisms on tributaries to the Great Lakes and the Mississippi River. These structures limit the upstream movement of invasive species and limit their distribution.

To maintain these barriers and prevent the inland spread of AIS, the State of Wisconsin has developed a fish passage guidance document that balances benefits of habitat connectivity with the risk of AIS movement upstream. Locks and dams currently used for navigation, like those on the Lower Fox and Mississippi rivers, are currently not considered barriers to dispersal, and closing locks is not considered a method to limit AIS spread.

Lastly, the Great Lakes Mississippi River Interbasin Study identified eight potential pathways for AIS to move between the Great Lakes and Mississippi River basins within Wisconsin. Four of the locations are considered low-risk and four are medium-risk. In general, the low-risk locations have a small probability (less than 1% annual flood occurrence) of experiencing a surface water connection, while the medium-risk locations either have a larger probability of sustained surface water connections (approximately 10% annual flood occurrence) or have infrastructure connections (e.g., water pipes between basins in Portage, WI). Given the relatively low risk of these pathways, no management actions outside of normal activities take place to further reduce invasion risk through the pathways.


Tamara Thomsen

The Portage Canal, connecting the Lower Fox River system and the Wisconsin River.

PATHWAY: RECREATIONAL ACTIVITIES AND SERVICE PROVIDERS

➜ see Implementation strategies on page 49

Wisconsin's abundant high-quality water resources make it a popular place for water-based recreation for both residents and nonresidents, with Wisconsin selling the third highest number of out-of-state fishing licenses in the nation. All types of water-based recreation, including boating, fishing, diving, snorkeling, rafting/tubing, wildlife watching, hunting and other activities, occur in Wisconsin. The travel and tourism associated with these activities is a boon to the Wisconsin economy, and these water-based recreational activities are part of life in Wisconsin.


WDNR

Unfortunately, any activity that involves traveling between different waterbodies presents some risk of transporting AIS. Any gear or equipment used on the water may become fouled with AIS or material that contains AIS, and using that gear or equipment on a different waterbody could introduce those AIS.

With more than 600,000 registered boats in Wisconsin, recreational boating is known to be a common, if not the most common, secondary invasion pathway for AIS in the United States (Johnson et al. 2001). It helped spread Eurasian watermilfoil across the United States (Smith and Barko 1990), and more recently, it has facilitated the spread of Dreissenid mussels to the western United States (Hickey 2010). The State of Wisconsin has done numerous things to help address this pathway. Wisconsin's primary tool is NR 40, an invasive species rule that made it illegal to transport aquatic vegetation and bilge and live well water on public roadways. Additionally, the statewide CBCW boater education program, based off of the Aquatic Nuisance Species Task Force (ANSTF) Recreational Guidelines, consists of hundred of volunteers and paid staff that educate boaters on AIS prevention steps and inspect more than 100,000 boats each year.

Wisconsin has invested heavily in outreach to recreational boaters. The WDNR has streamlined grant funding available for local entities interested in implementing CBCW programs; $600,000 was awarded for CBCW activities by the WDNR in 2017. AIS education grants are available to fund local AIS coordinators who train and coordinate CBCW inspectors. Data collected from CBCW inspections indicate that 95% of boaters are aware of the actions they need to take to prevent the spread of AIS.

However, given the diversity of recreational activities, it has been difficult to reach all segments of the recreational activity pathway. Regulations and CBCW have been effective tools for reaching the core of the boating population, but more specific segments of that population, such as transient boaters (Witzling et al. 2016) or specialty watercraft operators (Campbell et al. 2016), may pose a greater risk and need additional outreach to implement sustainable behaviors. Other segments of the recreational activity pathways may not use boats (e.g., wading anglers) or use them in ways that aren't easily addressed by the standard CBCW program (e.g., fur harvesting, waterfowl hunting). While these sub-pathways may not be as large as the general recreational boating pathway, reaching these audiences is important to further reduce the risk of invasions into Wisconsin.


Jeffrey J. Strobel


Jeffrey J. Strobel

Another audience in this pathway consists of the businesses that support these activities – marinas, lake and dock service providers, aquatic plant harvesters, chemical applicators and other related companies. These are all businesses that either use watercraft in similar ways to recreational users or service recreational watercraft. Little AIS outreach has been directed toward this stakeholder group, and future efforts should engage this influential water user group. The group includes important opinion leaders for water-based recreation whose support is critical to the success of any AIS management strategy. Some stakeholders in this group also have the potential to exhibit some high-risk behaviors, including using multiple waterbodies in a single day.

PATHWAY: NON-RECREATIONAL FISHING AND AQUACULTURE

→ See implementation strategies on page 52

Non-recreational fishing and aquaculture encompass a number of potential primary and secondary invasion pathways that deal with commercial and guided fishing activities as well as fish and bait production and sales. These water-based activities often occur on multiple waterbodies within a short period of time using various types of gear on different waterbodies, allowing these activities to transport and inadvertently introduce AIS. Two types of prevention activities will be needed to reduce risk through these pathways – those that focus on removing AIS before equipment transport and those that reduce the risk of products being contaminated with AIS. There are various strategies to achieve these prevention activities.

General AIS prevention regulations (NR 40) apply to all of the sub-pathways identified in the non-recreational fishing and aquaculture implementation table. Regulations specific to some of the sub-pathways do exist in other portions of state statute and administrative code. Regulated activities include wild bait harvest (NR 20.14), fish and bait production and importation (s. 29.735, Wis. Stats.), private fish stocking (s. 29.736, Wis. Stats.) and fishing tournaments (NR 20.40).

Some targeted outreach efforts have already occurred (e.g., AIS HACCP in aquaculture, tournament fishing, bait shops), showing success at reducing AIS transport risk and engaging opinion leaders. Continuing these approaches while modifying them to reach additional user groups within this pathway (e.g., fishing guides) will add to the success of previous efforts.

Research and monitoring are also important strategies to incorporate in the non-recreational fishing and aquaculture pathway. While some limited monitoring occurs (e.g., wild bait harvesters are required to retain harvest records), the consistency and general utility is questionable. Coupling a robust monitoring program with research aimed at prioritizing risk and thus maximizing the cost-effectiveness of actions is a challenging but critical strategy.

In some instances, best management practices (BMPs) to reduce the risk of gear being contaminated with AIS will need to be developed and implemented. The Hazard Analysis and Critical Control Point (HACCP) process is one tool that may be helpful in reducing risk across these sub-pathways.

Training both new and existing stakeholders in these approaches will ensure that the risk of AIS transport will remain low within this pathway.

BY THE NUMBERS:

- Wisconsin hosted 589 permitted fishing tournaments.*
- Aquaculture is a $21 million dollar industry in Wisconsin.
- Wisconsin's Great Lakes commercial fisheries are valued at $5 million dollars.

*Source: https://dnr.wi.gov/topic/fishing/documents/tournaments/2016TournamentSummary.pdf

UW Sea Grant

Fishing tournament staging in Oconto.


UW Sea Grant

Fish tanks at the Northern Aquaculture Demonstration facility.

PATHWAY: AQUATIC SURVEYING AND MONITORING ACTIVITIES

➜ See implementation strategies on page 54

Federal and state agencies, tribes, universities, community-based organizations, volunteer groups and contractors use aquatic surveys to collect information on the status of water quality, biological communities and habitat. Large and small vessels are used in these surveys and deploy sampling equipment such as gill nets, trawls, trap nets, water-quality testing equipment, aquatic plant rakes, dip nets, wetsuits and scuba gear, or they employ onboard or in-water remote sensing equipment to collect information. Use of this equipment in multiple waterbodies, including lakes, rivers and wetlands within the state or across state lines, could result in the introduction and dispersal of AIS from one area to another if the equipment is not properly decontaminated (Olson et al. 2000).

Currently, the **WDNR Boat, Gear, and Equipment Decontamination and Disinfection Manual Code 9183.1** outlines the minimum decontamination requirements to be followed by WDNR employees, agents and service providers. Where there is authority to do so, WDNR may require permittees to comply with the decontamination requirements. Employees should also recommend that permitees follow this manual code, since compliance with the code may be considered a reasonable precaution as defined by NR 40.02(44).

This manual code was initiated in 2007 and revised in 2015 to improve disinfection methods to be effective for all known AIS. These actions are more comprehensive than what is legally required of the general public (inspect, remove, drain, never move). BMPs include knowing what AIS are present in a waterbody targeted for work and using decontamination techniques that are known to be effective for all species known to be present. Training includes a website with a Q&A document, BMPs, recorded webinar, videos and in-person activities. An implementation chart identifies responsible WDNR staff and partners that will provide in-person trainings. Great Lakes Indian Fish and Wildlife Commission and other partners follow similar decontamination guidelines.

Future efforts should ensure that all agencies, organizations and volunteers are taking action to prevent the spread of AIS through management activities. Efforts to increase communication and share methods across agencies will result in a more consistent and efficient approach to stopping the spread of AIS.

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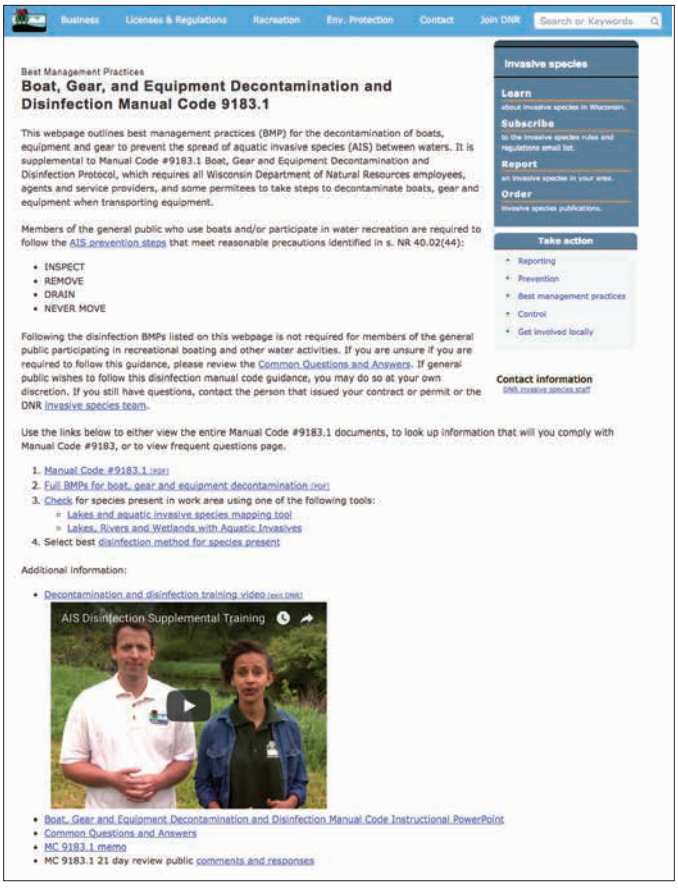

WDNR web page for Boat, Gear, and Equipment Decontamination and Disinfection Manual Code 9183.1. To visit this page, do a keyword search on dnr.wi.gov for "Boat, Gear, and Equipment Decontamination."

PATHWAY: TRANSPORTATION AND UTILITY CORRIDORS

➜ See implementation strategies on page 55

Transportation corridors, such as roadways, railways and trails, represent a pathway for the movement of AIS. Although this pathway is largely focused on terrestrial species, these corridors require draining, creating opportunities for wetland invasive species (e.g., invasive Phragmites) to move along roadside ditches and other transportation corridors. AIS that spread along transportation corridors threaten public safety (e.g., fires, views, proper drainage, etc.) and ecological functions and values (e.g., biodiversity) when they spread to adjacent habitats.

Road construction and roadside maintenance, including mowing, are likely the primary ways AIS are transported via this pathway. Invasive species can also be moved by flooding or the intended activities occurring on these corridors themselves.

BMPs currently exist to help manage many of the aspects of this pathway. The Wisconsin Council on Forestry led the creation of BMPs to prevent the spread of invasive species through recreational activities and transportation/right-of-way maintenance. Additional BMPs exist for recreational activities on trails and for heavy equipment operators. While some efforts have been made to make all of the relevant groups aware of these BMPs and many groups already use them, more could be done to reach all groups and provide relevant training.

Existing invasive species regulations will likely help limit the spread of existing AIS in Wisconsin along transportation corridors. NR 40 recommends all stakeholders take reasonable precautions to prevent the spread of invasive species, and this part of the rule may help with the adoption of prevention BMPs. The WDNR's gear disinfection manual code will apply to some permitted construction and maintenance activities, and some existing permits already include requirements to perform preventative actions. NR 40's requirement to control prohibited species may also help limit the spread of invasive species throughout Wisconsin. Given that adequate regulations currently exist, enforcement of these actions can help prevent AIS from spreading in the state.


Missouri DOT


Rob Jamieson


Tim Beyer


Paul Skawinski

PATHWAY: ORGANISMS IN TRADE

➜ See implementation strategies on page 57

Aquatic plants and animals that have been introduced through trade pose a significant threat to Wisconsin waters. For the most part, these plants and animals have been obtained for specific purposes, including as landscaping, as pets, for classroom and laboratory use, as bait or for consumption. This trade occurs via traditional sales through retail stores, markets or biological suppliers, as well as via increasing sales through the global Internet marketplace.

AIS obtained through trade find their way into lakes and streams through a variety of pathways. Although well intentioned, uneducated consumers may purposefully release unwanted pets or plant species with their associated pathogens, believing it is a humane action without knowing the damaging consequences to the environment. Each year, numerous occurrences of various species of piranhas, pacus and other aquarium fish are reported in the Great Lakes states. Release may be through direct disposal of organisms to lakes and streams or through aquarium water disposal into the storm sewer system.

AIS can also be distributed unintentionally and unknowingly through sales of aquatic species, as contaminant species might be associated with legitimately sold species, or through misidentification and unfamiliarity with a given species' common or scientific name. Sometimes legal species may be contaminated with fragments of a similar plant species, snails, minute invertebrates, fish, amphibians, parasites or diseases.


Paul Skawinski

Water hyacinth.

AIS as contaminants come in both macroscopic and microscopic forms. Macroscopic forms include common species such as water hyacinth. Microscopic forms can include algae and cyanobacteria that may cause algal blooms when environmental conditions are ideal for rapid population growth. Microscopic forms can also include pathogens that can be accidentally transported through trade. A study conducted in Minnesota showed that almost 93% of plant orders contained unwanted plants, seeds, mosses, fungi, snails or fish (Maki and Galatowitsch 2004).

Ten percent of the orders in the study included regulated aquatic invasive plant species, including hydrilla, giant salvinia, curly-leaf pondweed and purple loosestrife. With the U.S. water garden industry valued at $1 billion annually, the potential for movement of regulated species is tremendous. Plants and seeds that are known to be AIS may be purchased for the purpose of habitat restoration either through retail stores or the Internet. Thus, AIS may be purchased and planted either intentionally or unintentionally.

There continues to be purposeful noncommercial movement of exotic species, including AIS, for private collections and cultural traditions. In addition to sales, distribution often occurs to friends, neighbors and other members of gardening and aquarium clubs.


Doug Jensen

Chinese mystery snail.

In the late 1990s U.S. Department of Agriculture (USDA) officials determined that the Internet had become a new pathway for the sale of regulated organisms through online auctions, Internet discussion, interest groups and chat rooms (Suiter and Sferrazza 2007). This new method of trafficking in illegal plants and animals could lead to the introduction and dispersal of unwanted AIS into the United States, Great Lakes and Wisconsin waters.

The Federal Lacey Act regulates introduction of potential AIS through trade by allowing wildlife species to be designated as injurious. The USDA Animal and Plant Health Inspection Service (APHIS) Federal noxious weed program is designed to prevent the introduction of invasive plants. Among other things, it authorizes the USDA to take actions to limit the spread of plants that have been declared noxious weeds.

On a state level, the WDNR's NR 40 rule makes it illegal to possess, transport, transfer or introduce certain invasive species in Wisconsin without a permit. This rule has granted the WDNR the ability to manage OIT (organisms in trade) pathways by controlling what species are available in trade and requiring industry to take actions to prevent the spread of invasive species through transportation of OIT.

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) has authority over licensed nurseries with sales greater than $500/year and regulates the industry through a permit and inspector program. DATCP has issued more than 1,500 nursery grower and dealer licenses in Wisconsin.

WDNR estimates that there are more than 500 unlicensed plant and animal dealers, such as pet stores, in Wisconsin. However, this number is an estimate due to the lack of licensing for pet stores. Any effort to create a comprehensive list of pet stores in Wisconsin would help tighten up the OIT pathway.

Options to help manage OIT pathways have emerged in recent years. The Great Lakes Commission (GLC) has developed the GLADIATR monitoring system that identifies sources of regulated invasive species on the Internet. Technology like this will help Wisconsin and other Great Lakes states more efficiently manage Internet trade pathways. Research by the WDNR has identified effective strategies to communicate with retailers, while the revitalization of the Habitattitude campaign by the Pet Industry Joint Advisory Council (PIJAC) and the Great Lakes Sea Grant Network has provided tools to increase awareness of OIT issues among consumers. These outreach programs have been largely based off the ANSTF Voluntary Guidelines. Using these and other emerging tools will help Wisconsin more effectively manage OIT pathways in the future.


WDNR

Bait minnows.


Creative Commons/This Year's Love

Aquarium goldfish.


Tim Campbell

Water lettuce and water hyacinth in a retail store.


Tim Campbell

Garden pond maintenance.

Management Activities that Support the Pathways Approach

With the implementation of a pathways approach to managing AIS, most management activities become strategies for addressing those pathways. Those strategies and other related activities can be found here.

EDUCATION AND OUTREACH

Wisconsin uses ANSTF national prevention campaigns (Stop Aquatic Hitchhikers, Habitattitude) and the ANSTF's guidelines to prevent the spread of aquatic invasive species as the cornerstone of our outreach messaging.

Wisconsin's AIS outreach program is implemented by the Wisconsin Aquatic Invasive Species Partnership (Partnership). The Partnership is a group of professionals representing federal, state and local government, universities and non-governmental organizations that all work on AIS issues. Led by Extension Lakes and the WDNR, the Partnership implements AIS outreach programs statewide.

A number of key education and outreach programs are administered through the Partnership, including:

- **Clean Boats Clean Waters:** our education-based water-craft inspection program is coordinated by Extension Lakes and is comprised of paid inspectors and citizen volunteers.
- **The Drain Campaign and the 4th of July Landing Blitz:** two targeted outreach campaigns coordinated by Extension Lakes that use community-based social marketing principles to inspire boaters to adopt sustainable behaviors.
- **Project RED and Snapshot Day:** two citizen science efforts coordinated by the River Alliance of Wisconsin that provides AIS monitoring data on Wisconsin streams.
- **Citizen Lake Monitoring Network:** a citizen science effort coordinated by Extension Lakes that trains citizens to monitor their lakes for AIS and other water quality metrics.

The Partnership holds two in-person meetings each year and has opportunities to meet at the Wisconsin Lakes Convention and during other online meetings. These meetings, combined with an email list and file-sharing service, are the primary means of communications.

Many Partnership organizations are funded through the WDNR surface water grants program. Currently, the surface water grants program is on a competitive yearly funding cycle that awards approximately $600,000 yearly to county or regional partners to hire AIS Coordinators that implement the Partnership's education and outreach programs. However, this funding model has led to coverage gaps by partners and uneven implementation of AIS outreach programs across the state. Because of this, Wisconsin will be moving away from a competitive grants program to fund partners and will move to a contract model that will allow for a base-level of core AIS outreach services to be implemented. This new model will be called the Wisconsin AIS Prevention Network and it is scheduled to be implemented in 2021. This will hopefully lead to more consistent implementation of AIS prevention programs across Wisconsin and more long-term members of the Wisconsin AIS Partnership.

A sign that is posted near wader cleaning stations.

AGENCY COLLABORATION

Preventing the spread and managing the impacts of AIS involves the work of many different agencies. Actions under this strategy will require multiple agencies to solve problems or make improvements. This currently is done in Wisconsin through the WDNR Department Invasive Species Team, the Wisconsin Invasive Species Council and ad hoc working groups that are created on specific topics. There are also opportunities to collaborate through the Wisconsin Lakes Partnership and the Wisconsin AIS Partnership at regular in-person and online meetings.

RESEARCH

Information gaps that prohibit Wisconsin from addressing AIS management issues can be filled through research. Wisconsin has several different programs to meet research needs. The WDNR has an AIS research grant program and can award up to $500,000/year to meet Department research needs. Wisconsin Sea Grant has a biennial research program that awards $2,000,000/year that can include invasive species research. WDNR has also used federal GLRI grants to conduct AIS research.

Wisconsin has and will continue to work with researchers across the state on research projects. This includes researchers at the University of Wisconsin Center for Limnology and the USGS Upper Midwest Environmental Research Center.

REGULATION AND ENFORCEMENT

There are several state statues (e.g. Wis. Ss. 23.22), which provide the authority to develop and implement programs that will prevent, contain and control AIS in Wisconsin. Administrative Rules are then developed by the different state agencies to interpret the state statutes and describe how the statutes will be implemented (e.g. NR 40). Additional internal guidance and policies may be prepared to further describe how the administrative rules will be implemented. Where current regulations exist, Wisconsin has primarily used education and outreach to help people understand and comply with those regulations. While generally effective, there are still individuals that do not comply with regulations even with education. In these instances, increased enforcement effort is needed to further reduce invasion risk.

Wisconsin's regulations require boaters to:

- **INSPECT** your boat, trailer and equipment.
- **REMOVE** any attached aquatic plants or animals (before launching, after loading, and before transporting on a public highway).
- **DRAIN** all water from boats, motors and all equipment.
- **NEVER MOVE** live fish away from a waterbody.
- **DISPOSE** of unwanted bait in the trash.
- **BUY** minnows from a Wisconsin bait dealer. Use leftover minnows only under certain conditions.

More information on Wisconsin's authorities can be found in Appendix 1.

MONITORING

➜ See implementation strategies on page 59

Monitoring for AIS serves multiple functions, but this section will discuss monitoring for the purposes of Goals 1 and 2 (prevention and containment). Monitoring activities that are a function of Goal 3 (control) are discussed in the section on control. Monitoring activities for prevention purposes help managers and stakeholders determine the distribution of AIS to better direct AIS prevention resources and to better address AIS invasion pathways.

Since 1986, the Citizen Lake Monitoring Network (CLMN), jointly administered by the Extension Lakes program and the WDNR, has trained thousands of volunteers across the state to monitor physical and biological aspects of lakes. The CLMN program includes protocols for monitoring Wisconsin lakes, and it has proven to be an effective tool for engaging citizens in monitoring efforts across the state. In 2009 The River Alliance of Wisconsin initiated Project RED: Riverine Early Detectors, and more recently Bridge Snapshot Day, to train citizens to monitor for AIS along streams and rivers. In 2017, Bridge Snapshot day was expanded to monitor lakes, rivers and wetlands. Additional external partners, such as the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), United States Geological

Survey, United States Fish and Wildlife Service, universities and others also contribute monitoring data.

The State of Wisconsin completed a comprehensive 5-year lake monitoring project in which 1,000 lakes with public boat access across Wisconsin were surveyed for AIS. Although the project allowed WDNR staff to verify existing populations of AIS and identify new ones, the primary purpose of the project was to determine the rate of spread of AIS in Wisconsin and ultimately assess the effectiveness of the Wisconsin's investment in boater AIS education activities. If the rate of spread is determined to be decreasing or flat, AIS education activities are having an impact. If the rate is increasing, AIS education activities may not be as effective as once thought. Data collection was completed in 2015, and results indicate that the rate of spread of AIS remained constant.

A pilot project was completed in 2015 to develop and test protocols for AIS monitoring in streams. Results indicate that the protocol detected pioneer populations and identified urban land use as an important feature to use in targeted monitoring for wetland aquatic invasive plants. Efforts will be made to continue to integrate these protocols with routine water quality monitoring on streams by biologists and Water Action Volunteers (Wisconsin's volunteer steam monitoring program). River Alliance of Wisconsin will continue to provide early detection support as well as response following new detections on streams.

Strategies for AIS monitoring in wetlands have been developed and implemented on state lands. However, most AIS monitoring in wetlands will be implemented mostly by local invasive species partners.

The completion of these projects has presented an opportunity for a revised AIS monitoring strategy. The previous monitoring strategy prioritized random sampling so the rate of AIS spread could be determined in a statistically valid way. The WDNR will integrate AIS detection into routine water quality sampling and also implement more target monitoring at high-risk lakes in areas where AIS are more likely to be found. Some AIS partners already do this – GLIFWC implements a targeted strategy on high-risk waters that are important to its member tribes. Additionally, future efforts will increase volunteer participation and enable volunteers to be the early detection monitors.

BY THE NUMBERS:

The WDNR paid for 4,750 hours of AIS monitoring and data management using state funds in 2018.


Bob Jozwowski

Volunteer stream monitor training session.


Kris Stepenuck

Stream monitoring.

New technologies may provide opportunities for increased efficiencies in AIS monitoring. Mobile technologies make it easier to report, monitor and map AIS. Programming capabilities may help managers seamlessly share data, allowing them to be more precise about where to monitor for AIS and to avoid duplication of effort. Monitoring that uses environmental DNA may also provide efficiencies for the AIS monitoring program, especially when monitoring for rare and hard-to-detect species. Lastly, a shift to focusing on monitoring specific pathways may help with the detection of new invasions through those pathways.

RESPONSE ACTIONS

➜ See implementation strategies on page 59

The WDNR Invasive Species Response Framework was developed in 2012 to aid resource managers who are responsible for responding to newly discovered populations of AIS. This framework provides guidance on the necessary components of an effective response. Occurrences will be reported to the WDNR for verification and then communicated to stakeholders. A team will identify resources to develop and implement a plan for further reconnaissance, control, outreach and education. Following plan implementation, monitoring and evaluation will assess project success and begin restoration.

Because new invasions are dynamic, the WDNR's framework cannot, and does not, attempt to provide answers or solutions to all of the issues associated with responses. The factors involved in a species invasion – the species' number, density, distribution and proximity to other known invasions; the time of year; water use; and numerous other factors – determine what actions are possible and useful. Therefore, instead of laying out predetermined plans, the WDNR chose to use the framework to establish a process to guide decision-making and response actions for species invasions anywhere in the state.

By guiding resource managers through a decision-making process and forming communication plans for staff to follow, the WDNR's framework maintains a flexibility that allows it to be applied to a wide range of invasion types, as well as making it adaptable over time as staff and program needs change. Since the development of this framework, the WDNR's ability to efficiently respond to new invasions has greatly improved.

Through the application of the WDNR's response framework, staff have been able to identify several ways the response framework could be improved. Generally, better communication tools to facilitate information transfer between the WDNR and the public are needed. Better clarity of response roles for WDNR and partner staff is also needed. The Incident Command System (ICS) will be consulted to improve the communication process. ICS is a standardized approach to the command, control and coordination of emergency response providing a common hierarchy within which responders from multiple agencies can be effective.

In addition to outreach activities, further agency collaborations will also help the WDNR improve response procedures. Wisconsin already works closely with federal, interstate, state and local partners on development of response plans and research options for invasive species control that can be used to respond to new invasions. The WDNR will continue to work with varying government agencies to adopt similar frameworks, identify priority species for response efforts across multi-jurisdictional waters and participate in mock exercises to aid in response efforts for multi-jurisdictional waters.

A volunteer screens benthic samples for New Zealand mudsnails that were collected by WDNR biologists in 2013.

Control – Definition and Current Status

Wisconsin engages in AIS control activities with different goals, depending on the situation. These include, among other conservation goals, providing relief from the impacts of established AIS populations, reducing the probability of spread, and attempting eradication. Control actions should help achieve situation-specific management goals, restore aquatic ecosystems and build resiliency.

Many of Wisconsin's AIS control efforts are implemented through the WDNR Aquatic Plant Management program. These efforts can be supported with grants to local organizations through WDNR's surface water grants program or may be funded by private dollars.


WDNR

Gill netting carp.


WDNR

Raising purple loosestrife control beetles on netted plants.

Other control efforts outside of the aquatic plant management program exist in Wisconsin, including the Great Lakes Fishery Commission sea lamprey control program and the WDNR's rough fish (fish not commonly sought after for sporting purposes that can become a nuisance - e.g. common carp) removal program. Control work is also completed in Wisconsin with the support of federal grants (e.g., the Great Lakes Restoration Initiative) and county funds, and by other independent entities in Wisconsin, including GLIFWC and individual tribes. All of these efforts are complemented by Wisconsin's investment in AIS education and outreach activities; preventing and slowing the spread of AIS leads to fewer populations that need control actions.

Control efforts with the hopes of eradication do occur. When these efforts are feasible, they often start with a WDNR Early Detection Response grant and then continue with additional funding. The response to the red swamp crayfish (see supplemental materials document) in Germantown is an example of this, as are successful efforts to remove water hyacinth, water lettuce and yellow floating heart from Wisconsin waterbodies. Some success has also been seen using manual removal for small populations of Eurasian watermilfoil. For eradication to be a reasonable goal, an effective early detection and response (EDR) program should be in place so AIS populations are discovered while they are small. It should be noted that eradication is often the exception, rather than the rule, and that expectations of eradication should be tempered. This includes the understanding that suppression of populations can still achieve desirable management goals.

Wisconsin has numerous control tools at its disposal, including physical, chemical and biological control options. All of these control tools have been successfully deployed in the state. The WDNR/Extension purple loosestrife biocontrol program is a prime example of a biological control suppressing populations and bringing back a more natural community. Chemical and physical control methods have been used to provide relief from the effects of well-established populations and to prevent the spread of small, localized populations. Targeted manual removal efforts have also been effective at containing small populations. Using all three control options, in addition to educational and regulatory approaches, is the basis for an effective integrated pest management (IPM) program that delivers desirable environmental outcomes.

Research on control options is ongoing and will continue to provide managers with new options for control and management of AIS. Current research on aquatic plant herbicides will continue to inform managers about non-target impacts and application methods on new technologies, including microparticle control for Asian carps and Zequanox application methods for dreissenid mussels. This research may provide managers with new tools to control species that may not have been previously subject to control work. The integration of IPM principles in all AIS response actions will provide better AIS management and will lessen undesirable impacts.

BY THE NUMBERS:

- Chemical permits received in 2018: 1,551, acres permitted for treatment: 12,733
- Mechanical permits received in 2018: 184, acres permitted for treatment: 3,524

APPENDICES/TABLES

APPENDIX 1 – EXISTING AUTHORITIES AND PROGRAMS

FEDERAL AUTHORITIES

NANPCA AND NISA

There are multiple pieces of federal legislation that are relevant to the management of AIS in Wisconsin. The Nonindigenous Aquatic Nuisance Prevent and Control Act (NANPCA) of 1990 and its subsequent reauthorization and amendment in the form of the National Invasive Species Act of 1996 (NISA) created the ANS Task Force and mandated a coordinated federal aquatic invasive species program to help specific regions and states better address aquatic invasive species issues. NANPCA was primarily created in response to the zebra mussel invasion of the Great Lakes, where ballast water introduction had caused serious ecological and economic effects. Although the zebra mussel invasion of the Great Lakes has played a central role in prompting passage of the federal legislation, NANPCA has been established to prevent the occurrence of all new AIS introductions and to limit the dispersal of all AIS already in United States waters.

The NANPCA, established for the prevention and control of the unintentional introduction of nonindigenous ANS, is based on the following five objectives as listed in Section 1002 of the NANPCA:

- To prevent further unintentional introductions of nonindigenous ANS.
- To coordinate federally funded research, control efforts and information dissemination.
- To develop and carry out environmentally sound control methods to prevent, monitor and control unintentional introductions.
- To understand and minimize economic and ecological damage.
- To establish a program of research and technology development to assist state governments.

The primary components of the NANPCA:

- Required vessels entering ports on the Great Lakes to exchange ballast water and meet other requirements, with voluntary guidelines for similar actions on other waters of the United States.
- Authorized a number of studies and monitoring programs to assess the spread of AIS and develop methods for controlling them.
- Required the development of ballast water programs as well as the establishment of the Ballast Water Management Demonstration Program.
- Authorized the establishment of the ANS Task Force (ANSTF) and established a mechanism for regional collaboration and coordination through the establishment of the ANSTF Regional Panels.
- Authorized the development of an AIS Program to be housed within the USFWS.
- Established the State/Interstate ANS Management Plan Grant program managed by the USFWS, through which states can develop and implement a comprehensive state management plan for the prevention and control of ANS.

The NISA amended NANPCA "To provide for ballast water management to prevent the introduction and spread of nonindigenous species into the waters of the United States, and for other purposes." The NISA authorized:

- The production of guidelines for how to guard against the introduction and dispersal of invasive species.
- Regulations for vessel operations and crew safety, and education and training programs to promote compliance.

- Funding for research on environmentally sound methods to control the spread of invasive species.
- Ecological surveys for certain environmentally sensitive regions of the country.
- Establishment of the National Ballast Information Clearinghouse to provide data about ballasting practices and compliance with guidelines.

The NISA officially expired in 2002. Stakeholder groups and members of Congress have been working to pass another revision aimed specifically at aquatic invasive species, though the new legislation has not passed as of publication of this SMP.

LACEY ACT

The federal Lacey Act targets the trafficking of illegal wildlife, fish and plants. Under the Lacey Act, it is unlawful to import, transport or possess certain species and plant products. Other species require a specific import declaration. Furthermore the injurious wildlife provisions of the Lacey Act prevent illegal introductions of invasive species.

CLEAN WATER ACT

The federal Clean Water Act (CWA) provides for protection of surface water quality in the United States. The statute employs regulatory and nonregulatory tools to achieve the broad goal of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. Multiple sections of the CWA directly or indirectly pertain to AIS including the regulation of ballast water discharges. In addition, Section 404, Wetlands, of the CWA has potential implications by regulating the discharge of dredged or fill material into waters of the United States. For more information and the complete text of the CWA, see www.epa.gov/regulations/laws/cwa.html.

STATE AUTHORITIES

Wisconsin's legislative and regulatory framework consists of various state statutes and administrative rules. The most relevant provisions of these are described in more detail below.

CHAPTER 23, WISCONSIN STATUTES

Chapter 23 of the Wisconsin Statutes creates Wisconsin's invasive species management program. Section 23.22 (1) (c), Wis. Stats., defines "invasive species" as nonindigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Section 23.22 (2) (a), Wis. Stats., requires the WDNR to "establish a statewide program to control invasive species in this state." As part of the statewide control program, the WDNR is required to:

- Create and implement a statewide management plan to control invasive species.
- Administer a program related to aquatic plants (established under s. 23.24, Wis. Stats., see below).
- Encourage cooperation among state agencies and other entities to control invasive species.
- Seek public and private funding for the program.
- Provide education and encourage and conduct research concerning invasive species.
- Promulgate rules to identify, classify and control invasive species. As part of these rules, the WDNR may also establish procedures and requirements for issuing permits to control invasive species.

In addition, s. 23.24, Wis. Stats., directs the WDNR to establish a program to protect diverse and stable native aquatic plant communities in the waters of the state and to regulate how aquatic plants are managed through rules and permits. This section

designates certain aquatic plants as "invasive aquatic plants" and provides authority for the WDNR to identify additional invasive aquatic plants. With certain exceptions, this section also prohibits the introduction of nonnative aquatic plants, manual removal of aquatic plants and use of chemical and biological controls in the absence of a WDNR-issued permit. Section 23.24 (5), Wis. Stats., specifically prohibits the distribution of invasive aquatic plants and provides for penalties for violations of the law.

CHAPTER 29, WISCONSIN STATUTES

Laws related to the management of wild animals, fish and plants are found primarily in ch. 29, Wis. Stats. Several provisions of this chapter are related to or have implications for invasive species prevention or control.

Section 29.735, Wis. Stats. prohibits importation of nonnative fish and their eggs for the purposes of introduction, use as bait, or rearing in a fish farm in the absence of a WDNR-issued permit. Several other sections relate to the control of rough fish or similarly undesirable fish species. For example, with few exceptions, s. 29.407 (4), Wis. Stats., provides that no live rough fish except goldfish, dace, and suckers, may be transported into or within the state without a WDNR-issued permit. Section 29.414, Wis. Stats., allows the WDNR to use screens or similar barriers in navigable streams to prevent rough fish or other undesirable fish from invading the streams. Section 29.421, Wis. Stats., allows, with a few exceptions, the WDNR to take rough fish by various means. Under s. 29.424, Wis. Stats., when the WDNR finds that any species of fish is detrimental to any of the waters of the state it may designate the species of fish and specify the waters in which the species of fish is found to be detrimental. The WDNR may then remove the detrimental fish species from the specified waters. The WDNR implements these regulations largely through the provisions included in ch. NR 19, Wis. Admin. Code.

CHAPTER 30, WISCONSIN STATUTES

Chapter 30, Wis. Stats. establishes regulations for the protection and management of navigable waters, including provisions to minimize the threat of invasive species. For example, s. 30.07 (2), Wis. Stats., make it illegal to place or operate a vehicle, seaplane, watercraft or other object of any kind in a navigable water if it has any aquatic plants or aquatic animals attached to the exterior. This section also makes it illegal to take off with a seaplane or transport or operate a vehicle, watercraft or other object of any kind on a highway with aquatic plants or aquatic animals attached to the exterior. The WDNR augments these provisions through rules contained in chs. NR 19, NR 40, and NR 109, Wis. Admin. Code. Finally, s. 30.18 (2) and s. 31.02 (1), Wis. Stats., include rules regarding the diversion or withdrawal of water from lakes and streams. Withdrawals are regulated through individual permits that may consider the associated risk of spreading invasive species.

CHAPTERS 93-95, WISCONSIN STATUTES

Chapter 93, Wis. Stats. outlines the responsibilities of the Department of Agriculture, Trade and Consumer Protection (DATCP). Section 93.07(12), Wis. Stats., requires the DATCP to conduct surveys and inspections for the detection and control of plant pests, promulgate and enforce rules needed to prevent the dissemination of pests, declare and manage emergencies relating to the detection and control of plant pests and suggest methods of control. Similarly, s. 93.07(10), Wis. Stats., requires the DATCP to protect the health of animals and of humans and to determine and employ the most efficient and practical means for the prevention, suppression, control and eradication of communicable diseases among animals. For these purposes, the section authorizes DATCP to establish, maintain, enforce and regulate quarantines and other measures relating to the importation, movement and care of animals and their products, the disinfection of suspected localities and articles and the disposition of animals.

Chapter 94, Wis. Stats. establishes the state's plant inspection and pest control authorities, including the ability of the DATCP to institute quarantines to prevent the introduction and spread of pests, including invasive species. Section 94.01 allows the DATCP to prohibit the removal of plants and pest-harboring material from private or public property that contains or is exposed to pests, except under conditions necessary to prevent the spread of the pests. Under s. 94.02, Wis. Stats., if the DATCP finds any premises, plants or pest-harboring materials infested or infected with pests, it may require the owner or person in charge to

treat the premises or remove and destroy infested or infected plants and pest-harboring material.

Section 94.03, Wis. Stats. prohibits the sale, offer for sale, movement, transport, delivery, shipment or offer for shipment of plant pests and biological control agents without a DATCP-issued permit. Permits may be issued only after the DATCP determines that the proposed shipment or use will not create sufficient hazard to warrant refusal of a permit. The DATCP is authorized to regulate the sale and use of biological control agents to assure their safety and effectiveness in the control of pests and to prevent the introduction or use of biological control agents which may be injurious to persons or property or non-target plants or animals. The term "biological control agent" refers to "any living organism which because of its parasitic, predatory or other biological characteristics may be effective for use in the suppression or control of pests by biological rather than chemical means" (s. 9403(2), Wis. Stats.). Section 94.10, Wis. Stats., establishes a nursery stock inspection and licensing requirements and established seed inspection program. The rules to implement these provisions are contained in ch. ATCP 21 (Plant Inspection and Pest Control), Wis. Admin. Code. Using these authorities, the DATCP has enacted quarantines for two invasive species: emerald ash borer (*Agrilus planipennis*) and gypsy moth (*Lymantria dispar*).

Chapter 95, Wis. Stats. addresses animal health. Under s. 95.19, Wis. Stats., no person may import, sell, transport or exhibit an animal that is exposed to or infected with a contagious or infectious disease. Knowingly concealing or misrepresenting that an animal has been exposed to or infected with a contagious or infectious disease is also prohibited. People are also prohibited from knowingly permitting an animal that has been exposed to or infected with a contagious or infectious disease to commingle with other animals under conditions that may cause the disease to spread to an animal owned by another person. The DATCP may promulgate rules authorizing the transport under a DATCP permit of an animal exposed to or infected with a contagious or infectious disease for slaughter or other purposes prescribed by the DATCP. The rules also may specify those contagious or infectious diseases to which the prohibitions above apply. Section 95.20, Wis. Stats., further allows the DATCP to prohibit or regulate the importing of animals into this state or the movement of animals within this state if there are reasonable grounds to believe that regulation or prohibition is necessary to prevent the introduction or spread of a disease that threatens the health of animals or humans. Like s. 29.735, Wis. Stats., s. 95.60, Wis. Stats., prohibits importation of nonnative fish and their eggs for the purposes of introduction, use as bait, or rearing in a fish farm without having a state-issued permit. The rules to implement these provisions are contained in ch. ATCP 10 (Animal Diseases and Management), Wis. Admin. Code.

OTHER RELATED WISCONSIN STATUTES

Chapter 281, Wis. Stats. establishes regulations related to protecting and managing water quality and quantity. Section 281.17(2), Wis. Stats., requires the WDNR to supervise chemical treatment of waters for the suppression of nuisance-producing organisms that are not regulated by the aquatic plant program established in ch. 23, Wis. Stats. (see Chapter 23, Wisconsin Statutes, discussion above). This section outlines WDNR authorities for purchase of equipment and cost reimbursements. Implementing procedures are contained in ch. NR 107, Wis. Admin. Code.

Chapter 66, Wis. Stats. establishes the state's general municipal law. Among the regulatory authorities granted to local units of government, town chairs, village presidents and city mayors and managers can annually require the destruction of all noxious weeds within their respective municipalities. This section defines "noxious weed" as "Canada thistle, leafy spurge, field bindweed, any weed designated as a noxious weed by the department of natural resources [WDNR] by rule, and any other weed the governing body of any municipality or the county board of any county by ordinance or resolution declares to be noxious within its respective boundaries" (s. 66.0407 (1) (b), Wis. Stats.). The law requires that landowners destroy all noxious weeds on lands they own or control. It further requires that highway patrolmen destroy noxious weeds on federal, state and county trunk highways. Town boards are responsible for destroying noxious weeds on the town highways. Chapters 59, 60 and 61, Wis. Stats., also authorize expenditures for control of invasive species, weeds and pests.

Chapter 27, Wis. Stats. authorizes local park boards to plant, transplant, remove, trim, spray and otherwise care for and protect all trees and shrubs on or in that part of every street lying between the lot line and the curb, or in the center or side plots in all boulevards and parkways, and in all public parks or grounds belonging to the city and control all such planting and

transplanting by others. The board may also guard all trees within the city to prevent the spread of disease or pests and to eliminate dangerous conditions.

ADMINISTRATIVE CODE

CHAPTER NR 40, WISCONSIN ADMINISTRATIVE CODE

To comply with statutory directives, the WDNR promulgated chapter NR 40, Wis. Admin. Code (hereafter referred to simply as NR 40). The purpose of NR 40 is to "identify, classify and control invasive species in Wisconsin as part of the statewide program required by s. 23.22 (2) (a), Wis. Stats." (s. NR 40.01).

DEFINITION AND CLASSIFICATION OF INVASIVE SPECIES

For the purposes of NR 40, "invasive species" has the meaning given it in s. 23.22 (1) (c), Wis. Stats. In addition, invasive species includes hybrids, cultivars, subspecific taxa and genetically modified variants whose introduction cause or is likely to cause economic or environmental harm or harm to human health. The term "species" is further clarified in NR 40 to mean "monera, protista, fungi, plantae, animalia, viruses, phytoplasmas, mycoplasma-like organisms and prions and includes seeds, propagules and individual living specimens, eggs, larvae and any other viable life-stages of such species" (s. NR 40.02 (48)). For fish, the term invasive species includes all nonnative species (s. NR 40.02 (24)). As indicated in an explanatory note in s. NR 40.02, the WDNR does not consider dead specimens or organisms that are dead, not revivable and no longer capable of living, growing, developing, reproducing and functioning as "invasive species."

NR 40 classifies invasive species into two categories: prohibited and restricted:

"Prohibited invasive species" or "prohibited species" means an invasive species that is likely to survive and spread if introduced into the state, potentially causing economic or environmental harm or harm to human health, but which is not found in the state or in that region of the state where it is listed as prohibited in NR 40, with the exception of isolated individuals, small populations or small pioneer stands of terrestrial species, or in the case of aquatic species, that are isolated to a specific watershed or the Great Lakes, and for which statewide or regional eradication or containment may be feasible.

"Restricted invasive species" or "restricted species" means an invasive species that is already established in the state or in that region of the state where the species is listed as restricted in NR 40 and that causes or has the potential to cause economic or environmental harm or harm to human health, and for which statewide or regional eradication or containment may not be feasible.

Section NR 40.03 (2) requires the WDNR to consider the following criteria in classifying a nonnative species as an invasive species:

- The species' potential to directly or indirectly cause economic or environmental harm or harm to human health, including harm to native species, biodiversity, natural scenic beauty and natural ecosystem structure, function or sustainability; harm to the long-term genetic integrity of native species; harm to recreational, commercial, industrial and other uses of natural resources in the state; and harm to the safety or wellbeing of humans, including vulnerable or sensitive individuals.
- The extent to which the species is already present in the state, or in portions of the state, including whether there are isolated pioneer stands.
- The likelihood that the species, upon introduction, will become established and spread within the state.
- The potential for eradicating the species or controlling the species' spread within the state, including the technological and economic feasibility of eradication or control.
- The socioeconomic value afforded by the species, including any beneficial uses or values the species may provide for recreation, commerce, agriculture or industry within the state.

APPENDIX 1 – EXISTING AUTHORITIES AND PROGRAMS – CONTINUED

REGULATION OF PROHIBITED AND RESTRICTED SPECIES

With limited exceptions, no person may transport, possess, transfer or introduce a prohibited species. Similarly, with limited exceptions, no person may 1) transport, possess, transfer or introduce a restricted invasive fish or crayfish species, or 2) transport, transfer or introduce any other restricted species.

One such exception is if the WDNR determines that the transportation, possession, transfer or introduction was incidental or unknowing and was not due to the person's failure to take reasonable precautions. NR 40 defines "reasonable precautions" as "intentional actions that prevent or minimize the transport, introduction, possession or transfer of invasive species" and include but are not limited to best management practices (BMPs) approved by the WDNR, practices recommended by the "Wisconsin Clean Boats, Clean Waters" program and "Stop Aquatic Hitchhikers" campaign, and compliance with plant and plant pest quarantine regulations imposed by the DATCP or USDA APHIS. For the transfer of aquatic plants, reasonable precautions include verifying that the species transferred is identified correctly and is not regulated in ch. NR 40 and that there are no other listed invasive species comingled with the species being transferred. This exception does not apply to preventive measures required elsewhere in NR 40.

In addition, if authorized by a WDNR-issued permit, a person may transport, possess, transfer or introduce a prohibited species for research, public display or, if the species is not a fish or crayfish, for other purposes specified by the WDNR. Transport, possession, transfer or introduction of a restricted invasive species for research, public display or for other purposes specified by the WDNR can also be authorized by a permit.

A person may transport, possess or give away a prohibited invasive species for the purpose of identification or disposal without a WDNR-issued permit if the person reports the location of origin of the prohibited species and no individual specimens or propagules are allowed to escape or be introduced. A person may transport or give away a restricted invasive species for the purpose of identification, education, control or disposal without a WDNR-issued permit if no viable individual specimens or propagules are allowed to escape or be introduced. These exceptions do not apply to terrestrial and aquatic vertebrates or fish. Restricted plant species parts that are incapable of reproducing or propagating may be transported, transferred or introduced without a permit.

The restrictions do not apply to a person who transports, possesses, transfers or introduces a terrestrial invertebrate or plant disease-causing microorganism that is regulated under a DATCP or USDA APHIS quarantine if:

- The person is in compliance with a DATCP–USDA APHIS compliance agreement applicable to the invertebrate or disease-causing microorganism.
- The transport, possession, transfer or introduction takes place entirely within the quarantine applicable to the invertebrate or disease-causing microorganism.

Other exceptions are for persons who have a DATCP-issued permit for importation, movement, distribution or release of prohibited species or a WDNR-issued scientific collector permit for the invasive species.

INVASIVE SPECIES PERMITS

As mentioned previously, NR 40 allows for a person to transport, possess, transfer or introduce a prohibited or restricted species if the person has been issued a permit by the WDNR for the activity. The WDNR, however, must determine that permit applications meet the following criteria:

- The applicant is knowledgeable in the proper management or humane care of the invasive species.
- The applicant has an adequate site or facility for containment of the invasive species.
- The applicant has demonstrated to the WDNR's satisfaction that permitted activities will not cause significant ecologic or economic harm or harm to human health.
- The applicant has complied with the conditions of any previous WDNR permits issued under this chapter.

An applicant meeting these criteria may be issued a permit subject to conditions the WDNR considers reasonable.

APPENDIX 1 – EXISTING AUTHORITIES AND PROGRAMS – CONTINUED

WDNR-issued permits can authorize transport, possession, transfer or introduction of prohibited species for research, public display or, if the species is not a fish or crayfish, for other purposes specified by the WDNR. The WDNR can issue permits for the transport, possession, transfer or introduction of a restricted invasive species for research, public display or for other specified purposes.

Additional information regarding these permits can be found at dnr.wi.gov/topic/Invasives/permits.html or by searching "NR40 permit" in the WDNR website.

PREVENTIVE MEASURES

NR 40 includes a number of additional provisions to prevent the introduction and spread of invasive species. These include requiring reports of escapes of restricted invasive fish species; requiring immediate removal of aquatic plants and aquatic animals from vehicles, boats, boat trailers and gear when removing them from water; requiring the draining of water from vehicles, equipment or gear when removing them from water; and prohibiting the transport of an identified carrier of an invasive species from an infestation control zone or quarantine area.

DECONTAMINATION PROTOCOLS

Chapters NR 320, 323, 328, 329, 341, 343 and 345, Wis. Admin. Code, relating to general navigable waters permit criteria, set equipment decontamination requirements to stop the spread of invasive species from one waterway to another and require removal of all plants, animals, mud, debris, etc., before and after use.

APPLICABLE FEDERAL LAWS

16 U.S.C. § 4724 – State aquatic nuisance species management plans

16 U.S.C. § 4722 – Aquatic nuisance species program

7 U.S.C. § 7714 or § 7715 – Plant pest quarantines

NISA AUTHORITY UPDATE

An inquiry into the status of efforts to seek reauthorization of the Nonindigenous Invasive Species Act (NISA) revealed that there has been no attempt by the federal agencies or Congress to reauthorize NISA. The lack of any movement to reauthorize NISA means the federal government and its partners operate under the existing authorization.

GAPS IN AUTHORITY – LACEY ACT

In 2017, D.C. District Court upheld a 2015 District Courts ruling that changed the interpretation of the injurious wildlife provision of the Lacey Act (18 U.S.C. § 42(a)(1)). The Lacey Act had long been interpreted by the US Fish and Wildlife Service to mean that interstate transportation of injurious species was prohibited. The court's ruling upheld the United States Association of Reptile Keepers (USARK) lawsuit that the Lacey Act does not prohibit transport of injurious wildlife between States within the continental United States. The Lacey Act still prohibits the importation of injurious wildlife into the United States, and it still prohibits the transportation of injurious wildlife between the U.S., the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, and any possession of the United States. It is important to note that the USFWS has the authority to help facilitate enforcement of other Federal laws and helps States, tribes and other jurisdictions uphold protections they deem appropriate for their wildlife and plant resources. These protections may include state laws that prohibit certain activities with species identified as invasive under State law. Interstate movement of these species in violation of State law could be a violation of one of these provisions of the Lacey Act.

Wisconsin's state laws (Wis. Admin. Code NR 40) regulating the movement of AIS is comprehensive and would provide the state and federal enforcement agents sufficient authority to stop the movement of regulated species into, within or through the state.

FEDERAL AUTHORITIES

The State of Wisconsin has several federal facilities, and properties within its borders which requires Federal agencies to be active in the state. Some federal agencies are active in Wisconsin by providing federal AIS grants or regulations (e.g. US EPA). Some of the Federal agencies involved in Wisconsin and their areas of coverage are summarized below.

Federal Agency	Facility or Property
National Parks Service	St. Croix River National Scenic Riverway
US Forest Service	Chequamegon National Forest Nicolet National Forest
US Fish and Wildlife Service	Necedah National Wildlife Refuge Upper Mississippi River National Wildlife Refuge Trempealeau National Wildlife Refuge Driftless Area National Wildlife Refuge
US Army Corps of Engineers	Mississippi River Lock and Dam (3–9)
Federal Energy Regulatory Commission (FERC)	FERC Licensed Dams in Wisconsin
US EPA	Federal AIS Grants and Regulations
US Coast Guard	Federal Regulations

National Parks Service (NPS)

There are a few laws which give the National Parks Service (NPS) authority to protect the resources within and outside of the park boundaries for activities benefiting park natural resources. The NPS Organic Act (16 U.S.C. § 1 et seq., P.L. 113-287, 128 Stat. 3094.) specifically authorizes the NPS to provide for the destruction of detrimental animals, which includes invasive species. Additional laws include the Consolidated Natural Resources Act of 2008 (16 U.S.C. § 1j, P.L. 113-287, 128 Stat. 3094, and the General Authorities Act of 1970, (16 U.S.C. 1a-1; P.L. 113-296).

The NPS has been especially active in the St. Croix River National Scenic Riverway by supporting AIS education and prevention activities. NPS staff have been active in protecting native mussel populations in the Riverway by physically removing zebra mussels from native mussel shells.

US Forest Service (FS)

The US Forest Service (FS) authorities come from Title 36 Code of Federal Regulations which allows for the prevention and control of aquatic and terrestrial invasive species. Additionally, 36 C.F. R. 222.8 identifies the FS's obligation to identify and control invasive species in National Forest System. Several laws, regulations and policies provide the FS with the authority or direction

to prevent and control invasive species including:

- Consolidated Appropriations Resolution, 2003 (16 U.S.C. § 2104) – provides authority for FS to enter into stewardship contracts with public or private entities to prevent and control invasive species and reestablishing native species.
- Forest Service Manual 2900 – An internal directive that provides foundational comprehensive guidance for the management of invasive species on aquatic and terrestrial areas of the National Forest System.

US Fish and Wildlife Service (USFWS)

The US Fish and Wildlife Service (USFWS) not only manages several refuges in Wisconsin but is also active in the AIS arena at the national level as co-chair of the ANS Task Force, provider of federal grants to implement federally approved Aquatic Nuisance Species Management Plans and Great Lakes Restoration Initiative program grants.

The laws, regulations and policies providing authority or direction to the USFWS include:

- Title 18 of the Lacey Act which prohibits the importation and interstate transport of injurious species.
- National Wildlife Refuge System Administration Act (16 U.S.C. §§ 668dd-ee, regulated through 50 C.F.R.) – specifically 50 C.F.R. § 27.52 which prohibits the introduction, liberation or placement of any plant or animal on any national wildlife refuge except as authorized.
- Refuge Manual Chapter 7 RM 8 – established a policy on the release of exotic species on refuges.
- Service Manual 601 FW 3 Biological Integrity, Diversity, and Environmental Health.
  - 3.14 F – prohibits the release of species on refuges outside of their historic range unless it is essential for the control of an invasive species and prescribed in an integrated management plan.
  - 3.16 A – identifies the USFWS objective to prevent the introduction of invasive species, detect and control populations of invasive species, and provide for restoration of native species and habitat conditions in invaded ecosystems.
  - Service Manual 750 FW 1 – establishes policy to help prevent the spread of invasive and non-target species by developing and implementing a quality control planning process in all Service operations within the Fisheries Program through Hazard Analysis and Critical Control Point Plans.

US Army Corps of Engineers (USACOE)

During the Great Lakes Mississippi River Interbasin Study the USACOE identified eight potential pathways connecting the Great Lakes and Mississippi River basins in Wisconsin. Four of these connections were considered medium risk and the remaining four were low risk. Following identification and the completion of an inventory of physical features, Department staff investigated the medium risk pathways and determined them to be free from invasive species. The Department in consultation with USACOE staff determined that due to the invasive species (Viral Hemorrhagic Septicemia) most likely to cross the basin boundary it was extremely unlikely that it would be able to become established in the Mississippi River basin. The four medium risk pathways were:

- Brule Headwaters – A long narrow valley spans the basin divide. Habitat at this location is predominately forested wetland and intermittent pools of stagnant water. An intermittent surface water connection forms in the bottom of the valley which connects Porcupine Creek in the Mississippi River Basin with the West Fork Brule River, which drains to Lake Superior. The duration of the connection is limited to several days during periods of snow melt or rainfall events.
- Portage Downstream and Canal – This connection is located southeast of Portage, Wisconsin. The habitat in the location is agricultural fields, wetlands and limited woodlands. The potential connection is located primarily within the Swan Lake Wildlife Area. The main connection point between the two basins is an ungated interbasin flow structure that was

constructed as part of Portage Flood Risk Management project. An aquatic connection exists for floods slightly greater than a 10 percent annual recurrence interval event.

- Portage Upstream – This connection is located west of Portage, Wisconsin. There are two culverts under the levee which separates the Great Lakes and Mississippi River Basins. The site was determined to be capable of conveying water across the basin divide for floods slightly greater than the 10 percent annual recurrence interval event.
- Rosendale-Brandon – This potential connection is located about 15 miles west of the City of Fond du Lac. The pathway consists of an emergent and scrub-shrub wetland that drains into both the Great Lakes and Mississippi River Basins. The intermittent streams associated with the connection can maintain a surface water connection during a 10 percent recurrence interval storm event.

Federal Energy Regulatory Commission (FERC)

The Federal Energy Regulatory Commission (FERC) regulates several hydroelectric dams in Wisconsin via a license. During the licensing process, the WDNR participates in the formal process, to ensure that public rights and interests related to natural resources and recreation are adequately identified and protected. Many licenses have requirements to maintain and/or enhance the waterbodies where the hydroelectric dams are located. WDNR also issues a State Water Quality Certification (WQC). The WQC may add additional requires to the FERC license to ensure that adequate resource protection measures are implemented by the licensee. A significant point of discussion is often the need to provide fish passage at these hydroelectric dams without allowing the movement of AIS.

FERC's authority came from several Congressional actions:

- Federal Power Act
- Public Utility Regulatory Policies Act
- Natural Gas Act, and Interstate Commerce Act
- Energy Policy Act of 2005

US Coast Guard (USGC)

The US Coast Guard (USCG) develops and enforce international fisheries and maritime agreements, including those concerning ballast water management. Ballast water is regarded as a historically significant pathway bringing a significant number of AIS to the Great Lakes. Recently implemented federal regulations have greatly slowed the arrival of new AIS to the Great Lakes helping to protect the inland waters from new species.

APPENDIX 2 – TIMELINE OF REVIEWS AND APPROVALS

The Wisconsin AIS Management Plan has gone through a rigorous process of reviews and approvals by internal and external authorities. A list of those authorities and the dates of their reviews are below:

- WI AIS Management Plan Core Team, April 2018
- WDNR Program Management Team, May 2018
- WDNR Operations Management Team, June 2018
- Wisconsin Invasive Species Council, June 2018
- Aquatic Nuisance Species Task Force, Tentative May 2019

APPENDIX 3 – PROGRAM EVALUATION

WDNR will summarize progress and achievements of the AIS program every two years in its regular report to the legislature on Wisconsin's invasive species program. This report will feature success stories and a summary of program outputs.

Wisconsin uses a number of evaluation tools to assess the success of its AIS management program. WDNR and UW–Madison Division of Extension will continue to measure the impact of its programs on recreational boaters through the CBCW boater behavior study and the boater/angler survey that is completed every five years. These efforts help assess our boating population as a whole, and help track the impacts of our programs. Focus groups and interviews will continue to help us identify emerging issues. For pathway assessment, new evaluation techniques will need to be developed as we better understand each pathway.

Opportunities for stakeholder feedback will occur twice per year at our Wisconsin AIS Partnership meetings and once per year at the Wisconsin Lakes Convention.

At 5 years, the AIS core team will formally review the plan and make any changes to ensure the plan stays relevant for an additional 5 years.

At 10 years, a larger revision process should occur to help Wisconsin incorporate new technologies and changes in the invasion landscape.

If there is a need to alter the plan outside of the five- and ten-year windows outlined above, a request can be sent to the DNR AIS Program Coordinator to convene the Core Team to address this mid-course correction.

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APPENDIX 5 – ACRONYMS

ACOE: United States Army Corporation of Engineers

AIS: aquatic invasive species

ANS: aquatic nuisance species

ANSTF: Aquatic Nuisance Species Task Force

APHIS: Animal and Plant Health Inspection Service

BASS: Bass Anglers Sportsman Society

BMP: Best Management Practice

CAWS: Chicago Area Waterway System

CBCW: Clean Boats Clean Waters

CISMA: Cooperative Invasive Species Management Area

CLMN: Citizen Lake Monitoring Network

CWA: Clean Water Act

DATCP: Department of Agriculture, Trade and Consumer Protection (also referenced as: WDATCP – Wisconsin Department of Agriculture, Trade and Consumer Protection)

DOT: Department of Transportation

EDR: Early Detection and Response

EPA: Environmental Protection Agency

FTE: Full Time Employment

GLDIATR: Great Lakes Detector of Invasive Aquatics in Trade

GLC: Great Lakes Commission

GLIFWC: Great Lakes Indian Fish & Wildlife Commission

GLRI: Great Lakes Restoration Initiative

HACCP: Hazard Analysis and Critical Control Point

IMO: International Maritime Organization

IPM: integrated pest management

LE: law enforcement

LTE: Limited Term Employment

MDEQ: Michigan Department of Environmental Quality

MDNR: Michigan Department of Natural Resources

NANPCA: Nonindigenous Aquatic Nuisance Prevention and Control Act

NEPA: National Environmental Policy Act

NISA: National Invasive Species Act

NPS: National Park Service

OIT: organism in trade

OTIC: Order Tracking and Inventory Control

PIJAC: Pet Industry Joint Advisory Council

Project RED: Riverine Early Detectors

SAG: Species Assessment Group

USDA: U.S. Department of Agriculture

USDA APHIS: U.S. Department of Agriculture Animal and Plant Health Inspection Service

USFWS: U.S. Fish and Wildlife Service

USGS: United States Geological Survey

UW: University of Wisconsin

WAA: Wisconsin Aquaculture Association

WDNR: Wisconsin Department of Natural Resources

WISG: Wisconsin Sea Grant

APPENDIX 6 – LITERATURE CITED

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APPENDIX 7 – DOCUMENTATION AVAILABLE ONLINE

The following resources are accessible online at the time of publication.
If you need help accessing a resource listed here, please contact:

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COMMENTS RECEIVED ON THE PLAN, RESPONSES TO THEM, HOW THEY WERE ADDRESSED

Available at [to be completed later]

COMPLEMENTARY AIS MANAGEMENT PLANS INCLUDING:

- **WISCONSIN INVASIVE SPECIES COUNCIL STRATEGIC PLAN**
  Available at invasivespecies.wi.gov/initatives/strategic-plan/statewide-strategic-plan-13-16
- **GLIFWC INVASIVE SPECIES WORK PLAN**
  Available at invasives.glifwc.org/annual.workplan/glifwc.annual.workplan.pdf
- **WETLAND INVASIVE SPECIES STRATEGIC PLAN**
  Available at dnr.wi.gov/topic/Wetlands/documents/WetlandInvasiveSpeciesStrategy.pdf
- **WDNR AQUATIC PLANT MANAGEMENT STRATEGIC ANALYSIS**
  Available at dnr.wi.gov/topic/eia/apmsa.html
- **LAKE SUPERIOR AIS PLAN**
  Available at www.epa.gov/sites/production/files/2015-11/documents/lake-superior-aquatic-invasive-species-complete-prevention-plan-201401-92pp.pdf
- **ST. CROIX AIS PLAN**
  Available at www.co.washington.mn.us/DocumentCenter/View/19401/St-Croix-River-Basin-Aquatic-Invasive-Species-Strategic-Plan-?bidId=
- **LOWER WISCONSIN AIS PLAN**
  Available at dnr.wi.gov/news/input/documents/guidance/AISPlanDraft.pdf
- **RIVER ALLIANCE AIS PLAN**
  Available at https://uwmadison.box.com/s/zky2phxawwyodxx9h8llw8ht90pqwtkl

NR 40 SPECIES LISTINGS AND LINK TO SAG DOCUMENTS

Available at dnr.wi.gov/topic/invasives/classification.html (navigate to the “Species list” tab.)

AQUATIC AND WETLAND INVASIVE SPECIES PRESENT

Keyword search “aquatic invasive species locations” on dnr.wi.gov

RESPONSE FRAMEWORK

Keyword search “invasive species framework” on dnr.wi.gov

PRIOR ANALYSES OR REPORTS

Available at https://uwmadison.box.com/s/90kssmesmw6evb467v2zwagp97yiy3h8

GREAT LAKES INVASIONS GLC

www.glc.org/wp-content/uploads/GLP-2007-aquatic-invasions-whole.pdf

TABLE 1 – MANAGING EXISTING POPULATIONS

➜ See description and status on page 13

IMPLEMENTATION STRATEGIES

Goal 3: Control existing populations of AIS to minimize harmful impacts

Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Program Maintenance	Provide funding for AIS control actions	WDNR	WI AIS Partnership
	Implement integrated pest management approaches for control activities	WDNR	Consultants
	Implement NR 107 and NR 109	WDNR	Consultants
	Prioritize management efforts of NR 40 species	WDNR	Consultants
	Invest in other parts of AIS management (outreach, monitoring) to limit the need for expensive control actions	WDNR	Extension, WISG, WI AIS Partnership
Research	Invest in new control technologies	WDNR	Universities
	Better understand and refine existing control technologies	WDNR	Universities
	Continue to implement pre/post treatment monitoring for research purposes	WDNR	Universities
Regulations	Explore the possibility of experimental use of existing control technologies with regulators	WDNR	DATCP, EPA
Collaboration	Share research outputs with local, state and regional partners	WDNR	Universities, ANSTF, WI AIS Partnership, Extension
Collaboration	Work across organizations to better communicate control options and their benefits and consequences	WDNR	Universities, WI AIS Partnership, Extension

TABLE 2 – MARITIME COMMERCE

IMPLEMENTATION STRATEGIES

➜ See description and status on page 16

Goals 1 & 2 Pathways Approach: Prevent new invasions and stop secondary spread in Wisconsin through maritime commerce

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Ballast Water	Education/ Outreach	Initiate, promote and support general ballast water information and educational efforts	Extension/ WISG	WDNR, WI AIS Partnership
		Develop AIS education and outreach materials specifically for the shipping industry	WDNR/ Extension/ WISG	U.S. Great Lakes Shipping Association, Lake Carriers Association, Great Lakes Ports Association
	Agency Collaboration	Work with other jurisdictions to address ballast water issues	WDNR	Extension, WISG
		Work with other organizations for table-top exercises to respond to high-risk vessels	WDNR	Extension, WISG, USFWS, MDNR, MDEQ, Illinois DNR
		Reach out to other organizations to bring them up to speed on Wisconsin ballast water permits	WDNR/ Extension/ WISG	U.S. Great Lakes Shipping Association, Lake Carriers Association, Great Lakes Ports Association
		Continue to participate in regional efforts to manage ballast water issues (e.g., Great Lakes ANS Panel, Great Lakes Ballast Water Collaborative). Increase internal communications about these efforts	WDNR	Extension, WISG
		Work with NPS and Isle Royale National Park to support their work on treatment systems	WDNR	NPS
		Work with NPS to protect Apostle Islands and implement ballast water outreach	WDNR	NPS
		Better understand AIS monitoring efforts in Great Lakes and Mississippi River ports across partners	EPA/USFWS	WDNR, USGS
		Evaluate the current administrative home of the WDNR ballast water permit program and, if appropriate, relocate the program to a more appropriate WDNR section	WDNR	
	Research	Support research to make ballast treatments more effective	WDNR	WISG, Great Ships Initiative
		Support research to make discharge in compliance with wastewater standards	WDNR	WISG, Great Ships Initiative
		Support research to decrease time for ballast treatment systems	WDNR	WISG, Great Ships Initiative

TABLE 2 CONTINUED – MARITIME COMMERCE

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Ballast Water (continued)	Research (continued)	Utilize ballast sub-samples to evaluate compliance with permit requirements	WDNR	USGS, University of Wisconsin System
		Continue to understand the impacts of algae and harmful microbes	Extension/ WISG	WDNR
	Regs/ Enforcement	Enforce Wisconsin permit standards across all vessels requiring a Wisconsin permit in the Great Lakes	WDNR	
		Continue to issue and run the Wisconsin Ballast Water Permit program with a goal of inspecting 25% of all arrivals (met at full capacity)	WDNR	
Hull, Anchor, Superstructure Fouling	Agency Collaboration	Work with other states and regional entities to address this issue (e.g., Great Lakes ANS Panel, Great Lakes Ballast Water Collaborative)	WDNR/ Extension/ WISG	
	Research	Evaluate the risk of biofouling as a pathway for Great Lakes shipping vessels	University of Wisconsin System	WDNR
	Regs/ Enforcement	Clarify WDNR authority to enforce fouling issues. If none exists, request authority to enforce fouling issues	WDNR	
Overarching	Monitoring	Identify locations of pathway release, identify current monitoring efforts, identify gaps and monitor needs, implement monitoring where needed	WDNR	WI AIS Partnership

TABLE 3 – CANALS, DAMS AND DIVERSIONS

➜ See description and status on page 17

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach:
Prevent new invasions and stop secondary spread in Wisconsin through canals, dams and diversions

Subpathway	Strategy	Specific Actions	Lead	Cooperating Organizations
Great Lakes Mississippi River Interbasin Study – Chicago Area Waterway System (CAWS)	Education/ Outreach	Summarize status of discussions concerning the prevention of AIS through the Chicago Area Waterway System on a yearly basis	WDNR	Wis. Lakes, River Alliance, WISG
	Agency Collaboration	Provide opportunities to assist partners to become informed and educated about issues, so they may express concerns or recommendations through proper channels	WDNR	Wis. Lakes, River Alliance, WISG
	Regs/ Enforcement	Develop and enforce regulations that are supportive of regional goals and objectives	WDNR	Wis. Lakes, River Alliance
Great Lakes Mississippi River Interbasin Study – Other Pathways	Agency Collaboration	Provide opportunities to assist partners to become informed and educated about issues, so they may express concerns or recommendations through proper channels	WDNR	Wis. Lakes, River Alliance
	Regs/ Enforcement	Develop and enforce regulations that are supportive of regional goals and objectives	WDNR	Wis. Lakes, River Alliance
Mississippi River Lock and Dam System	Education/ Outreach	Develop and support existing educational programs and outreach efforts to inform users of the importance of AIS prevention steps at barriers to AIS dispersal	WDNR	Minnesota DNR, Iowa DNR, River Alliance
	Agency Collaboration	Work with federal agencies, neighboring states and non-profit conservation organizations to increase awareness of AIS prevention steps	WDNR	WDATCP, ACOE, FWS, RWA
		Work with other state agencies to reduce AIS available in trade	WDNR	WDATCP, ACOE, FWS, RWA
	Research	Look for opportunities to support existing research or develop research to address critical control or management needs	WDNR	Minnesota DNR, Iowa DNR, River Alliance
	Regs/ Enforcement	Develop and enforce regulations that are supportive of regional goals and objectives	WDNR	Minnesota DNR, Iowa DNR, River Alliance
First barriers to dispersal of source waters (Great Lakes, Mississippi River)	Education/ Outreach	Develop an initiative to increase user compliance with AIS prevention steps at critical first barrier (Great Lakes, Mississippi River) locations	WDNR	WDATCP, ACOE, FWS, RWA
	Agency Collaboration	Implement Fish Passage Guidance	WDNR	WDATCP, ACOE, FWS, RWA
	Regs/ Enforcement	Increase water guard presence at first barrier locations to enforce compliance of AIS regulations	WDNR	WDATCP, ACOE, FWS, RWA, WISG
Portage Canal	Education/ Outreach	Develop and support existing educational programs or outreach efforts to inform users of the importance of AIS prevention steps at barriers to AIS dispersal	WDNR	WDATCP, ACOE, FWS, RWA
	Regs/ Enforcement	Increase law enforcement presence at first barrier locations to enforce compliance of AIS regulations	WDNR	WDATCP, ACOE, FWS, RWA
Overarching	Monitoring	Identify locations of pathway release, identify current monitoring efforts, identify gaps and monitor needs, implement monitoring where needed	WDNR	WI AIS Partnership

TABLE 4 – RECREATIONAL ACTIVITIES AND SERVICE PROVIDERS

➜ See description and status on page 18

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach:
Prevent new invasions and stop secondary spread in Wisconsin through recreational activities and service providers

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Recreational Boating	Education/ Outreach	Continue to inspect more than 100,000 watercraft/year through the Clean Boats Clean Waters (CBCW) program	Extension/ WDNR	WI AIS Partnership
		Implement a mobile CBCW data collection and entry system statewide by 2020	Extension/ WDNR	WI AIS Partnership
		Create a registry and certification for CBCW inspectors by 2020	Extension/ WDNR	WI AIS Partnership
		Include the boater observation study as a component of CBCW statewide in 2019	Extension/ WDNR	WI AIS Partnership
		Develop new outreach materials to address boating pathways that may require additional actions to reduce risk (e.g., wakeboard boats, personal watercraft)	Extension/ WDNR	WI AIS Partnership
		Evaluate outreach efforts annually and modify when necessary	Extension/ WDNR	WI AIS Partnership
		Continue coordination of statewide outreach campaigns that target recreational boaters (e.g., Landing Blitz, Drain Campaign)	Extension/ WDNR	WI AIS Partnership
		Develop continuing education opportunities for CBCW volunteers that increase their capacity to educate boaters	Extension	WI AIS Partnership
		Better target transient boaters and boaters from out of state	Extension/ WDNR	WI AIS Partnership
	Agency Collaboration	Develop a statewide set of core services for the Wisconsin AIS Prevention Network funded by WDNR contracts	WDNR	WI AIS Partnership
		Develop a watercraft decontamination strategy for Wisconsin boaters and communicate the strategy with partners	Extension/ WDNR	WI AIS Partnership
		Communicate across LE, CBCW and AIS partners for more strategic outreach	Extension/ WDNR	WI AIS Partnership
	Research	Determine risk and appropriate actions to reduce AIS transport risk of specialty recreational watercraft (e.g., wakeboard boats, personal watercraft)	Extension/ WISG	WI AIS Partnership
		Continue with CBCW data collection techniques that allow for statistically valid evaluations of boater actions	Extension	WI AIS Partnership
	Regs/ Enforcement	Support warden education to reduce barriers to enforcement action	Extension/ WDNR	WI AIS Partnership
		Increase the number of law enforcement AIS group checks	Extension/ WDNR	WI AIS Partnership
		Support required AIS enforcement effort by conservation wardens	WDNR	WI AIS Partnership

(continued)

TABLE 4 CONTINUED – RECREATIONAL ACTIVITIES AND SERVICE PROVIDERS

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Wading Sports	Education/ Outreach	Adapt the CBCW program to facilitate conversations with shoreline anglers/wading sports participants	Extension/ WDNR	WI AIS Partnership
		Develop a clean angling program that reaches the number of wading anglers with Stop Aquatic Hitchhikers! guidance	Extension/ WDNR	WI AIS Partnership
		Develop Stop Aquatic Hitchhikers! messaging and outreach materials for fur harvesters	Extension/ WDNR	WI AIS Partnership, Wisconsin Trappers Association
		Expand the use of wader cleaning stations across the state	Extension/ WDNR	WI AIS Partnership
		Increase contacts with wading sports participants and shoreline anglers from 0 to 10,000/year by 2025	Extension/ WDNR	WI AIS Partnership
		Expand *Stop Aquatic Hitchhikers!* messaging to waterfowl hunters by making 5,000 in-person contacts/year	Extension/ WDNR	WI AIS Partnership, Duck Unlimited, Wisconsin Water-fowl Association
	Agency Collaboration	Identify new partners to increase awareness of AIS prevention among wading sports participants	Extension/ WDNR	WI AIS Partnership
		Identify new partners to promote clean angling practices in streams	Extension/ WDNR	WI AIS Partnership, Trout Unlimited, River Alliance
	Research	Evaluate the efficacy and use of wader cleaning stations and evaluate their use	Extension/ WDNR	WI AIS Partnership, River Alliance
		Identify obligatory hubs for wading sports participants	Extension/ WDNR	WI AIS Partnership
		Develop a HACCP approach and AIS prevention actions for fur harvesters	Extension/ WDNR/WISG	WI AIS Partnership, Wisconsin Trappers Association
Activity/Gear	Education/ Outreach	Promote the ANSTF *Stop Aquatic Hitchhikers!* guidelines for recreational activities for all water users as voluntary prevention actions	Extension/ WDNR/WISG	WI AIS Partnership, ANSTF
		Develop or continue outreach campaigns targeted toward gear or activities	Extension/ WDNR	WI AIS Partnership
	Agency Collaboration	Explore partnerships with industry to include *Stop Aquatic Hitchhikers!* prevention message on commonly used gear	Extension/ WDNR/WISG	WI AIS Partnership
	Research	Perform risk assessments of gear associated with recreational activities	Extension/ WDNR/WISG	WI AIS Partnership

TABLE 4 CONTINUED – RECREATIONAL ACTIVITIES AND SERVICE PROVIDERS

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Lake & River Service Providers	Education/ Outreach	Develop a consistent message and a set of BMPs to provide service providers	Extension/ WDNR/WISG	WI AIS Partnership
		Develop a decontamination training for external partners that need to follow WDNR decontamination protocols	Extension/ WDNR/WISG	WI AIS Partnership
		Create and implement AIS outreach campaigns that target the lake and river service industry	Extension/ WDNR/WISG	WI AIS Partnership
	Agency Collaboration	Use public records to develop a database of service provider contact information for outreach and enforcement	Extension/ WDNR/WISG	WI AIS Partnership
		Coordinate across law enforcement agencies to enforce AIS laws	Extension/ WDNR	WI AIS Partnership
	Research	Pilot a "Clean Marina"-like certification and training program for service providers by 2025	Extension/ WDNR/WISG	WI AIS Partnership
		Identify which WDNR permittees perform activities that have a high risk of transporting AIS	Extension/ WDNR	WI AIS Partnership
		Assess which AIS prevention approaches are already in place within the lake and river service provider industry	Extension/ WDNR	WI AIS Partnership
		Create a database of lake service providers	Extension/ WDNR	WI AIS Partnership
	Regs/ Enforcement	Determine which WDNR permittees should follow WDNR decontamination procedures	Extension/ WDNR	WI AIS Partnership
		Increase NR 40 compliance efforts that focus on the lake and river service industry	Extension/ WDNR	WI AIS Partnership
Overarching	Education/ Outreach	Evaluate how *Play.Clean.Go!* fits into Wisconsin's overall invasive species outreach strategy	Extension/ WDNR	WI AIS Partnership, IPAW
		Explore methods of integrating the *Stop Aquatic Hitchhikers!* message into existing internal and external trainings	Extension/ WDNR/WISG	WI AIS Partnership
		Develop a Wisconsin AIS Partnership Outreach and Communications Guidance document	Extension/ WDNR/WISG	WI AIS Partnership
	Agency Collaboration	Explore how Wisconsin can co-brand with existing campaigns such as *Clean Drain Dry*	Extension/ WDNR	WI AIS Partnership, Wildlife Forever, ANSTF
	Monitoring	Identify locations of pathway release, identify current monitoring efforts, identify gaps and monitor needs, implement monitoring where needed	WDNR	WI AIS Partnership

TABLE 5 – NON-RECREATIONAL FISHING AND AQUACULTURE

→ See description and status on page 19

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach:
Prevent new invasions and stop secondary spread in Wisconsin through non-recreational fishing and aquaculture

Subpathway	Strategy	Specific Actions	Lead	Cooperating Organizations
Commercial Fishing	Education/ Outreach	Develop AIS toolkit that empowers people who commercially fish in the Great Lakes to identify and report potentially new AIS	WISG	WDNR, Lake Superior and Lake Michigan Commercial Fishing Boards
Food Aquaculture	Education/ Outreach	Continue to make training available to private fish farms in AIS HACCP	WISG	WDNR, DATCP, WAA
	Research	Develop monitoring program to evaluate the frequency that AIS appear in fish imported to or distributed throughout Wisconsin	Extension	WDNR, DATCP, WAA
Bait – Wild Harvest	Education/ Outreach	Continue to make training available to wild bait harvesters in AIS HACCP	WISG	Individual bait harvesters
	Agency Collaboration	Develop working group to ensure information is available between appropriate partners	WDNR	DATCP, individual bait harvesters, WAA
	Research	Develop monitoring program to evaluate the frequency that AIS appear in wild bait harvested throughout Wisconsin	WDNR/ UW	DATCP, individual bait harvesters
	Regs/ Enforcement	Enforce existing AIS-relevant laws for wild bait harvesters by inspecting harvest for listed species	WDNR	DATCP, individual bait harvesters, WAA
		Engage in collaborative review of wild bait harvest regulations		DATCP, individual bait harvesters, WAA
Fishing Tournaments	Education/ Outreach	Communicate with all stakeholders about completed outreach work targeting tournaments, and better implement existing programs	WDNR/ Extension	BASS, WI Bass Federation Nation, The Bass Federation, National Professional Anglers Association, The Walleye Federation
	Agency Collaboration	Identify partnership opportunities with national groups to spread message and importance of AIS prevention and control	WDNR/ Extension	BASS, WI Bass Federation Nation, The Bass Federation, National Professional Anglers Association, The Walleye Federation
		Work with state and local tournament groups to encourage tournament anglers to volunteer for inspection stations		
	Regs/ Enforcement	Proactively engage with tournament organizers and participants by attending pre-meetings to ensure all are aware of new AIS regulations and regulations are followed	WDNR	WI AIS Partnership
Rough Fish Removal	Education/ Outreach	Train rough fish harvesters in AIS HACCP	WDNR/ Extension/ WISG	Individual rough fish harvesters

TABLE 5 CONTINUED – NON-RECREATIONAL FISHING AND AQUACULTURE

Subpathway	Strategy	Specific Actions	Lead	Cooperating Organizations
Rough Fish Removal (continued)	Agency Collaboration	Engage commercial rough fish harvesters to collaboratively develop BMPs and outreach toolkit	WDNR	Individual rough fish harvesters
	Research	Multi-pronged research effort could focus on efficacy of rough fish harvest in reducing AIS (e.g., Asian carp) as well as modeling potential for rough fish harvesters to be vectors of various AIS		Individual rough fish harvesters
	Regs/ Enforcement	Enforce existing AIS relevant laws for rough fish harvesters by inspecting harvest for listed species	WDNR	Individual rough fish harvesters
Fishing guides – Inland and Great Lakes	Education/ Outreach	Develop AIS toolkit geared toward fishing guides, including targeted outreach material for their activities and potential distribution materials to clients	WDNR/ Extension/ WISG	WDNR, tourism and guide associations in WI, National Professional Anglers Association
	Agency Collaboration	Develop outreach material and publicity campaign to inform guides	WDNR/ Extension/ WISG	WDNR, tourism and guide associations in WI, National Professional Anglers Association
	Research	Conduct basic survey of randomly selected guides to quantify transience and model potential transport pathways. Conduct AIS law compliance survey to evaluate efficacy. Develop specific survey for Great Lakes guides' clients to characterize their behavior as pathways from Great Lakes to inland waters	Extension	UW-Madison
	Regs/ Enforcement	Proactively engage with guides to ensure all are aware of AIS regulations and regulations are followed	WDNR	
Private stocking – Aquaculture	Education/ Outreach	Continue to make training available to private fish farms in AIS HACCP	Extension	WDNR, DATCP, WAA
	Agency Collaboration	Continue to engage partners in the aquaculture business within and outside of Wisconsin in a collaborative effort to implement BMPs to prevent the introduction and spread of AIS	WDNR	DATCP, WAA
	Research	Develop monitoring program to evaluate the frequency that AIS appears in fish imported to or distributed throughout Wisconsin	WDNR	DATCP, WAA
Bait – Importation and Aquaculture	Education/ Outreach	Continue to make training available to private fish farm operators in AIS HACCP	Extension	WDNR, DATCP, WAA
	Agency Collaboration	Continue to engage partners in the aquaculture business within and outside of Wisconsin in a collaborative effort to implement BMPs to prevent the introduction and spread of AIS	WDNR	DATCP, WAA
	Research	Develop monitoring program to evaluate the frequency that AIS appears in fish imported to or distributed throughout Wisconsin	WDNR	DATCP, WAA

TABLE 6 – AQUATIC SURVEYING AND MONITORING ACTIVITIES

→ See description and status on page 20

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach:
Prevent new invasions and stop secondary spread in Wisconsin through state and federal agency activities

Subpathway	Strategy	Actions	Lead Organization	Cooperating Organizations
Agency Management Activities	Education/ Outreach	Continuously train staff on decontamination procedures	WDNR	Extension, WI AIS Partnership
	Agency Collaboration	Form a collaborative to improve and promote decontamination methods among monitoring staff across agencies	WDNR/ Extension	Extension, WI AIS Partnership, state agencies
		Continue to work with regional entities to ensure that decontamination protocols are consistent across states	WDNR/ Extension	
	Research	Continue to refine decontamination and disinfection methods	WDNR	
	Regs/ Enforcement	Regularly assess the compliance of staff with decontamination manual code	WDNR	Permitee/ contractor
Law Enforcement	Education/ Outreach	Train law enforcement on decontamination procedures	WDNR	Local LE
	Agency Collaboration	Collaborate to improve and promote disinfection methods among monitoring staff and researchers	WDNR	Extension, WI AIS Partnership, state agencies
	Research	Continue to refine decontamination and disinfection methods	WDNR	
Academic Researchers	Education/ Outreach	Train researchers on decontamination procedures	WDNR	Extension, WISG
	Agency Collaboration	Promote the adoption of decontamination BMPs throughout universities in Wisconsin	WDNR/ UW System	Extension
		Collaborate to improve and promote disinfection methods among monitoring staff	UW System	WDNR
	Regs/ Enforcement	Continue to include decontamination requirements in scientific collector permits	WDNR	Universities
Overarching	Monitoring	Identify locations of pathway release, identify current monitoring efforts, identify gaps and monitor needs, implement monitoring where needed	WDNR	WI AIS Partnership

TABLE 7 – TRANSPORTATION AND UTILITY CORRIDORS

→ See description and status on page 21

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach:
Prevent new invasions and stop secondary spread in Wisconsin through transportation and utility corridors

Subpathway	Strategy	Actions	Lead Organization	Cooperating Organizations
Maintenance	Education/Outreach	Continue to educate local maintenance agencies about DOT BMPs	DOT/Extension	
		Work with relevant staff to implement WDNR decontamination manual code	WDNR	
	Agency Collaboration	Update AIS provision that goes into contract for aquatic DOT projects to reflect disinfection manual code changes	DOT/WDNR	
	Regs/Enforcement	Evaluate the adoption of DOT right-of-way BMPs by local management agencies	WDNR	
Improvement and Construction	Education/Outreach	Continue to educate local maintenance agencies about DOT BMPs	DOT/Extension	
		Work with staff to implement WDNR decontamination manual code	WDNR	
		Develop better contractor education methods so that DOT contractors are more aware of invasive species issues	DOT/Extension	
	Agency Collaboration	Train DOT project managers how to use existing WDNR invasive species location resources	WDNR/DOT	
	Research	Assess feasibility of invasive species free fill for use in construction projects	DOT/Extension/ WDNR	
		Develop AIS containment strategies for bridge projects or projects near water	Extension	
		Redraft AIS BMPs for DOT	DOT/Extension/ WDNR	
	Regs/Enforcement	Work with WDNR for enforcement of NR 40	WDNR	
Overarching	Agency Collaboration	Work to revise DOT BMPs to include wetland species and references	DOT/Extension/ WDNR	
		Develop ability to enforce DOT, WDNR and DATCP regulations across organizations	DOT/WDNR/ DATCP	
		Maintain multi-organizational efforts to increase collaboration and overarching goals	DOT/WDNR/ Extension	Local governments, WI AIS Partnership
		Promote local collaborations to sustain monitoring and control efforts	Extension	
		Encourage specific mention of wetland invasive species in NEPA documents	DOT/WDNR/ Extension	

(continued)

TABLE 7 CONTINUED – TRANSPORTATION AND UTILITY CORRIDORS

Subpathway	Strategy	Actions	Lead Organization	Cooperating Organizations
Overarching (continued)	Research	Assess the maintenance practices of recreational trails and promote BMPs to trail managers	Extension	
		Develop a better understanding of how recreational vehicle use of public roads contributes to invasive species spread	Extension	
		Perform message testing to promote roadside BMP development	Extension	
		Assess vectors of wetland invasive species spread	Extension	
		Develop new control methods for new and existing wetland invasive species	Extension/ WDNR	
	Monitoring	Identify locations of pathway release, identify current monitoring efforts, identify gaps and monitor needs, implement monitoring where needed	WDNR	WI AIS Partnership

TABLE 8 – ORGANISMS IN TRADE

➜ See description and status on page 22

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach:
Prevent new invasions and stop secondary spread in Wisconsin through organisms in trade

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Overarching	Education/ Outreach	Integrate Habitattitude outreach resources into Wisconsin AIS Prevention Network through trainings and making products available in OTIC	Extension/ WISG	WI AIS Partnership
		Make information about regulated invasive species more readily available and accessible to industry pathways (e.g., revamp WDNR web page, TakeAIM.org integration)	WDNR	WISG
	Agency Collaboration	Work with Wisconsin Invasive Species Council to assess OIT pathways (stakeholders, extent of industry, existing regulations)	Wisconsin Invasive Species Council	WDNR, Extension, WISG, DATCAP, industry trade groups
		Financially support the efforts of the Great Lakes Commission to implement the GLDIATR (Great Lakes Detector of Invasive Aquatics in Trade)	WDNR	Great Lakes Commission
		Make GLDIATR implementation a part of a WDNR employees' regular work	WDNR	WDNR, Extension, DATCP, GLC
	Research	Inventory state of alternatives for commonly sought invasive species (help industry find NR 40 alternatives, fact sheets)	WDNR	Extension, universities
		Continue risk assessment research to determine which species pose a threat to Wisconsin (NR 40/SAG process)	Universities	WDNR, Extension
		Develop a comprehensive list of OIT subpathways in Wisconsin	WDNR	WISG, Extension, Universities
	Regs/ Enforcement	Support stepped enforcement of retailers that are selling NR 40-prohibited species	WDNR	DATCP
Pet trade	Education/ Outreach	Continue to engage and update retailers and wholesalers on NR 40	WI AIS Partnership	WDNR, Extension
		Establish a Habitattitude presence at hobby and trade shows	Extension/ WISG	WI AIS Partnership
	Agency Collaboration	Determine what the current regulatory framework for the pet trade is and identify opportunities for interagency collaboration	WDNR	DATCP, Depart-ment of Safety and Professional Standards, PIJAC,
	Research	Explore how HACCP approach may help retailers reduce risk of AIS introduction	WISG	Extension, WDNR
		Support efforts to explore different models for pet surrender and takeback networks	Extension/ WISG	WI AIS Partnership, zoos, nature centers, pet stores
	Regs/ Enforcement	Continue to respond to NR 40 complaints	WDNR	WI AIS Partnership

(continued)

TABLE 8 CONTINUED – ORGANISMS IN TRADE

Subpathway	Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Plant Trade	Education/ Outreach	Continue contact regarding NR 40 to retailers and wholesalers	WI AIS Partnership	Extension, WDNR, DATCP
		Integrate NR 40 and AIS messaging into Master Gardeners, Master Naturalists and hobbyist organizations	Extension	WDNR
		Utilize AIS Partnership to extend NR 40 and AIS messaging to garden centers	Extension	CISMAs, Wisconsin AIS Partnership
	Agency Collaboration	Continue collaboration and coordination on nursery outreach and enforcement	DATCP/ WDNR	
	Research	Explore growing options for new alternatives	Industry	WDNR, funding agencies, industry, universities
		Continue risk assessment research to determine which species pose a threat to Wisconsin	WDNR/ universities	
	Regs/ Enforcement	Continue regular visits to nurseries	DATCP	
		Continue to respond to NR 40 complaints	DATCP/ WDNR	
		Take timely and appropriate NR 40 enforcement actions when violations occur	DATCP/ WDNR	Wisconsin AIS Partnership, Wisconsin Green Industry Federation
Biological Supply	Education/ Outreach	Pilot an online AIS and Habitattitude teacher training course that trains teachers on NR 40 and BMPs for using organisms in the classroom	Extension/ WISG	Wisconsin Society of Science Teachers, Wisconsin Association of Environmental Education
		Provide information to biological suppliers about NR 40 changes	WDNR	Extension, Center for Biology Education, Center for Environmental Education
	Research	Learn more about the animal husbandry skills of teachers and others who use study specimens	Extension/ WISG	Nature centers, zoos
		Determine which native species may serve the needs of teachers	Extension/ WISG/WDNR	
Overarching	Monitoring	Identify locations of pathway release, identify current monitoring efforts, identify gaps and monitor needs, implement monitoring where needed	WDNR	WI AIS Partnership

TABLE 9 – MONITORING FOR AIS

➜ See description and status on page 25

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach: Prevent new invasions and stop secondary spread in Wisconsin through response actions

Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Monitoring	Support cross-program cross-partner network that completes AIS early detection and response surveys and enter all results into SWIMS.	WDNR	AIS Network
	Increase SWIMS data reporting efficiency and data acquisition.	WDNR	AIS Network
	Develop and implement strategies to monitor pathways.	WDNR	AIS Network
	Develop and implement strategies to assess long-term trends of AIS.	WDNR	AIS Network

TABLE 10 – RESPONSE

➜ See description and status on page 27

IMPLEMENTATION STRATEGIES

Goals 1 & 2 Pathways Approach: Prevent new invasions and stop secondary spread in Wisconsin through response actions

Strategy	Specific Actions	Lead Organization	Cooperating Organizations
Education/ Outreach	Continue to provide AIS identification training for staff, partners and public stakeholders	WDNR	Extension
	Make the response communications protocol widely available to partners	WDNR	Extension
	Annually update response framework contact list	WDNR	Extension
Agency Collaboration	Work with other government agencies to adopt the existing response framework	WDNR	Extension
	Work with network of partners to identify priority species for response efforts across multi-jurisdictional waters	WDNR	Extension, WISG
	Implement Incident Command System approaches to new invasions when appropriate	WDNR	WI AIS Partnership
	Make Integrated Pest Management approaches standard when addressing new invasions	WDNR	WI AIS Partnership
	Create a model memorandum of understanding to help response efforts across multi-jurisdictional waters	WDNR	Extension, WISG
Research/ Development	Continue to develop internal and external response framework	WDNR	Extension
	Develop simple reporting forms for response	WDNR	Extension
	Develop communication mechanisms to direct response actions or to share public information	WDNR	Extension
	Clarify response roles of WDNR staff	WDNR	
Monitoring	Implement response monitoring in a timely manner after initial discoveries	WDNR	WI AIS Partnership

WISCONSIN AQUATIC INVASIVE SPECIES MANAGEMENT PLAN

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