



**Aquatic Invasive Species
Prevention Plan**

Lake County

Table of Contents

- 1.0 Introduction
- 2.0 Current Lake County Inner Lakes and Rivers AIS Infestations
 - 2.1 Rusty Crayfish
 - 2.2 Spiny Waterflea
 - 2.3 Zebra Mussel
 - 2.4 Curly-leaf Pondweed
- 3.0 Current Lake County Marine Access Lake Superior AIS Infestations/Diseases
 - 3.1 Rainbow Smelt
 - 3.2 Mystery Snails
 - 3.3 Eurasian Ruffe
 - 3.4 Viral Hemorrhagic Septicemia (VHS) Disease
- 4.0 Actions
 - 4.1 Action 1: Assess the county’s resources and risk of AIS introduction
 - 4.2 Action 2: Increase Lake County enforcement resources
 - 4.3 Action 3: Increase public awareness and participation in prevention
 - 4.4 Action 4: Increase available resources and leverage partnerships
 - 4.5 Action 5: Broaden knowledge of and participation in early detection and rapid response activities
 - 4.6 Action 6: Manage existing populations of aquatic invasive species
 - 4.7 Action 7: Address specific pathways of introduction
- 5.0 Implementation
- 6.0 Updating and Amending the Plan

Appendices

- Appendix A: Table 1 - Lake County Inner Lakes/Rivers: Public Water Access Locations and AIS Infestations
Table 2 - Lake County Lake Superior: Public Water Access Locations and AIS Infestations/Diseases
- Appendix B: Lake County AIS Prevention Plan Partners
- Appendix C: Detailed Explanation of Specific Action(s) – To be Determined

1.0 Introduction

Aquatic Invasive Species (AIS) are threatening Minnesota waters. These non-native species harm fish populations, water quality and water recreation. This plan outlines the efforts that Lake County will undertake to help prevent the spread of harmful AIS within Lake County.

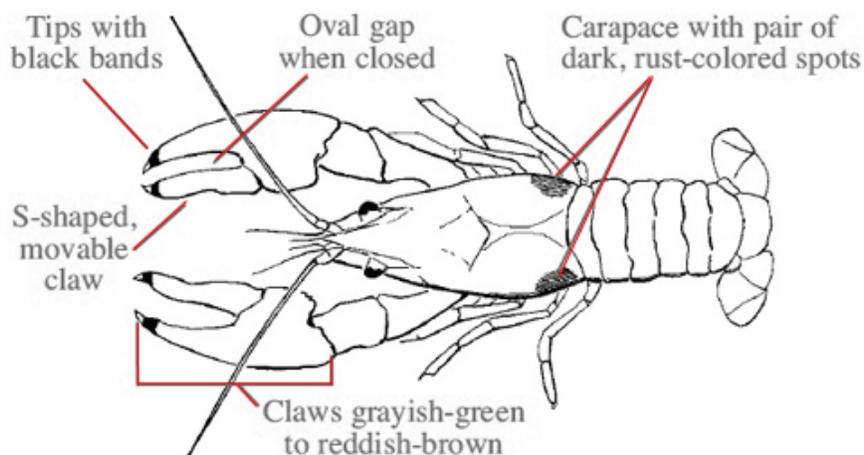
2.0 Current Lake County Inner Lake and River AIS Infestations

As of March 2015, rusty crayfish, spiny water flea, zebra mussels and curly-leaf pondweed have been found in some of the lakes and rivers in Lake County. A description of these species and how they are spread are described below. Table 1 in Appendix A presents a summary of the inner lakes and rivers in Lake County with public access that are currently infested with AIS.

2.1 Rusty Crayfish (*Orconectes rusticus*)

Means of Spread: Rusty crayfish they have likely spread through bait bucket release by anglers, aquarium release by hobbyists, activities of commercial harvesters, and live study specimen release by teachers and students who buy them from biological supply houses. Females can carry fertilized eggs or a male's sperm so even the release of a single female could establish a new population.

Description: Adults are generally 3-5 inches (7.5-13 cm) long (nose to tail). Claws larger and smoother than many other crayfish and are usually without wart-like white bumps. Claws have an oval gap when closed and do not have a distinct thin slit or notch present



Rusty Crayfish were first detected in southwestern Minnesota in the 1960s. Rusty Crayfish are invasive crustaceans spreading to lakes, rivers, and streams in several areas of North America. They are more aggressive than native crayfish, better able to avoid fish predation, and can harm native fish populations by eating their eggs and young. They can displace native crayfish, hybridize with them, and graze on and eliminate aquatic plants. Native to the Ohio River drainage, Rusty Crayfish have spread to several U.S. states and Ontario.

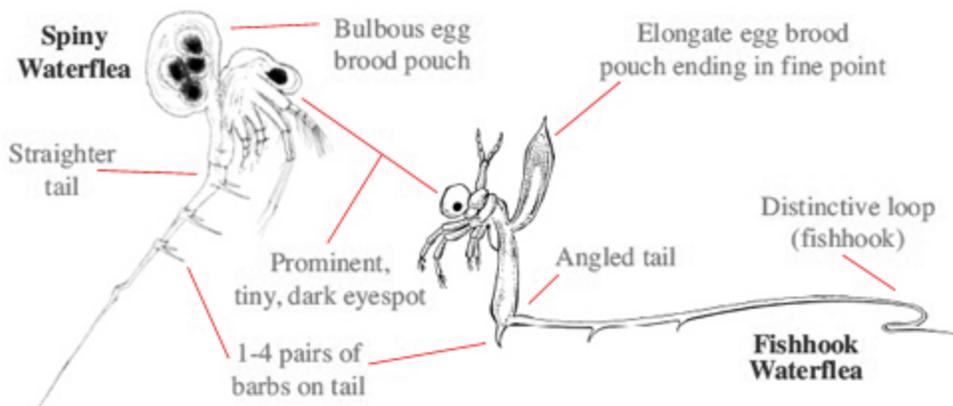
Eradicating established infestations is very difficult, if not impossible.

Regulations: Rusty crayfish are Regulated Invasive Species by the MNDNR, which means release into the environment is illegal. Licensed anglers may collect any crayfish for use as bait on the same waterbody. They may harvest up to 25 pounds of any crayfish for personal consumption. Selling live crayfish for bait or aquarium use is illegal.

2.2 Spiny Waterflea (*Bythotrephes longimanus*)

Means of Spread: The spiny waterflea can spread to inland waters when fishing gear and possibly bilge water, bait buckets and live wells are contaminated with egg-laden females. While females die out of water, under certain conditions they produce eggs that resist drying, remain viable, and can establish a new population.

Description: The spiny waterflea is difficult to distinguish without magnification for its total length is only 1/4 - 5/8 in (5-15mm). Clumps of spiny waterfleas look and feel like gelatin or cotton batting with tiny black spots. They prefer deep lakes, but can establish in shallow waterbodies and rivers. They are abundant during summer (June-September) depending upon water temperatures.



Illustrations: Michigan Sea Grant Program, Ontario Federation of Anglers and Hunters

Spiny waterfleas are small predacious crustaceans that threaten aquatic ecosystems and fishing by competing with native fish for food and fouling gear. Spiny Waterfleas eat native zooplankton which is an important food for native fishes. In some lakes, they caused the decline or elimination of some species of native zooplankton.

They arrived in ships' ballast water from Eurasia. Spiny waterfleas were discovered in Lake Ontario in 1982, and then spread to all of the Great Lakes and some inland lakes. Anglers often discover new infestations. Waterfleas collect in masses on fishing lines and downrigger cables. These masses can clog the first eyelet of rods, damage a reel's drag system, and prevent fish from being landed. Eradicating established infestations is impossible, but early detection of isolated populations may help slow or prevent the spread.

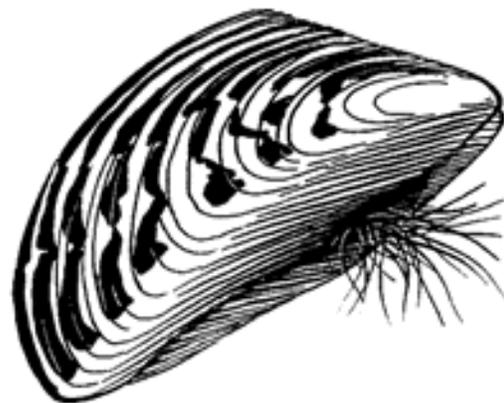
The first detections of spiny waterfleas in Minnesota inland lakes occurred in 1990 likely due to overland transport.

Regulations: Spiny waterfleas are a Regulated Invasive Species by the MNDNR, which means introduction into another waterbody is prohibited.

2.3 Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussels (*D. bugensis*)

Means of Spread: Adults can spread by attaching to boats, motors, boat lifts, docks, swim platforms, and aquatic plants. Larvae (veligers) can spread in contaminated water in tanker trucks, bait buckets, and bilges.

Description: Zebra mussels look like small clams with a yellowish or brownish "D"-shaped shell, usually with dark and light-colored stripes (hence the name "zebra"). They can be up to two inches long, but most are under one inch. Zebra mussels usually grow in clusters containing numerous individuals and are generally found in shallow (6-30 feet), algae-rich water. Zebra mussels are the only freshwater mollusk that can firmly attach itself to solid objects – submerged rocks, dock pilings, boat hulls, water intake pipes, etc. On smooth surfaces, young zebra mussels feel like fine sandpaper. Juveniles are about the size of peppercorns.



Zebra and Quagga Mussels are invasive aquatic animals that cost over \$1 billion/year to manage in the U.S. They clog drinking water intakes; foul boat hulls, motors, boat lifts, docks and swim platforms. Their sharp shells litter beaches. They harm native fish by consuming food and often kill native mussels, crayfish, and snails through fouling. They spread from Eurasia to the Great Lakes due to the ballast water discharge of commercial ships in the '80s and '90s. They spread to the Mississippi River via connected waterways and overland by attaching to aquatic plants and recreational watercraft, and possibly in bilge or bait water. Small mussels die out of water, but adults can survive for days.

Zebra Mussels were first detected in the Duluth-Superior Harbor in 1989 and in 1991, in the Mississippi River. From the Mississippi, they spread up the St. Croix River to Stillwater. Since 1990, 29 lakes in St. Louis County have become infested in Minnesota likely due to overland transport. Quagga Mussels were first detected in the Duluth-Superior Harbor in 2005 and are found in three locations in the Minnesota waters of the Mississippi River. They have not spread to any other inland Minnesota waters.

Regulations: Zebra Mussels are Prohibited Invasive Species by the MNDNR. The imports, possession, transport, and introduction into the wild is prohibited.

2.4 Curly-leaf Pondweed (*Potamogeton crispus*)

Means of Spread:

Curly-leaf is believed to spread from one body of water to another primarily by the unintentional transfer of plant fragments, primarily on trailered boats.

Description: Leaves are somewhat stiff and crinkled, approximately 1/2-inch wide and 2 to 3 inches long; leaves are arranged alternately around the stem, and become more dense toward the end of branches; produces winter buds can be confused with claspingleaf pondweed.

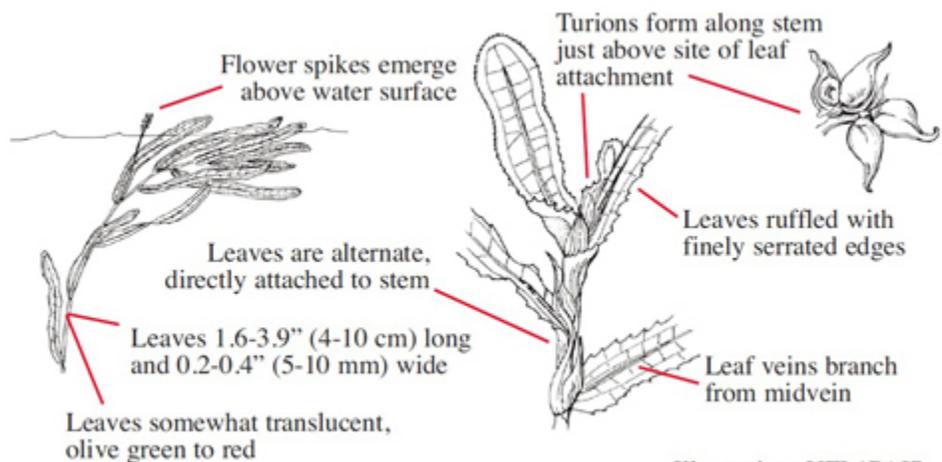


Illustration: UFL/CAIP

Native to Eurasia, Africa and Australia, curlyleaf pondweed was first discovered in North America in the mid 1880s. By 1978, it had spread across most of the United States and Canada. It spreads by seeds, rhizomes, turions, and plant pieces that break off and float on water currents. It can spread overland to new waters by clinging to watercraft, trailers, and equipment. Eradicating established curlyleaf pondweed infestations is nearly impossible. Your actions and your help in reporting new infestations are vital for preventing their spread.

Curly-leaf pondweed is a non-native, invasive submersed aquatic plant that was first observed in Minnesota in about 1910.

Regulations: Curly-leaf pondweed is classified as *prohibited invasive species* in Minnesota. It is illegal to possess, buy, sell, transport, and introduce a prohibited invasive species.

3.0 Current Lake County Marine Access Lake Superior AIS Infestations/Diseases

As of March 2015, rainbow smelt, Mystery Snails, Eurasian Ruffe and Viral Hemorrhagic Septicemia (VHS) disease has been found or seen in Lake Superior near the Lake County marine accesses. A description of these species and disease and how they are spread are described below. Table 2 in Appendix A presents a summary of the Lake Superior public marine access locations that are currently infested with AIS.

3.1 Rainbow Smelt (*Osmerus mordax*)

Means of Spread: Rainbow smelt were stocked in the Great Lakes and were first stocked in Lake Michigan in 1923. Subsequently, rainbow smelt spread throughout all the Great Lakes. Rainbow smelt invade new waters by moving through connected waters and through human transfer.

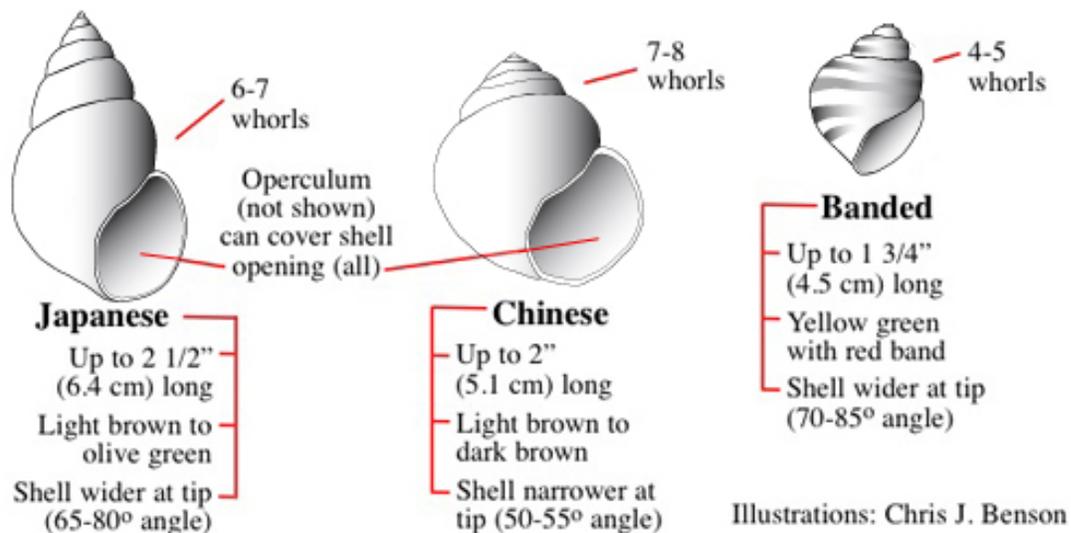
Description: Body is slender and cylindrical. Back is silvery pale green and the sides are iridescent purple, blue, and pink. The underside is white. The body has 26-35 gill rakers, a dorsal fin, an anal fin, pectoral fins, pelvic fins, an adipose fin, and a deeply forked tail fin. It has a pointed snout and large black and silver eyes. The average size when full-grown is 7 – 9 inches and weighs 3 oz.



Regulations: You must kill your smelt at the stream. It is unlawful to transport or possess live smelt. This is to prevent the spread of disease and smelt introduction to inland waters.

3.2 Mystery Snails (Chinese, Japanese and Banded)

Chinese (*Cipangopaludina chinensis*), Japanese (*C. japonica*), and banded mystery snails (*Viviparus georgianus*)



Means of Spread: Most likely introduced via dumping of aquariums and by transfer from one water body to another.

Description: Chinese mystery snail has small shallow depressions above the shell opening and rows of fine, short stiff hairs parallel to the whorl of the shell (may wear off with age and abrasion).

Banded mystery snail has red bands that are parallel to the whorl of the shell.

Regulations: Chinese, Japanese, and other mystery snails are invasive species regulated by the Minnesota Department of Natural Resources (MNDNR). The banded is a regulated invasive species as well. All are illegal to introduce into state waters.

3.3 Eurasian Ruffe (*Gymnocephalus cernuus*)

Means of Spread: Ruffe could be accidentally transported in livewells, bilge water, and bait buckets.

Description: The ruffe is a small European member of the perch family. Ruffe are primarily bottom feeders, preferring dark environments where they can hide from predators. Ruffe rarely grow bigger than 5 inches, although the



sharp spines on their gill covers, dorsal and anal fins make them difficult for larger fish to eat. The ruffe is native to central and eastern Europe. They were introduced into the Duluth harbor within ballast water discharged from ocean-going ships around 1985.

Regulations: Ruffe are a prohibited invasive species, which means import, possession, transport, and introduction into the wild is prohibited.

3.4 Viral Hemorrhagic Septicemia (VHS)

Means of Spread: VHS can be spread by moving infected fish from one body of water to another, moving infected water and equipment from one waterbody to another, stocking or releasing infected fish or water from infected fish hatcheries or the natural migration and movement of infected fish from one waterbody to another.



Photo courtesy of Dr. Mohamed Faisal

Description: At a low level of infection, fish might not display any symptoms. As the infection becomes greater, however, fish will display widespread hemorrhages (bleeding) throughout body surface (eye, skin and fins) and within the internal organs (swim bladder, intestine, kidney etc). Because of the bleeding, gills and liver might appear pale. Sick fish will often be listless, swim in circles, and are frequently observed at the surface of the water. Confirming VHS infection requires sophisticated laboratory testing. A diagnosis cannot be made based solely on observation because many different diseases of fish have very similar symptoms.

Regulations: If you catch a suspected diseased fish place the fish in a plastic bag and keep it in an iced cooler or refrigerator as quickly as possible (do not freeze). Call the local MNDNR fisheries office for instructions. If you observe a fish kill, call the State Duty Officer.

4.0 Actions

4.1 Action 1: Assess Lake County resources and risk of AIS introduction

Action	How action supports AIS prevention
Understand the variety of pathways of introduction to local waters.	Knowing the common pathways by which AIS can be spread is essential to effective prevention.

Action	How action supports AIS prevention
Using MNDNR's list of water bodies that are designated as infested in the county, identify linkages to other water bodies.	Some AIS may travel or be more easily transported between infested waters and other connected water bodies; knowing these linkages will help prioritize prevention resources.
Install traffic counters at select public accesses.	This action will help the county prioritize resources in the future by quantifying the use at different water bodies.

4.2 Action 2: Increase Lake County enforcement resources

Action	How action supports AIS prevention
Ensure that the county's peace officers, including water safety patrol staff, have been trained to enforce AIS laws and increase the number of peace officers within the county.	This action will extend the capacity of local enforcement to ensure compliance with AIS laws.
Utilize county AIS deputies to patrol roadways near infested lakes to issue compliance checks with AIS laws.	Compliance checks away from boat launches can be effective at communicating the presence of law enforcement and help to educate lake users on the seriousness of AIS laws and the penalties for infractions.
Increase watercraft inspections within the county by hiring authorized watercraft inspectors through a delegation agreement with the MNDNR.	Watercraft inspectors can help spread accurate messages to boaters and help prevent the spread of AIS.
Ensure that local authorities are aware of state regulations that prohibit transport of prohibited invasive species, aquatic plants, and water from designated infested waters.	Consistent enforcement of AIS regulations aimed at containment will help to prevent the further spread of AIS.

4.3 Action 3: Increase public awareness and participation in prevention

Action	How action supports AIS prevention
Train county field staff (e.g., zoning, septic system, land department) on practices to avoid spreading invasive species.	County staff can take simple steps to prevent AIS spread or new introductions, and can also set an example for businesses and individuals in the county.

Action	How action supports AIS prevention
Ensure that local businesses are reducing the risk of AIS spread in their operations; for example, lake service providers are now required to be certified by the MNDNR.	The day-to-day operations of some businesses, whether regulated or not, can pose a risk of AIS spread.
Develop methods and local training sessions to reduce risk of invasive species introduction through government and business operations.	The county will help prevent AIS spread by developing and sharing new risk-reduction methods and by identifying actions and operations that could contribute to AIS spread.
Develop curricula for schools and informal education materials for events such as county fairs to support youth education about AIS.	Young people can help prevent the spread of AIS through their own actions and by modeling their knowledge and actions to their families.
Develop and distribute AIS prevention messages targeting shoreland and riparian landowners who launch watercraft from their own private residential access	Many watercraft enter lakes and rivers from private residential property and are not reached by education and prevention efforts directed at public accesses and cooperating private non-residential accesses
Collaborate with other counties, watershed groups, and/or jurisdictions whose water bodies connect to the county's to develop a regional approach to AIS prevention.	Because AIS and the individuals who could transport them do not stay inside county borders, effective coordination is necessary to prevent AIS spread.
Train county field staff (e.g., zoning, septic system, land department) on management practices that will maintain and/or create diverse, native landscapes that are resilient to invasive species.	Making the environment more resistant to AIS can help prevent AIS infestation.
Hire seasonal educators, trained by the MNDNR, to distribute educational materials at selected public access points, and enlist additional volunteers to support this effort, particularly at high priority landings during peak usage times (holidays and weekends).	Targeting educational efforts to the users of a water body may help prevent AIS spread from or into that water body.

Action	How action supports AIS prevention
Work with the Stop Aquatic Hitchhikers campaign to strengthen awareness of AIS issues in the county.	Consistent messaging such as that from the Stop Aquatic Hitchhikers ads may help educate individuals about their role in AIS prevention.
Explore partnership opportunities with existing outreach efforts developed by the MNDNR and the Minnesota Sea Grant Program.	Leveraging existing communications materials ensures that the public receives accurate messages about rules and best practices related to AIS prevention.
Develop educational materials targeted to buyers and sellers of aquatic plants and animals.	Targeting AIS prevention messages to activities that may present a risk of AIS spread may be more effective than generic public awareness messages.
Develop tailored messages aimed at lake-related businesses (e.g., home builders, developers) and local government staff (e.g., county planners) regarding AIS prevention.	Ensuring that individuals are aware of AIS prevention measures that they can take in the course of their daily work will help to reduce the risk of AIS spread.
Coordinate with the MNDNR to publicize new infestations at access sites, in lake association newsletters, and other local publications.	Timely and accurate notice of new AIS infestations empowers the public to help prevent the further spread of AIS.

4.4 Action 4: Increase available resources and leverage partnerships

Action	How action supports AIS prevention
Seek additional funds to implement unfunded actions in county prevention plan.	The effectiveness of AIS prevention actions can be limited by inadequate financial resources.
Assist with funding local outreach and monitoring efforts by entities other than the county.	Overall AIS prevention efforts can be strengthened by supporting the capacity of other local organizations to conduct AIS outreach and monitoring activities.
Develop and maintain contacts with other local organizations, businesses, and government entities.	The participation of local partners is necessary for a county's AIS prevention plan to be effective.
Facilitate the establishment of local organizations such as County Coalitions of Lake Associations to create partners in implementing the county's AIS prevention plan.	Additional partnerships among local organizations will increase the county's capacity to implement its AIS prevention plan.

Action	How action supports AIS prevention
Establish a grant program to support local efforts to prevent the spread of AIS.	By leveraging existing capacity of other local organizations, the county can maximize the effectiveness of its AIS prevention funds.

4.5 Action 5: Broaden knowledge of and participation in early detection and rapid response activities

Action	How action supports AIS prevention
Obtain and distribute Watch ID cards from the Minnesota Sea Grant Program.	Finding new infestations of AIS early is key to preventing further spread, and ensuring that many people who use water resources know what AIS to look for maximizes the chance of early detection.
Encourage county staff, businesses, and individuals to submit samples of suspected AIS to the MNDNR.	The county can support early detection and prevention efforts by helping the MNDNR to quickly confirm new infestations of AIS.
Approve an early detection and rapid response program with county acting in a resource support agreement with the MNDNR.	This program will ensure that new infestations are properly reported and rapid response is deployed, if required.
Augment communication and reporting mechanisms for citizen monitoring of lakes and rivers.	Ensuring that local discoveries of AIS are quickly communicated to the right people will maximize prevention efforts related to new infestations.
Cultivate partnerships with organizations interested in AIS prevention (e.g., lake associations) to support AIS surveys in water bodies (infested and non-infested) and on docks and lifts.	Leveraging the resources of existing organizations will help to find new AIS infestations more efficiently and to prevent further spread of those AIS.

4.6 Action 6: Manage existing populations of aquatic invasive species

Action	How action supports AIS prevention
Where appropriate, use integrated pest management to control populations of high priority aquatic invasive plant species (e.g., Eurasian water milfoil, curly-leaf pondweed, flowering rush, purple loosestrife).	Effective management of existing AIS populations may reduce the likelihood of further spread.

Action	How action supports AIS prevention
Coordinate with the MNDNR for information on management of AIS, and adopt control plans utilizing safe and cost-effective techniques.	Effective management of existing AIS populations may help prevent further spread.
Contract with private vendors that possess the equipment, knowledge, and expertise to facilitate management of AIS in water bodies the county deems impaired or damaged by aquatic invasive species.	Effective management of existing AIS populations may help prevent further spread.
Evaluate AIS prevention efforts and cooperative relationships for possible improvements.	Participants at all levels can share input and new ideas to continuously improve the AIS prevention plan for the local area.

4.7 Action 7: Address specific pathways of introduction

Action	How action supports AIS prevention
Investigate the cost and feasibility of purchasing decontamination trailers for use in cleaning boats and equipment used in infested lakes within the county.	Decontamination of watercraft is a key tool in preventing AIS spread.
Encourage the development of a boat decontamination service or partner with existing businesses like car washes that could provide such services.	Decontamination of watercraft is a key tool in preventing AIS spread.

5.0 Implementation

Lake County has gathered information from many Federal, State and Local entities to compile tables summarizing Lake County public water access for inner lakes and rivers (Table 1, Appendix A) and Lake Superior (Table 2, Appendix A). Tables 1 and 2 are intended to be active documents that will be updated as often as necessary to reflect AIS impacts or any information useful in the implementation of the Lake County AIS Prevention Plan. Each of these tables contains the following information:

- Lake or River with public water access,
- Government entity responsible for the access,
- type of access (trailer launch or carry-in) and BWCA Entry Number,
- If a BWCA lake, if it allows up to 25 HP motors,

- AIS impact and entity that identified the impact,
- AIS Activities (i.e. signs present and/or inspection frequency)
- If there is a photograph of the boat ramp and AIS signs available.
- Information regarding the last time the Lake was checked for AIS and what species were checked.
- Identify if the access is a priority for AIS prevention based on the AIS impacts of adjacent lakes or rivers.

Future AIS prevention activities at the access locations identified in Tables 1 and 2 will be determined and implemented based upon priority ranking. These prevention activities may include field data gathering and research; education and outreach; sign placement; inspections and/or any other activities that may assist Lake County in AIS prevention.

6.0 Updating and Amending the Plan

This AIS Prevention Plan will be reviewed annually by the Environmental Services Department and updated as needed.

Appendix A

Table 1 - Lake County Inner Lakes: Public Water Access Locations and AIS Infestations

Table 2 - Lake County Lake Superior Public Water Access Locations, Types and AIS Infestations/Diseases

Appendix B

Lake County AIS Prevention Plan Partners

Organization	Contact(s)
Federal Government:	
U.S. Forest Service	Jason Butcher
U.S. Army Corps of Engineers	TBD
U.S. Fish and Wildlife Service	TBD
National Parks Service	TBD
Natural Resources Conservation Service	TBD
MN State Government:	
Department of Natural Resources	Phillip Hunsicker Philip.Hunsicker@state.mn.us
Pollution Control Agency	TBD
Board of Water & Soil Resources	Ryan Hughes ryan.hughes@state.mn.us
U of MN Sea Grant Extension Program	Doug Jensen djensen1@d.umn.edu
Independent:	
1854 Treaty Authority	Tyler Kaspar tkaspar@1854treatyauthority.org
Laurentian Resource Conservation and Development (LRC&D)	Paul Sandstrom sandstrom.paul.v@gmail.com
Lake County:	
Environmental Services Department	Christine McCarthy Christine.McCarthy@co.lake.mn.us
SWCD – District Manager	Dan Schutte Dan.Schutte@co.lake.mn.us
SWCD – Rainy River Coordinator	Derrick Passe Derrick.Passe@co.lake.mn.us
Lake County Invasive Team (LCIT)	Emily Nelson Emily.Nelson@co.lake.mn.us
Neighboring Counties:	
Cook County: Invasive Species Coordinator SWCD District Manager	Laurel Wilson lwilson@boreal.org Kerrie berg kerrie.berg@co.cook.mn.us
St. Louis County:	TBD
Townships: Beaver Bay Crystal Bay Fall Lake Silver Creek Stony River	TBD
Cities: Beaver Bay Silver Bay Two Harbors	TBD
Lake Associations: White Iron Chain of Lakes Assoc. (WICOLA)	www.WICOLA.org

Appendix C

Detailed Explanation of Specific Action(s)

(to be determined)