Carver County

2022 – 2026 AQUATIC INVASIVE SPECIES STRATEGIC PLAN

February 2022

The purpose of this five-year AIS Strategic Plan is to outline the current status of the AIS program, future direction, and framework for implementing new and ongoing actions strategies. During this time, additional priorities, goals, and action steps will be identified as part of an ongoing mission to successfully prevent and control invasive species, prevent habitat loss, water quality degradation, and other impacts associated with AIS and to ensure access to lands, lakes, and rivers in Carver County.

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1.0 Executive Summary

The Carver County Planning & Water Management Department is responsible for the development and implementation of the Carver County Aquatic Invasive Species (AIS) Management Program which works to prevent, manage, and control invasive species in the lakes, rivers, and wetlands of the county. The goals, action strategies, and objectives of the program were identified in the 2017 Aquatic Invasive Species Prevention and Management Plan, which is revised and updated in this document. The current plan is comprised of five central strategies to achieve these goals: Promote Collaboration, Education & Public Outreach, Watercraft Inspections & Decontamination, Early Detection Monitoring & Rapid Response, and AIS Management Projects. Within each strategy there are specific objectives and associated actions to effectively manage aquatic invasive species and their impacts on Carver County's native ecosystems. These objectives have been prioritized by county staff, the Board of Commissioners, and participants in AIS Stakeholder workshops.

2.0 AIS Plan Objective

The Carver County Planning & Water Management Department published its first AIS Management Plan in 2017 which documented currently known AIS issues in the County and identified goals and objectives that could be implemented by the County and its partners. This update reflects the program's ongoing mission to fulfill the objectives in the 2017 Plan and describes future needs and priorities of the program to manage the impacts of AIS in Carver County. The purpose of this five-year AIS Strategic Plan is to outline the current status of the program, future direction, and framework for implementing new and ongoing actions strategies. During this time, additional priorities, goals, and action steps will be identified as part of an ongoing mission to successfully prevent and control invasive species, prevent habitat loss, water quality degradation, and other impacts associated with AIS and to ensure access to lands, lakes, and rivers in Carver County. Invasive species management is strongly tied to water quality and quantity and will be integrated with the Department's water management activities to establish a holistic approach to AIS prevention and management.

2.1 Goals

In addition to the strategies outlined in this strategic plan, staff has set the following goals related to the prevention and management of AIS to address current and forecasted challenges over the next five years.

- ✓ Increase public awareness and participation in prevention.
- ✓ Increase available resources and leverage partnerships.
- ✓ Assess county resources and risks for AIS introduction and spread.
- ✓ Assess and control existing populations of AIS to minimize harmful impacts.
- ✓ Continue to prioritize and adapt to funding and other changes.
- ✓ In-depth evaluation of prevention & management strategies, projects, and education efforts for efficacy and cost-effectiveness.

3.0 Introduction

3.1 AIS in Minnesota

Aquatic invasive species (AIS) are nonindigenous species that threaten the diversity or abundance of native species, the ecological stability of infested waters, or any commercial, agricultural, aquacultural, or recreational activities dependent on such waters. As the world trade network continues to grow, new markets and trade routes continually open. This growth will increase the number of new species introductions and the frequency with which such introductions occur. Unchecked, AIS have the potential to imperil public health and transform ecosystems, resulting in widespread environmental degradation. AIS also threaten sectors of the state's economy that depend upon natural resources and native ecosystems. Aquaculture, tourism, property value, recreation, shipping, and water resource infrastructure, including hydropower facilities, may be adversely impacted by AIS. Some AIS introductions cannot be eradicated once established, and the invasion itself becomes irreversible. Proactive and coordinated management is necessary to protect the waters of Minnesota from AIS.

Minnesota's waterways have experienced a number of these aquatic invaders and are threatened by more in nearby regions. Many AIS were originally introduced to the great lakes area by ballast water discharges from over sea commercial vessels, and by the aquarium trade. AIS have continued to spread from human activities, specifically water related activities such as fishing, hunting, and water recreation here in the land of 10,000 lakes. Some common AIS that have made their way to Minnesota include: zebra mussels (*Dreissena polymorpha*), Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed, (*Potamogeton crispus*), several species of carp (*Cyprinidae*), and more recently starry stonewort (*Nitellopsis obtusa*). We are also on the lookout for other species not yet in the state where arrival is likely imminent and of high impact, such as hydrilla (*Hydrilla verticillata*) and quagga mussels (*Dreissena rostriformis)*.

AIS State Prevention Aid	
Year	**Carver County**
2014	$59,671
2015	$132,000
2016	$132,000
2017	$126,006
2018	$137,325
2019	$132,278
2020	$132,294
2021	$132,055
2022	$141,746

Table 1: Annual AIS State Prevention Aid

Minnesota is committing to AIS prevention efforts to ensure our water resources can be enjoyed by future generations. The 2014 Legislative Session enacted Law Chapter 308 to provide Minnesota counties with Aquatic Invasive Species Aid. Under the program, Counties are tasked with aiding in the prevention of aquatic invasive species through activities that "may include but are not limited to, site-level management, countywide awareness, and other procedures that the county finds necessary to achieve compliance." The state administered $4,500,000 for the year of 2014, and $10,000,000 in 2015

and each year thereafter if statute remains unchanged. The amount designated to each county is based on the number of public water accesses as well as the number of watercraft trailer parking spaces within the county. Table 1 shows the prevention aid dollar amounts Carver County received each year since 2014. County efforts will be in addition to work conducted by the MN Department of Natural Resources. It is the hope that this legislation will, with federal, state, and local support, reduce the spread of aquatic invasive species and their detrimental effects on Minnesota's lakes and rivers.

Figure 1: Carver County Location

3.2 County Background Information

Located just southwest of the Twin Cities, Carver County encompasses eleven cities, ten townships, and is home to 106,922 people per the 2020 US Census. The city of Chaska, situated in the western part of Carver County, is the County seat. The County shares its borders with Wright County to the north, Hennepin County to the east, Scott and Sibley Counties to the south, and McLeod County to the west. According to state records, Carver County has 76 named lakes, 29 public water accesses, and 335 public trailer parking spots. A small portion of Lake Minnetonka is on the Carver/Hennepin border and is managed by Hennepin County.

3.3 County AIS Prevention History

The Carver County AIS program got its start in 2011, shortly after state legislation allowed the MN DNR to share its watercraft inspection authority with the Counties. Members of the Lake Minnewashta Preservation Association (LMPA) reached out to the County and expressed their concern of AIS spreading to the lake. This put the wheels in motion for launching a watercraft inspection program.

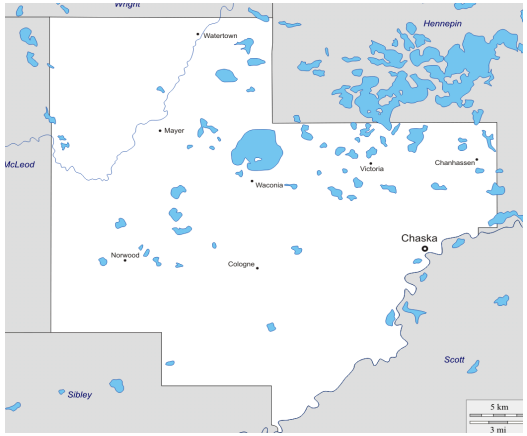

Figure 2: Carver County Boundary

In 2012, with support from partnerships with the Minnehaha Creek Watershed District (MCWD) and Friends of Lake Bavaria, the County was able to provide watercraft inspection services at public water accesses on 5 lakes including Waconia, Hydes, Rietz, Bavaria, and Minnewashta.

The watercraft inspection program has evolved over the last decade due to funding and logistical challenges (Table 2). For instance, the number of public water accesses receiving watercraft inspection services has varied due to funding, local partnership, and prioritization changes. As funding shifts, implementation challenges arise, such as prioritizing which lakes receive inspections, hours of inspections, and reviewing inspection strategies and logistics to align with available resources. The roving inspection program is one example of a creative implementation change.

Roving inspections are watercraft inspections that take place at multiple accesses by a single inspector who "roves" between various lakes. This model was attempted as a response to a decrease in partnership funds in 2017 and 2018. The idea was that one inspector would be able to conduct inspections on lower-use lakes with the use of signs that direct boaters to call the inspector, who would arrive within five minutes. Ultimately, although reducing costs for inspections, this model was discontinued because of very limited occurrences of boaters calling the inspector. Nonetheless, Carver County continues to creatively plan and prioritize resources accordingly for anticipated and unforeseen program changes.

The AIS program was initially implemented by the Carver County Parks Department until 2016 when the county determined that the program would be a better fit for the Planning & Water Management Department. The county subsequently hired a full-time AIS Coordinator to further develop and implement the program. The AIS program began to include more strategies such as decontamination, early detection monitoring, rapid response, and other AIS management projects that are highly linked to water management and the department's goals and priorities. AIS management is included in the Carver County Water Management Organization's (CCWMO) Watershed Management Plan, annual water monitoring plans, and as criteria to prioritize projects and waterbodies.

AIS Watercraft Inspection Program History			
Year	**Public Water Accesses with Inspection Services**	**Roving lakes**	**Decontamination Service**
2011	1	No	No
2012	5	No	No
2013	11	No	No
2014	10	No	No
2015	15	No	Yes
2016	15	No	Yes
2017	11	Yes	Yes
2018	11	Yes	Yes
2019	7	No	Yes
2020	7	No	Yes
2021	8	No	Yes

Table 2: AIS Program History

3.4 Importance of AIS Control in Water Management

Invasive species can have direct and substantial effects on water quality and quantity, as well as the plants and animals that rely on aquatic habitats. Scientists recognize that riparian communities are among the most susceptible to invasion by non-native species. Both terrestrial and aquatic invasive species affect watershed condition by altering erosion, runoff, and deposition processes. Failure to account for these effects in total maximum daily load models could result in substantial errors in calculating load allocations. These effects along with other natural physical processes may affect water availability and lead to flooding or drought.

Various means exist for invasive species to degrade water quality:

- Invasive species have the potential to disrupt nutrient loading as seen with water hyacinth and bunchgrass, alter sediments (zebra mussels), and release toxins as would be the result of a Tui Chub introduction.
- Invasive species also alter pollutants through bioaccumulation and the introduction of other contaminants into waterways. As new invasive species are introduced, many management efforts are relying on pesticides to

control invasive species spread, however this mitigation strategy may exacerbate ecological and human health effects.

- Decomposition of invasive plants, such as Eurasian watermilfoil, alters the loading cycles of nitrogen and phosphorus.
- Following die off, bacterial decomposition of decaying plant material can reduce dissolved oxygen.
- Zebra and Quagga mussels filter particles from the water column and concentrate nutrients in their feces, changing nutrient regimes and enriching sediment. They also change water clarity and alter conditions for native species adapted to turbidity, accumulate and transfer water-borne contaminants to other benthic invertebrates and contribute to cyanobacteria blooms.
- Invasive species are well known to restructure freshwater food webs.

Many other examples of how invasive species affect water quality and quantity exist, so the management of invasive species in waterways should be holistic and integrated with other waterway management activities, other nuisance plant and animal control work, and fisheries management activities.

4.0 Current Status of County Waters

As of September 2021, the following waters in Carver County were listed as infested with AIS by the MN DNR (Table 3). The County has 29 waterbodies that are currently infested with Eurasian watermilfoil and 9 that are infested with zebra mussels. After the discovery of zebra mussels in Lake Minnewashta, County Water Management and Minnehaha Creek Watershed District (MCWD) staff, along with support from Lake Minnewashta Preservation Association (LMPA), led a rapid response effort to control and eradicate the infestation. Thanks to an aggressive early detection program, the zebra mussel infestation was found early enough for feasible treatment options. A 29-acre portion of the lake known as "Little Minnie" was treated with a copper product EarthtecQZ and initial results indicated the treatment was effective. Subsequent monitoring of the rest of the lake over the next few years was necessary to confirm whether zebra mussels were present in other areas of the waterbody. Staff from Carver County, MN DNR and MCWD continued to closely monitor for zebra mussels as part of the DNR's requirement to make annual monitoring reports for 3 years after initial introduction. Unfortunately, zebra mussels were found in various occasions in separate portions of the lake in 2019 and 2020.

Waterbody	Infestation and Year listed		
	Eurasian Watermilfoil	Brittle Naiad	Zebra Mussel
Ann	1995	2017	
Auburn	1995		
Bavaria	1995		
Burandt	2004		2017
Carver Creek from Waconia to the Minnesota River			2018
Courthouse	2016		
Eagle	2001		
Firemen's	1997		
Hydes	2014		
Jonathan (Upper Lake Grace)	2016		
Kelser's Pond	2009		
Lotus	1995	2017	2019
Lucy	2007		
Lundsten	2019		
Miller			2018
Minnewashta	1995		2016
Oak	2020		
Parley	2001		
Pierson	1995		2020
Reitz	2008		
Riley	1995		2018
Schutz	1995		
Steiger	2002		
Stone	1995		
Susan	2005	2019	
Swede	2008		
Unnamed (Grace)	2016		
Virginia	1995		2014
Waconia	1995		2014
Wasserman	2001		
Zumbra	1995		

Table 3: Carver County Infested Waters List

4.1 Nearby Threats

There is a risk of further spread from these lakes within the county and the risk of introductions from infested waterbodies that are located outside of the county. There are over 25 waterbodies in neighboring Hennepin County that are infested with zebra mussels, including the massive and extremely popular Lake Minnetonka. A small portion of Lake Minnetonka crosses over the Carver County border and is very close in proximity to many Carver County lakes. Prior Lake in neighboring Scott County is another popular zebra mussel infested lake that could potentially be a source of AIS introduction. Recent findings of starry stonewort in Stearns, Wright, and Hennepin Counties are also a cause for alert. We know that outdoor enthusiasts and recreational users travel all over the state, so being mindful of which infested lakes they might be traveling to and from can help with prevention efforts.

5.0 Prevention & Management Strategies

Management of AIS is challenging; however, considerable success is being achieved. Prevention efforts, research and information exchange, new detection and eradication techniques, innovative control methodologies, and collaborative models are increasing our capacity to manage AIS. The Carver County AIS Strategic Plan is a series of strategies that presents a coordinated approach to prevent, respond to, and manage AIS. This involves taking advantage of what has been learned and creating next steps that are well planned and coordinated. The Strategic Plan contains a target set of priority objectives, and associated strategies that are intended for next 5 years.

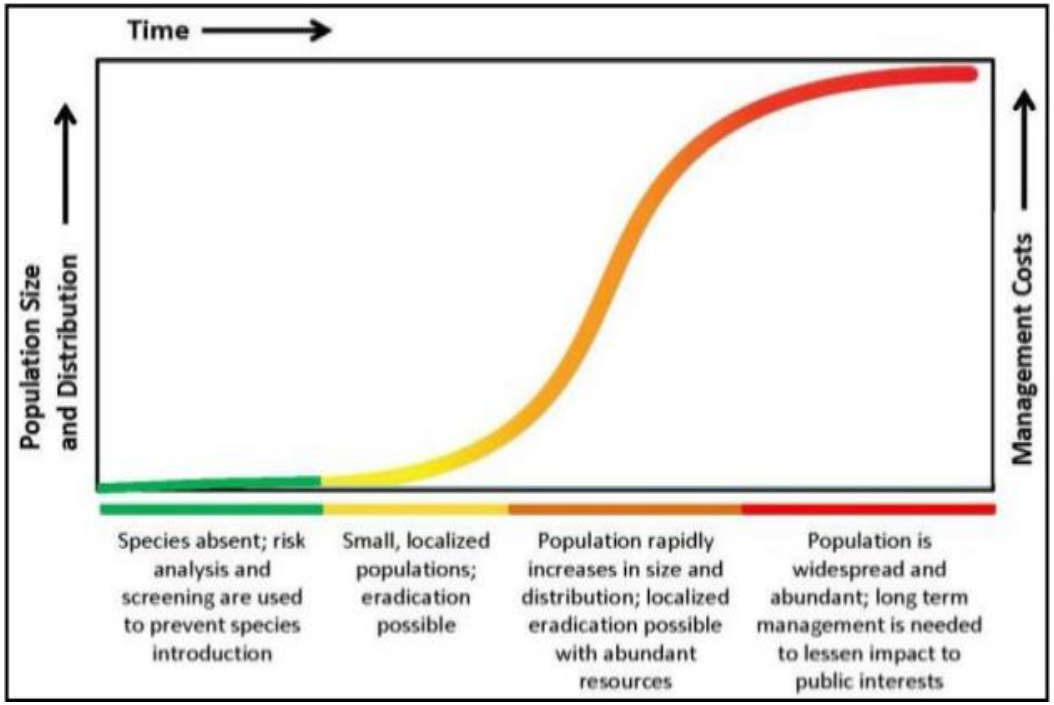

Figure 3: Invasion Curve

5.1 AIS Prevention

Unchecked, AIS have the potential to transform ecosystems, resulting in widespread economic, environmental, and societal harm. The invasion curve below (Figure 3) illustrates that prevention is the most cost-effective means to avert the risk of harmful species introductions. Once introduced, AIS often spread quickly. If a species is not detected and managed early, intensive, long-term control efforts will be unavoidable and costly.

Preventing the spread of AIS into and out of Carver County waterbodies is the key priority of the AIS program. Long-term success in prevention will reduce the rate of introductions, the rate of establishment, and avoid many of the long-term economic, environmental, and social costs associated with AIS. The central strategies and associated action steps for AIS prevention are detailed below:

5.1.1 Promote Collaboration

The threat of AIS is a complex and wide-spread issue that requires collaboration over County, State, and Regional borders. The US Forest Service, US Fish & Wildlife, Army Corp of Engineers, National Park Service, Natural Resource Departments, County and Tribal resource managers, local watershed districts, lake associations, sportsmen clubs, non-profits and engaged citizens all play a crucial role. Having diverse cooperative partnerships in place can strengthen a program's effectiveness by increasing the knowledge base, creating consistency, and sharing resources and ideas.

To help strengthen and develop the AIS program, the county partners with other counties, watershed districts, and/or jurisdictions whose water bodies connect to the County's to develop a regional approach to AIS prevention.

Minnesota Department of Natural Resources (MNDNR)

Carver County partners with the MN DNR in several ways. The DNR requires that counties interested in implementing AIS prevention programs that include watercraft inspections enter into a delegation agreement. The MN DNR provides training, testing, and authorizations to inspectors working for the County. They also provide protocols for inspection and decontamination procedures and are available for technical advice as needed. The County is responsible for hiring and supervising watercraft inspectors and making sure they complete the required training and certification. County staff work closely with DNR AIS specialists and planners when creating and implementing the County AIS plan. The two agencies join forces frequently to ensure a consistent inspection program and communicate effectively with DNR enforcement officers.

The DNR also facilitates regional workshops to bring together local government staff to share and learn from collective experiences, support collaborative efforts, and maintain strong inter-county relationships.

City of Chanhassen

A cooperative agreement with the City of Chanhassen helps provide watercraft inspections at three Chanhassen lakes, Lotus, Susan, and Ann.

Minnehaha Creek Watershed District (MCWD)

The MCWD partnered with Carver County 2012 – 2020 by issuing grants that helped provide watercraft inspections at 3 lakes as part of the Carver County Watercraft Inspection program. One of the grants was a cost-share agreement that covered 50% of inspection costs for Lake Minnewashta. Another grant agreement provided funds for roving inspection services at Piersons, Parley, and Wasserman lakes. The District no longer provides these watercraft inspection funds but County and MCWD staff have a close and productive relationship and have worked together in a variety of AIS prevention and management endeavors, including early detection monitoring and rapid response efforts.

Riley Purgatory Bluff Creek Watershed District (RPBCWD)

A cooperative agreement with RPBCWD helps provide watercraft inspections at three lakes in the District, Lotus, Susan, and Ann. District staff also work closely with County staff coordinating early detection monitoring, rapid response efforts, and aquatic vegetation surveys.

Lake Minnewashta Preservation Association (LMPA)

LMPA has been partnering with the County since the birth of the AIS Program and has contributed funds to watercraft inspections and rapid response efforts at lake Minnewashta. Association members work closely with county staff coordinating inspection schedules, monitoring for AIS, and coordinating aquatic vegetation surveys.

Lotus Lake Conservation Alliance (LLCA)

The LLCA contributes funds for watercraft inspections at Lotus Lake. Association members work closely with County staff coordinating inspection schedules, monitoring for AIS, and helping recruit watercraft inspectors.

Area Partnership for Piersons Lake Enhancement (APPLE)

APPLE has contributed funds for watercraft inspections at Piersons Lake and work closely with County staff coordinating inspection schedules, and monitoring for AIS.

Neighboring Jurisdictions

Carver County staff has professional relationships with several resource managers from nearby counties and watershed districts, as well as AIS managers throughout the state. Through these relationships, staff can keep up with the rapidly changing and growing world of AIS prevention and learn what other counties are doing with their prevention aid funds, about new and innovative ideas for AIS grants, and what is happening in cutting edge AIS research.

COUNTY AIS PLAN ACTION (Promote Collaboration)	HOW ACTION SUPPORTS AIS PREVENTION
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 to create partners in implementing the county's AIS prevention plan.	Additional partnerships among local organizations (such as Lake Associations) can increase the county's capacity to implement its AIS prevention plan.
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 local organizations to conduct AIS outreach and monitoring activities.
Seek additional funds to implement unfunded actions in county prevention plan.	The effectiveness of AIS prevention can be limited by inadequate financial resources.
Have Rapid Response Plans in place with partners/stakeholders.	If new infestations are discovered, having a shared rapid response plan in place can increase the probability of successful treatment options.

Table 4: Promote Collaboration Action Steps

5.1.2 Education & Public Outreach

One of the key elements of AIS prevention is increasing public awareness. It is important that the public understands the problems and impacts associated with aquatic invasive species and what they can do to help stop the spread. Effectively reaching people whose actions may have consequences on our natural environment, even in the "digital age," can be an arduous task. It is crucial that AIS managers spread a consistent message and design education programs that communicate effective behavioral change strategies to the proper audiences. Several agencies and conservation groups have created national public awareness campaigns such as the Stop Aquatic Hitchhikers

campaign, Habitattitude and 100th Meridian, and have promoted catch phrases like Clean Drain Dry, and Clean Boats Clean Waters. Carver County wants to help convey these messages and potentially develop its own credo to deliver a clear and consistent message to its local audience.

The goal of the AIS Education and Outreach Program is to develop a diverse set of tools to use for public awareness where the same messages are ingrained in every aspect of the County AIS Plan. Activities associated with this plan include but are not limited to; development of educational curricula for events at schools and youth groups, collaboration with other outreach campaigns such as Stop Aquatic Hitchhikers and Minnesota Sea Grant, installation of AIS signs at public water accesses within the County, and distribution of promotional material and tailored messages to specific audiences regarding steps to take to prevent the spread of AIS.

Additionally, watercraft inspectors are the face of the program and are a great resource for boaters when it comes to AIS education. Law enforcement officers are also trained in AIS education and help remind boaters of laws as well as tips & tricks to stay compliant.

COUNTY AIS PLAN ACTION (Education & Outreach)	HOW ACTION SUPPORTS AIS PREVENTION
Develop and/or use existing AIS curricula for K-12 schools to support youth AIS involvement.	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/or use existing informal education materials for County Fairs and other local events.	Providing opportunities for the public to learn about AIS at local events will spread prevention messages.
Work with Stop Aquatic Hitchhikers and other campaigns to strengthen awareness of AIS issues in the county.	Consistent messaging helps educate individuals about their role in AIS prevention.
Explore partnership opportunities with existing outreach efforts such as the MNDNR, Minnesota Sea Grant, and neighboring Counties and Watershed Districts.	Utilizing existing communications materials ensures that the public receives accurate messages about rules and best practices related to AIS prevention.
Install AIS signage at County Public Water Accesses.	Educational signs at boat launches help remind boaters of the AIS laws and steps to take while inspecting watercraft.
Distribute AIS prevention messages via website and social media.	Providing AIS information that is easily accessible online will help the public with AIS prevention efforts.
Distribute AIS prevention messages via print media such as local newspapers and newsletters.	Providing AIS information in local print media gets prevention messages into homes and businesses.
Develop tailored messages aimed at specific audiences (eg., Lakeshore owners, Lake Service Providers, Fishing Community, etc.)	Ensuring that individuals are aware of AIS prevention measures they can take at home or in the course of their work will help reduce the risk of AIS spread.
Develop and/or distribute promotional material (eg., keychains, towels, Stop Aquatic Hitchhikers and Sea Grant materials, and educational AIS specimens.)	Items that display AIS messaging can act as a constant reminder of steps to take to prevent spread.
Improve Watercraft Inspector Education with additional training and continued education.	Providing on-going training and support to Watercraft Inspectors will improve their ability to educate the public.

Conduct Evaluation Surveys to gauge the community's perception of the AIS program.	Evaluating if the public is receiving AIS messages and if their knowledge and behavior is changing will help improve future education efforts.

Table 5: Education & Outreach Action Steps

5.1.3 Watercraft Inspections & Decontamination

Because overland travel of contaminated watercraft and water related equipment is the largest vector of aquatic invasive species movement from waterbody to waterbody, watercraft inspections and decontamination can be an effective first-line defense against the introduction and spread of AIS. Watercraft inspections also serve to inform the public of the threat of AIS and steps to take to ensure compliance to MN AIS laws. The MN DNR deploys watercraft inspectors at public water accesses throughout the state (including Carver County) based on risk and request, but do not have the ability to have inspectors and/or decontamination stations at every lake. Since 2011, local units of government have been able to enter into a delegation agreement with the MN DNR that allows them to hire their own watercraft inspectors. Inspectors have the authority to prohibit the launch of watercraft to boaters who refuse inspection or refuse to remove attached AIS. They also have the authority to require a watercraft to be decontaminated in scenarios where a decontamination unit is on site. Waterbodies to be inspected are chosen and prioritized based on risk assessments. Metrics such as public use, water connectivity, and suitability for AIS are used to determine how a waterbody is ranked.

COUNTY AIS PLAN ACTION (Watercraft Inspections & Decontamination)	HOW ACTION SUPPORTS AIS PREVENTION
Fund and provide 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.
Provide decontamination services for boats and other water related equipment to public.	Decontamination is a key tool in preventing the spread of AIS. It is in the public's interest to have a convenient and consistent way to decontaminate.
Ensure that the County's peace officers, including water safety patrol staff, have been trained to follow and enforce AIS laws.	This action will extend the capacity of local enforcement to ensure compliance with AIS laws.
Enlist volunteer educators to distribute educational material at selected public access points and high	Targeting educational efforts to the users of a waterbody may help prevent AIS spread from or into that waterbody.

priority landings during peak usage times (holidays & weekends).	
Clear vegetation debris around public boat launches.	Inspectors can help prevent AIS spread by clearing some of the aquatic vegetation debris around access sites.

Table 6: Watercraft Inspection & Decontamination Action Steps

5.2 AIS Management & Control

Several AIS introductions have already occurred in Carver County waters, and despite the best efforts at prevention, more will likely occur. Unchecked, AIS can reproduce and spread very quickly, often with significant harmful consequences. Research suggests that early detection and rapid response (EDRR) is the best strategy to manage new AIS introductions. This includes monitoring habitats at greatest risk of invasion, detecting high-risk species soon after introduction, and responding quickly to keep the species from becoming established and spreading. EDRR relies on sufficient resources and capacity to increase the likelihood of finding, containing, and eradicating localized AIS populations before they become widely established. Effective EDRR, however, can avoid the need for larger, longer, and more costly control efforts. The central strategies and associated action steps for AIS management and control are detailed below:

5.2.1 Early Detection Monitoring

A key strategy of effective AIS management is having an aggressive early detection monitoring program. Detecting an invasive species early, before it has become established, increases the feasibility of successful response and eradication efforts. Having staff, volunteers, and lake residents all involved in early detection activities also brings immediate AIS awareness to the community and may strengthen prevention and outreach efforts.

The County's Early Detection Monitoring Program takes a target-species approach and involves survey and sample collection for invasive plants and animals, as well as water sample collection for zebra mussel veligers and e-DNA. Species are prioritized according to the MN DNR's Prohibited and Regulated Invasive Species list. Habitats to be monitored are also prioritized based on risk factors such as AIS suitability and infestation risk.

Seasonal interns are trained to conduct AIS early detection surveys on as many lakes and waterbodies in the county that can be safely accessed, taking special considerations to higher prioritized habitats. Survey methods are based on the MN DNR's Guidance for Conducting Aquatic Invasive Species Early Detection and Baseline Monitoring in Lakes document. County staff and volunteer lake shore owners place and check zebra mussel settlement plates in many lakes, both

infested and non-infested. The settlement plates are used for early detection in non-infested lakes and help track zebra mussel distribution and abundance in infested lakes. Staff also conduct aquatic vegetation surveys that help understand the dynamics of plant populations and identify new infestations in County lakes.

COUNTY AIS PLAN ACTION (Monitoring & Early Detection)	HOW ACTION SUPPORTS AIS MANAGEMENT
Placement of zebra mussel substrate sampling plates in multiple waterbodies throughout the County.	Substrate samplers can be used to determine if zebra mussels are present in a waterbody and be used to monitor abundance and population growth in lakes with known zebra mussel populations.
Conduct Aquatic Vegetation Surveys on multiple lakes throughout the County.	Aquatic vegetation surveys will help Water Management staff understand the dynamics of aquatic plant populations in County waterbodies and identify new invasive plant infestations.
Conduct shoreline assessments and snorkel surveys at public water accesses and other high-risk areas.	County staff can contribute to preventing the spread of AIS by searching for signs of new infestations.
Attempt to recruit lake volunteers such as lake residents, students, and conservation groups to conduct shoreline surveys.	Volunteers can expand monitoring efforts and help spread AIS prevention messages.
Conduct zebra mussel veliger tows and e-DNA sampling.	Using multiple early detection methods increases the chances of finding evidence of newly introduced and/or reproducing zebra mussel populations.

Table 7: Monitoring & Early Detection Action Steps

5.2.2 Rapid Response

Although prevention and monitoring efforts are vital to an AIS plan, they are not foolproof. Managers must be prepared to act in the event of an AIS introduction. If a new aquatic invasive species population is detected when it is still small and manageable, it is crucial to have a Rapid Response Plan prepared to ensure that the incident is addressed quickly and effectively. Eradication is usually the goal of a rapid response, but is not always feasible, especially in aquatic ecosystems. The US Fish and Wildlife Service recommend the following steps for a basic rapid response:

- Rapid confirmation of the identity of the suspicious organism.

- Assess the extent of the infestation.
- Quarantine the infested area, if possible.
- Quick review of available control options to choose one best suited for the treatment conditions.
- Application of the chosen control option(s).
- Modification of the control strategy as indicated by the results ("adaptive management").

The county will use the above guidelines to prepare a rapid assessment and response plan that identifies appropriate actions to contain and/or remove newly detected or expanding invasive species within its boundaries. Because an AIS infestation will likely involve a multi-jurisdictional response, the response plan will have to identify the County's role and responsibilities among other jurisdictions that may act. Response plans will likely vary from case to case depending on severity of infestation, resources available, and entities involved.

COUNTY AIS PLAN ACTION (Rapid Response)	HOW ACTION SUPPORTS AIS MANAGEMENT
Create a General Rapid Response Plan.	This plan will ensure that new infestations are properly reported, and rapid response is deployed, if required.
Use AIS Rapid Response Plan and thoroughly assess the breadth and severity of new AIS introductions to determine rapid response actions.	Identifying and delineating new introductions will assist in determining response methods, cost, and likelihood of successful rapid response actions.
Have relationships and/or contracts in place with Lake Management consultants and AIS treatment applicators.	Having contracts in place before experiencing a new introduction will help speed up the rapid response process.
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 and management efforts related to new infestations.

Table 8: Rapid Response Action Steps

6.0 AIS Management Projects

We know that prevention is the most efficient and least costly method of combating invasive species and as AIS become more established over time, the effort and associated costs of addressing them escalate exponentially. In some cases where AIS have been introduced and established in waterbodies located within Carver County, intensive, long term

control efforts can be effective in managing or eradicating the introduced species. Several AIS management projects are currently under way in Carver County to address invasive carp and goldfish. The county also partners with various other counties and districts to manage common reed (*Phragmites australis),* an invasive plant found on roadsides and wetlands. Long term management projects such as these are expensive and usually require multiple funding sources such as grants and cooperative partnerships. With limited resources, not every established AIS population in the county can be controlled, however, with continued monitoring and new research, staff continues to search for opportunities to fund and implement management projects. Two current invasive fish management projects are detailed below:

6.1 Goldfish in the Grace chain of lakes

While doing routine monitoring in April 2019, Carver County Water Management staff discovered thousands of goldfish in an inlet to Big Woods Lake in Chaska. It was the most densely populated discovery of goldfish staff had seen. The most likely reason for the goldfish presence is one or more individuals illegally dumping pet goldfish over the years. Big Woods Lake is part of the Grace Chain of Lakes, which also includes Lake Grace, Lake Jonathan, McKnight Lake, and Lake Hazeltine.

Like many aquarium pets, goldfish are not native to Minnesota. When found in lakes and ponds, goldfish pose a threat to water quality and overall ecological health. Goldfish are hardy and very invasive like their close relative, the common carp. They stir up sediments and uproot plants while feeding. This action releases phosphorus into the water, which increases algae and decreases water clarity. The uprooting of native plants removes habitat for the native fish that rely on them, and goldfish compete with native fish for food and shelter. Once established, no easy solution exists to remove an invasive species like goldfish.

6.1.1 Workplan

There have not been any comprehensive studies about goldfish in a lake in the upper Midwest. There is little scientific literature on the impacts of goldfish to a lake, how they affect water quality, or how they respond to removal events.

In spring of 2020, Carver County Water Management Organization received a grant from the Board of Water & Soil Resources for a three-year work plan to study and remove goldfish from Big Woods Lake and Lake Hazeltine where the largest populations of goldfish are found. The study will look at how, where, and when the goldfish move in the chain of lakes. The study will also look at what removal techniques work best and when.

6.1.2 Goals

- Get estimates for number of adult and juvenile goldfish present in the lakes.
- Study spawning and migration habits.
- Identify nursery areas.
- Study how the goldfish population responds to removal efforts.
- Determine potential for long term management of this species.

The knowledge gained from this study can help staff and other agencies understand where goldfish likely spawn, how goldfish migrate through a lake system, how populations respond to fish removals, and the potential effort required to remove goldfish for a whole system.

Timeline for Goldfish Grant Project	**2020**				**2021**				**2022**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Permitting to sample goldfish and carp												
Spring goldfish removal												
Measuring, marking, and PIT tagging goldfish. Collection of samples for ageing.												
Permitting amendments												
PIT antenna installation and troubleshooting												
Electrofishing for CPUE and CMR estimate of goldfish and carp and PIT tagging												
PIT system annual rental from WSB												
YOY trap net surveys on Big Woods and Hazeltine												
Arranging commercial anglers and assisting with nettings and fish workup												
Ageing structure for goldfish and carp (sample of 50)												
Reporting												

Table 9: Goldfish project timeline

6.2 Carp in Benton lake

Common carp are invasive fish that contribute to algae blooms and poor water quality in lakes. While rooting around the lake bottom for food they muddy the water, uproot plants, and re-suspend nutrients like phosphorus back into the water. A 2017 study of Benton Lake in the City of Cologne revealed carp to be a large cause of the poor water quality in the lake.

6.2.1 Workplan

To manage and reduce carp populations in the lake, Carver County Water Management Organization has completed several projects. Fish barriers have been installed to prevent movement of carp, and aerators have been installed to create refugia for blue-gill sunfish, who are known to eat carp eggs. In 2019, the CCWMO received a grant from the Legislative-Citizen Committee on Minnesota Resources (LCCMR) for a 2-year project to study and remove carp from the lake. Although research shows that lakes can be restored by managing common carp, widespread implementation of carp management has been severely hindered by lack of effective removal methods. Traditional methods such as lake drawdowns, poisoning, and commercial seining are often ineffective, harmful to native species, cost-prohibitive, and/or rely on a few specialized contractors that are difficult to secure. This project will demonstrate a new method of managing common carp that can be implemented by citizen groups and LGUs to improve water quality by reducing in-lake nutrient loading.

6.2.2 Goals

- Study carp population estimates and migration habits.
- Enlist local citizens to field test a simple, innovative method of removing carp via specialized baited box-nets.
- Use an electric barrier/guidance system to guide carp aggregations to a removal site during spawning runs.
- Decrease common carp population to a known management threshold of 100kg/ha.
- Monitor lake response to carp removal activities.

Timeline for Benton Lake Project	2017		2018				2019				2020				2021				2022			
	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Temp. fish barrier installed						■																
Use of EGS																■	■	■		■		
installed aerators				■			■				■				■				■			
box net removals		■		■	■				■	■		■					■	■				
electrofishing surveys	■			■					■								■			■		
LCCMR grant							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
fish stocking				■			■															
water quality testing					■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
radio telemetry		■																				
PIT antenna installation at fish barrier							■	■	■													
trap net surveys					■		■						■				■				■	

Table 10: Benton Lake Carp Management Timeline

7.0 Future Direction

7.1 Priorities

It is generally recognized that the most effective strategy against invasive species is to prevent their introduction and establishment. Preventative measures typically offer the most cost-effective means to minimize or eliminate

environmental, societal, and economic impacts. Preventing the spread of AIS into and out of Carver County waterbodies is the key priority of the AIS program. Long-term success in prevention will reduce the rate of introductions, the rate of establishment, and avoid many of the long-term costs associated with AIS.

In addition to the AIS prevention measures detailed above, management of existing native aquatic species and natural areas surrounding our water resources (e.g. maximizing diversity and reducing disturbance) is another way to decrease susceptibility to invasion by non-native species and may also constitute an element of prevention. Many components of the CCWMO's Watershed Management Plan focus on maintaining resilient systems that can act to slow the establishment, spread, and dominance of invasive species.

With aquatic invasive species management still being a relatively new field with everchanging research and new technology, prioritizing strategies can be challenging. Based on current research, Carver County staff, considering input from the CCWMO advisory committee and other stakeholder groups, have identified watercraft inspections to be a very high priority of the AIS program. Watercraft inspectors (other than boaters themselves) are a first line defense from AIS. Inspectors not only inspect watercrafts that are entering and leaving waterbodies for attached AIS, but also educate boaters about AIS laws, best practices, and provide tips how to self-inspect boats and other water related equipment. A significant portion of AIS Program funds are allocated to watercraft inspections, however, several challenges have arisen over recent years, such as decreasing partnership funds and difficulty recruiting an adequate amount of seasonal staff to carry out a full season's inspection schedule. Because of challenges like these, staff must be able to continually adapt the AIS Program priorities to changes in funding, research, and trends in AIS management. Table 11 outlines the current AIS Priorities. These priorities will be reviewed annually and are subject to change if funding and logistical challengers such as staffing continues. If the current watercraft inspection and decontamination program is not sustainable under the current model, a likely scenario would be to decrease the number of inspection hours and allocate any additional resources to EDRR, Education, or AIS Management.

Priority 1	Watercraft Inspections & Decontamination
Priority 2	Early Detection Monitoring & Rapid Response (EDRR)
Priority 3	Education & Outreach
Priority 4	Promote Collaboration
Priority 5	AIS Management Projects

To prioritize watercraft inspection and AIS monitoring activities included in this plan, risk assessments are used to determine priority waterbodies. Risk assessment scores are based on AIS suitability and risk of infestation. Water quality data, connectivity, and public use are all considered.