



MEMORANDUM

Comfort Lake-Forest Lake Watershed District

Date: April 15, 2024
To: CLFLWD Board of Managers
From: Mike Kinney, District Administrator
Subject: Aquatic Invasive Species Comprehensive Prevention & Management Plan



District Wide

Background/Discussion

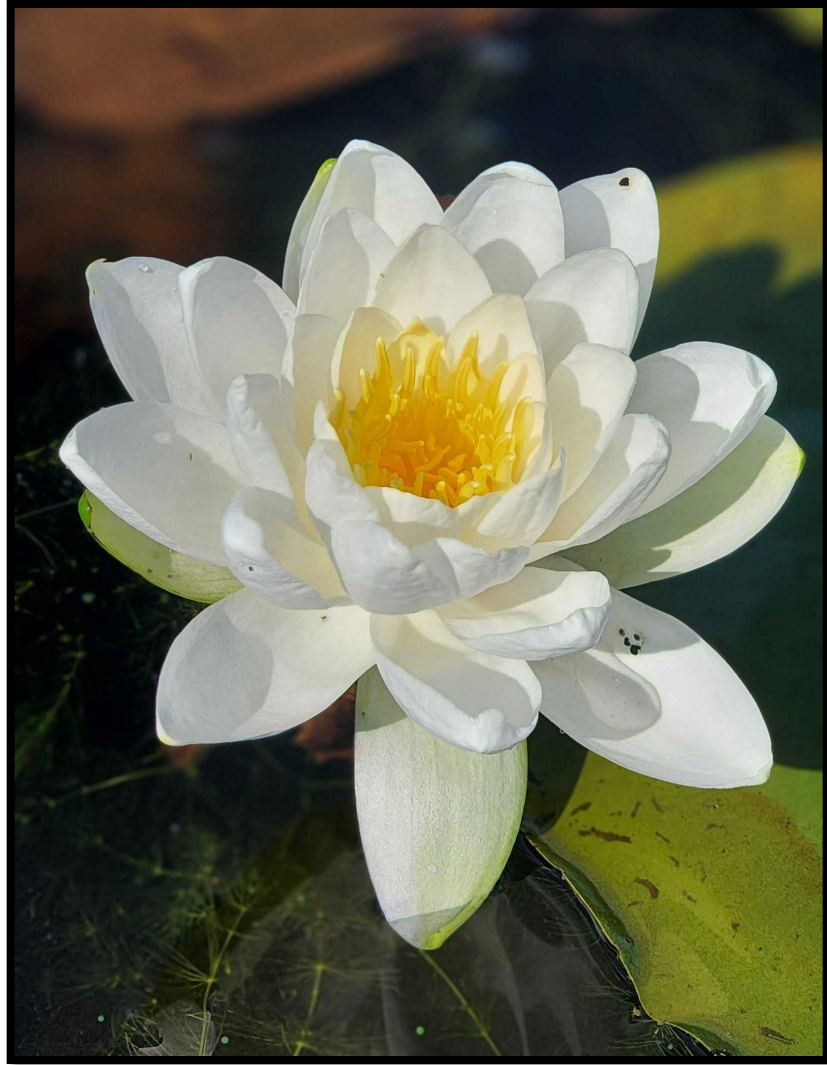
Garrett Miller and staff have completed drafting the District's Aquatic Invasive Species (AIS) Comprehensive Prevention & Management Plan. The plan's structure is based upon the AIS Prevention & Management Program (3011 program) description in the District's [10-year Watershed Management Plan](#) (WMP). Whereas the WMP identifies broad program goals and objectives, this plan provides consistent standards for AIS prevention and management that align with the District's mission and goals. Additionally, for each of the AIS Program's eight subcategories in the WMP, useful guidance and resources are provided as a pathway to achieve goals.

The AIS Comprehensive Prevention and Management Plan has already undergone staff review, as well as professional reviews by both Blue Water Science and EOR. All provided comments and edits that were incorporated into the final draft. To give additional review time ahead of the April 25th regular board meeting, the plan was distributed to the managers on April 12th. A final draft of the report will be brought to the May 9th meeting for board approval.

Attached

The Aquatic Invasive Species Comprehensive Prevention & Management Plan

Aquatic Invasive Species Comprehensive Prevention & Management Plan (Program 3011)



CLFLWD
WATERSHED DISTRICT

Drafted By: Garrett Miller – AIS Program Coordinator
Updated: April 2024

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Executive Summary

The structure of the Aquatic Invasive Species (AIS) Comprehensive Prevention & Management Plan is based upon the AIS Prevention & Management Program (3011 program) description in the District’s 10-year Watershed Management Plan (WMP) adopted in 2021. The WMP identifies broad program goals and objectives, and this plan provides consistent standards for aquatic invasive species (AIS) prevention and management that align with the District’s mission and goals.

Management and operation plans drafted by the Comfort Lake-Forest Lake Watershed District (CLFLWD) are created using available literature, staff expertise, and external stakeholder expertise from contractors, researchers, and field experts. Some management plans have been adapted from other organizations to avoid redundancies.

AIS management is an ever-evolving field, and the enclosed operations and management plans are subject to continuous review, adaption, and improvement. The content of this report details the current best management practices as of early 2024 and management decisions are referenced with recent research and discussed with experts prior to implementation. Below is an overview of the four major overarching AIS Program goals with evaluation metrics:

Goal 1: Continue use and refinement of the District’s prevention and early detection & rapid response initiatives to reduce the risk of new invasive species introductions to District waterbodies and prevent the spread of existing infestations to other waterbodies.

Goal 1 Progress Evaluation Metrics

- Employ watercraft inspectors at district boat launches for at least 3,500 hours per year
- Perform 12 AIS education and outreach activities per year (distribute information, attend events and meetings)
- Perform one early detection survey per week at public boat launches during open water season
- Perform at least one invasive species delineation survey per species per year

Goal 2: Manage the existing population of AIS to reduce phosphorus loading.

Goal 2 Progress Evaluation Metrics

- Coordinate with the DNR to perform carp population surveys and maintain their levels below their adverse impact threshold of (100 kg/ha)

- Perform annual curly-leaf pondweed delineation surveys and manage it in areas exceeding moderate growth conditions (100-280 stems/m²).

Goal 3: Manage existing populations of AIS to improve native plant diversity by managing AIS populations that pose a risk to native plant health.

Goal 3 Progress Evaluation Metrics

- Managing AIS densities below their adverse impact threshold

Goal 4: Ensure ecological integrity is protected by providing guidance and technical support to other organizations and residents who manage AIS for recreational benefits.

Goal 4 Progress Evaluation Metrics

- Attending at least one meeting of each lake association per year
- Performing at least two education and outreach activities per year

The CLFLWD's AIS Program is broken down into eight subcategories, as described in the [District's 2022-2031 Watershed Management Plan](#) (WMP). These subcategories define areas of program focus and work that help to achieve the AIS Program's overarching four major goals (described above). The structure of this plan will follow the order in which these subcategories are described in the WMP. Subcategory descriptions, objectives, and resources will be provided for each. An overview of these categories is listed below:

- [3011B. Watercraft Inspections](#)
- [3011C. AIS Prevention at Lake Access Sites](#)
- [3011D. AIS Early Detection and Rapid Response](#)
- [3011E. Invasive Species Pilot Control Project](#)
- [3011F. Point-Intercept Macrophyte Surveys](#)
- [3011G. Aquatic Invasive Species Management](#)
- [3011H. Common Carp Management](#)

Introduction

This section of the CLFLWD's AIS Comprehensive Management Plan will focus on identifying what Aquatic Invasive Species are, how they are regulated, what risks they pose, and how they spread. A basic understanding of these components of AIS will make the program goals and objectives clearer in later sections of this report. Information to describe these components has been taken from recent available research and sources. Links to the source material will often be provided.

What are Aquatic Invasive Species (AIS)?

According to [Minnesota Statutes – Chapter 84D. Invasive Species](#), “Invasive Species” means nonnative species that:

- (1) Causes or may cause economic or environmental harm or harm to human health; or
- (2) Threatens or may threaten natural resources or the use of natural resources in the state.

AIS can be non-native plants, animals, and pathogens that are introduced into an aquatic habitat. An aquatic habitat does not always mean submerged under water; it can also include partially submerged habitat, shoreline near the water, or something in between like a wetland with fluctuating water levels.

Minnesota has passed state laws that classify invasive species, which establishes the level of regulation and allowable uses for each species. These classifications are intended to help limit the spread and introduction of these AIS in the state. The four tiers of this classification system are: 1.) prohibited, 2.) regulated, 3.) unregulated nonnative species, 4.) and unlisted nonnative species. Each of these tiers are explained below and accompanied by a few examples of associated AIS. For more information on Minnesota's AIS Laws and a more complete list of species, please visit the DNR's webpage "[Minnesota Invasive Species Laws](#)".

1.) Prohibited Invasive Species

Pose a significant threat to natural resources and are therefore unlawful to possess, purchase, transport, or introduce into the wild, except under certain conditions such as disposal, control, research, or education.

Examples of Prohibited Invasive Species

- Curly-leaf Pondweed (*Potamogeton crispus*)
- Eurasian Watermilfoil (*Myriophyllum spicatum*)
- Flowering Rush (*Butomus umbellatus*)
- Starry Stonewort (*Nitellopsis obtusa*)
- Bighead Carp (*Hypophthalmichthys nobilis*)

- Zebra Mussels (*Dreissena spp.*)
- Faucet Snail (*Bithynia tentaculata*)
- Silver carp (*Hypophthalmichthys molitrix*)
- Golden clam (*Corbicula fluminea*)

2.) Regulated Invasive Species

Allows individuals to legally possess, sell, buy, and transport certain regulated invasive species. It remains unlawful to introduce any in a free-living state, such as released or planted in public waters. These species are typically associated with the aquarium and aquatic plant trades.

Examples of Regulated Invasive Species

- Water Hyacinth (*Eichornia crassipes*)
- Yellow Iris or Yellow Flag (*Iris pseudacorus*)
- Brazilian Waterweed (*Egeria densa*)
- Carolina Fanwort (*Cabomba caroliniana*)
- Common Carp (*Cyprinus carpio*)
- Goldfish (*Carassius auratus*)
- Banded Mystery Snail (*Viviparus georgianus*)
- Rusty crayfish (*Orconectes rusticus*)

3.) Unregulated Nonnative Species

Nonnative species that are not regulated under Minnesota Invasive Species Statutes, but have regulations for fishing, hunting, or transporting them.

Examples of Unregulated Nonnative Species

- Brown Trout (*Salmo trutta*)
- Coho Salmon (*Oncorhynchus kisutch*)
- Chinook Salmon (*Oncorhynchus tshawytscha*)
- Rainbow Trout (*Oncorhynchus mykiss*)

4.) Unlisted Nonnative Species

Species where there are no State Invasive Species Statutes that prohibit or regulate them in any way. Before these species may be released into a free-living state, the DNR must evaluate the species for potential risks and designate an appropriate classification for it.

Similar to the Minnesota Invasive Species Law, there is also a [Minnesota Noxious Weed List](#) that regulates some aquatic invasive species. Where the Invasive Species Law is mainly administered and enforced by the Minnesota Department of Natural Resources (DNR), the Minnesota Department of Agriculture (MDA) does the same for the Noxious Weed List. The MDA's list also has four tiers that include, **1.) Prohibited Eradicate:** Species that must be eradicated on all lands in the State **2.) Prohibited Control:** Species that are already established in the State but must be controlled in a way to prevent their spread **3.) Restricted Noxious Weeds:** Species that cannot be imported, sold, or transported in the State without a permit **4.) Specially Regulated**

Species: Native or nonnative species that have economic value, but also have the potential to harm when uncontrolled. The two species worth mentioning from this list that have been managed by the CLFLWD include:

1. Non-native Phragmites (*Phragmites australis*) – Prohibited Control Species
2. Purple Loosestrife (*Celastrus orbiculatus*) – Prohibited Control Species

It should be noted that not all nonnative species are “invasive.” Some nonnative species survive in their new environment but coexist with the natives rather than outcompete them. For other nonnative species, they fortunately fail to establish themselves and naturally die-off in their new environment. This can happen due to the species’ inability to adapt to new environmental conditions that are outside its natural range. A local example of this was the introduction of water hyacinth in Bone Lake (Washington County) in 2019. Water hyacinth is native to tropical regions of South American and will thrive in warmer climates. Its ability to form thick and fast spreading floating mats of vegetation has made it one of the most invasive aquatic plants in the world. Water hyacinth fortunately failed to establish itself in Bone Lake and was eradicated by Minnesota’s freezing winter conditions.

Threats of AIS

AIS has the potential to cause harm to the economy, environment, our natural resources, and human health. Some nonnative species pose more risk than others depending on their level of invasiveness and unique characteristics. General examples of how AIS can be harmful include ([List Adopted from Wisconsin’s AIS Management Plan](#)):

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

Each year AIS in the United States causes \$120 billion in damages, according to a [2005 study by David Pimentel](#). In that study, beyond the financial losses from damages to agriculture, forestry, public health, recreation, and others, there is a debatably more costly lost to biodiversity. David Pimentel reported that of the 958 species listed on the threatened or endangered species list under the Endangered Species Act, 400 of them are considered at risk primarily due to competition or predation by invasive species. More species are likely to be added to this list as the effects of climate change stress native species through changing environmental conditions and as new habitats are opened to invasive species.

Here in Minnesota, the impact of AIS are felt as well. According to the [DNR's infested waters list](#), about 8% of Minnesota's +10,000 lakes are infested with AIS. Among the 16 species tracked on that list are spiny waterflea and zebra mussels (Full List Below). These species are of great concern to many in the state, including the CLFLWD, for several reasons. In a 2020 paper titled "[Walleye growth declines following zebra mussel and *Bythotrephes* invasion.](#)" researchers found that walleye grew more slowly in their first year of life when in a lake infested with spiny water flea or zebra mussels, (12% and 14% smaller respectively), compared with uninvaded lakes. The report stressed that this is problematic as slower growth during early life for fish is associated with higher mortality from predation, lower energy reserves to survive winter with, and a reduction in the energetic profitability of smaller prey species. The report continues to say these detriments in the first year of life can create a domino effect that impacts successful recruitment in later life stages. Not only is this concerning from an ecological perspective, but also an economic one as well considering sportfishing generates an estimated \$4.4 billion annually in economic impact for Minnesota ([Lakeland PBS](#)). Furthermore, the DNR already hatches millions of walleye eggs annually, costing the state more than \$3.5 million yearly. These figures are likely to rise if fishery managers wish to offset the negative impacts of spiny water flea and zebra mussels. This is just one of many examples of how Minnesota's residents and resources are being hurt by AIS.

Current AIS on the 2023 Minnesota DNR Infested Waters List

1. Bighead Carp – 44 waterbodies infested
2. Brittle Naiad – 9 waterbodies infested
3. Eurasian Watermilfoil – 417 waterbodies infested
4. Faucet Snails – 58 waterbodies infested
5. Flowering Rush – 52 waterbodies infested
6. Grass Carp – 12 waterbodies infested
7. New Zealand Mud Snail – 2 waterbodies infested
8. Red Swamp Shrimp – 1 waterbody infested
9. Round Goby – 3 waterbodies infested
10. Ruffe – 3 waterbodies infested
11. Silver Carp – 44 waterbodies infested
12. Spiny Waterflea – 68 waterbodies infested
13. Starry Stonewort – 27 waterbodies infested

14. VHS – 3 waterbodies infested
15. White Perch – 3 waterbodies infested
16. Zebra Mussels – 598 waterbodies infested

For the CLFLWD's AIS Program, the DNR's infested waters list is an important one. This list documents all aquatic invasive species that have established themselves in the state and which waterbodies are infested with them. For management and prevention purposes, the CLFLWD will put a greater focus on these species as they pose the greatest risk of introduction and harm. This is not to say species not on this list will be ignored. In fact, CLFLWD staff will continue to monitor other species listed on the Minnesota Invasive Species Law and Minnesota Noxious Weed List (both mentioned previously), as well as watch for new species posing risks outside of the state.

AIS Pathways and Spread

Most introductions of Aquatic Invasive Species have occurred due to human activity. Humans have both spread AIS unintentionally by transporting them either knowingly or unknowingly in/on vehicles, equipment, water, soil, etc., or intentionally spread them for some perceived value (ex. Common Carp introduced as a game fish, non-native phragmites was intentionally used in wastewater treatment, and Purple Loosestrife was sold as a decorative ornamental plant). Understanding the behaviors and pathways that lead to new AIS introductions is crucial in trying to prevent their spread.

The Minnesota DNR set out in 2018 with the goal of exploring the prevention of AIS through Community-Based Social Marketing. Their purpose was to apply behavioral psychology techniques to address risky human behaviors that spread AIS. They first needed to identify AIS pathways of spread, risky behaviors, target audiences, and barriers and benefits of targeted behavior change. Teaming up with the consultants, AZENTIVE, LLC and Beyond Attitude Consulting Inc., they performed a literature review of more than 150+ published studies and technical reports, and summarized the most relevant to determine the most important AIS pathways of spread ([list of all literature reviewed](#)). From their "[Moving Forward Report](#)", they identified five primary pathways for AIS in Minnesota in Table 1 below:

Table 1: Five Primary Pathways for AIS in Minnesota

Pathway	Main Mode of Transport	Sectors (i.e. target audiences)
Recreational Watercraft	Within and between waters on boats	Boaters Paddlers Anglers
Live Bait	Release of bait, bait packaging, and bait water	Anglers Commercial Trade (Shops, Dealers, Harvesters)
Gear and Equipment	Within and between waters on gear and equipment	Hunters Anglers Divers Lake service providers Shoreline property owners Researchers/academics Other recreationalists
Aquarium Trade	Intentional and unintentional release/escape of aquatic animals	Aquarium Owners Commercial Trade (Retail, Wholesaler, Maintenance, Biological Supply)
Aquatic Plant Trade	Intentional and unintentional release/escape of aquatic plants	Aquarium Owners Water Garden Owners Commercial Trade (Retail, Wholesaler, Maintenance, Biological Supply)

Table 1- Five Primary Pathways for AIS in MN - Credit MNDNR

Other pathways exist for the spread of AIS besides these five primary pathways identified above. However, the DNR’s thorough investigation inspires confidence that these five pose the greatest known risks and should be focused on heavily. This list will be at the forefront of thought when determining program goals and objectives in later sections of this report. The CLFLWD’s AIS program can greatly reduce its risk of new introductions by focusing on these five primary pathways.

3011 Program Goals and Progress Evaluation Metrics

The CLFLWD’s Aquatic Invasive Species Prevention and Management Program, as described in the [2022-2031 Watershed Management Plan](#), is broken out into eight subcategories of AIS prevention and management tasks. These subcategories will serve as a template for this comprehensive plan’s organization and structure. Overarching these eight subcategories are four major program goals and objectives and their associated progress evaluation metrics, which are as follows:

Goal 1: Continue use and refinement of the District’s prevention and early detection & rapid response initiatives to reduce the risk of new invasive species introductions to District waterbodies and prevent the spread of existing infestations to other waterbodies.

Goal 1 Progress Evaluation Metrics

- Employ watercraft inspectors at district boat launches for at least 3,500 hours per year
- Perform 12 AIS education and outreach activities per year (distribute information, event and meeting attendance)
- Perform one early detection survey per week at public boat launches during open water season
- Perform at least one invasive species delineation survey per species per year

Goal 2: Manage the existing population of AIS to reduce phosphorus loading.

Goal 2 Progress Evaluation Metrics

- Coordinate with the DNR to perform carp population surveys and maintain their levels below their adverse impact threshold of (100 kg/ha)
- Perform annual curly-leaf pondweed delineation surveys and manage it in areas exceeding moderate growth conditions (100-280 stems/m²).

Goal 3: Manage existing populations of AIS to improve native plant diversity by managing AIS populations that pose a risk to native plant health.

Goal 3 Progress Evaluation Metrics

- Managing AIS densities below their adverse impact threshold

Goal 4: Ensure ecological integrity is protected by providing guidance and technical support to other organizations and residents who manage AIS for recreational benefits.

Goal 4 Progress Evaluation Metrics

- Attending at least one meeting of each lake association per year
- Performing at least two education and outreach activities per year

3011B. Watercraft Inspections

General Program Description and Background

Preventing the spread of invasive species is the primary objective of the Aquatic Invasive Species Prevention & Management Program. The main line of defense against new introductions are watercraft inspectors and they play a crucial role in the District's and other organization's AIS Programs.

The Watercraft Inspection Program was created in Minnesota in 1992. In 2011, legislation was signed into law that gave authorized watercraft inspectors certain authorities: ability to visually and tactilely inspect water-related equipment; deny access to violators; and require decontamination prior to launching in Minnesota's waters under certain circumstances. The District began helping to fund and operate a watercraft inspection program since at least 2010. From 2014 to 2023, inspectors have conducted approximately 65,000 inspection surveys over the course of 34,200 hours across five public lake accesses within the District.



Figure 1 - CLFLWD's 2022 Team of Watercraft Inspectors - Forest Lake West Public Access

Program Goals

The watercraft inspection program (WCI program) is used to achieve a number of the CLFLWD's AIS Program goals that were described in section, "3011 Program Goals and Progress Evaluation Metrics". The program's foremost priority goal is to achieve at least 3,500 hours of inspections per year across the District's five public accesses. Inspections are the first line of defense and the best chance at preventing the introduction of new AIS. While performing these inspections, inspectors can serve other functions that help achieve the District's program goals, namely education and outreach. Inspectors can use these public interactions as an opportunity to distribute information about AIS, provide AIS treatment notices, address questions or concerns, and connect individuals with the District. Watercraft inspectors and their training on AIS identification make them adept early detection

surveyors. Beyond looking at watercrafts for new AIS, inspectors are tasked with performing weekly rake throw surveys from each of the public docks.

Program Implementation and Operation Objectives

The WCI Program is one of the largest components of the District's overall AIS Program. It requires a considerable amount of staff time spent planning, coordinating, and operating. Many components of the WCI Program are fortunately reoccurring on a consistent annual basis. This has allowed District staff to make slight adjustments each season that have improved the overall effectiveness and efficiency of the program. Below are the many components of the WCI program and suggested instructions for their completion and operation to ensure program goals are achieved.

Hiring

Hiring and staff retention has historically been one of the greatest challenges for the District's WCI program. The District currently has the equipment and resources to hire up to eight watercraft inspectors in-house. Most seasons operate with fewer inspectors but having a full team of eight is the goal to reach if possible. Several hiring strategies have been developed and utilized over the years to ensure the District has enough staff to meet program goals.

Job Posting and Advertising

The District has found greatest success in using a combination of job posting methods and advertising strategies. Advertising for the program can occur all year but should be most aggressive beginning in January and end when positions are filled. Advertisements should be posted in most, if not all, of the following manners annually to ensure the job posting is reaching a wide audience:

- **Online Job Boards** – Indeed (free or paid) and Conservation Job Board (paid).
- **Local Newspapers** – Forest Lake Times and Chisago County Press (both charges weekly for printed ads).
- **District Website** – Position is usually advertised on the District's website year-round.
- **Social Media** – Post the job announcement on the District's Facebook.
- **Lake Associations** – Email job announcement to local lake association presidents to share with their members.
- **Flyers** – Hang flyers on local business's pin boards. Flyer is also usually hung near the front door of the office.

- **Signs** – Printed yard signs have been made and posted at the public accesses. (DNR permission needed)
- **Handouts** – Provide current watercraft inspectors with job advertisement handouts for visitors interested in the position.
- **Outreach to Local Schools** – Reach out to local schools and ask to advertise the position to senior students.
- **Job Fairs** – District staff occasionally attend job fairs at universities to advertise seasonal positions and educate students on the work watershed districts perform. These are great opportunities to advertise the watercraft inspector positions.

Compensation

Organizations all over the state operate their own watercraft inspection programs, but a higher number operate in and around the metro area. The District has strived to offer its inspectors competitive compensation to attract applicants from the surrounding area. Inspectors working for the District have consistently been provided some of the best program compensation and bonuses in the State. The District has maintained this competitive edge by using wage data collected by the DNR and starting wages of local businesses. In addition to increased starting wages, the District has also adopted in recent years pay increases for returning inspectors. This combination has improved the District's ability to consistently hire a crew of inspectors to achieve the program's goal of at least 3,500 hours of inspections worked.

Compensation Structure (As of 2023)

- Base Pay – The starting wage for all inspectors begins at \$16.00 per hour.
- Returning Inspector Raises – Returning inspectors will make \$16.50 their 2nd year, \$16.75 their 3rd year, \$17.00 the 4th year, and will cap out at \$17.50 their 5th year.
- Holiday Pay – Offered pay and a half for work conducted on Memorial Day, Independence Day, and Labor Day.
 - Purpose of Holiday Pay – Holidays are the District's busiest days for inspections. These incentives encourage inspectors to make themselves available.
- Performance Bonuses – Up to \$250 awarded to inspectors who work 500 hours or more. If inspectors perform less than 500 hours, they will receive a percentage of the max payout based on actual hours worked.
 - Purpose of Performance Bonuses – Incentive for inspectors to work beyond their minimum required weekly hours.

- Lead Watercraft Inspector – Starting wage for the Lead Watercraft Inspector begins at \$17.00. This additional pay is compensation for their position’s added work and responsibilities.

In-House Training

In-person inspector meetings will be hosted by the District to further reinforce the teachings of the DNR’s required WCI trainings. The program will try to host one in-person meeting per month in the summer (June-August). These meetings are opportunities for team building, distribution of handouts and gear, program updates, review of DNR training materials, and time to address any questions or concerns as a group.

Scheduling

The goal number of inspection hours are set by the District annually for each of its five public accesses. These goals are calculated by dividing the lake’s budget by the program’s billing rate (\$23 per hour as of 2023). Each lake has its own goal, as organizations and grants often specify where within the WCI program the money needs to be spent. As a planning tool the program aims for at least 3,500 inspection hours across all lakes. Scheduling is prioritized by ranking accesses based on the hour goals and amount of traffic at each location to ensure goals are reached.

Joint Powers Agreement – Chisago County

Chisago County has been a partner for most of the District’s WCI Program history and has provided additional support through a joint powers agreement (JPA). In addition to running their own large county-wide program, they hire and coordinate several watercraft inspectors to work at District accesses. The total budget for the JPA has decreased (From \$75,000 to \$35,000 in 2023) as the District’s ability to hire and coordinate more inspectors has grown. Chisago County inspectors are currently stationed at District accesses during the weekdays, whereas the CLFLWD’s in-house inspectors focus primarily on the weekend shifts.

The joint power agreement states Chisago County will hire and coordinate several watercraft inspectors to help cover weekday shifts in the District. Periodic meetings and check-ins will be had with program leads to discuss scheduling and program operation. Chisago County historically schedules their inspectors on a rotation of accesses. More focus on particular accesses may be needed to reach hour goals for that location. Staff should work with

Chisago County to ensure there is adequate coverage and that the program is on pace to reach goals by the end of the season.

Described in the JPA is Chisago County's \$5,000 grant to the District from their County AIS Prevention Fund . Conditions for this grant are that the funds must be spent on Comfort Lake inspections only and the District must perform at least 250 hours of inspections at that access.

Lead Inspector

A need for a dedicated weekend contact for working watercraft inspectors was identified over the years. A Lead Inspector will be hired annually to ensure District inspectors have the quick resources and support they need. Preference for this position will be given to seasoned and returning watercraft inspectors. Their role will support the District's AIS Program Coordinator and the Watercraft Inspection Program by:

- Performing weekly AIS early detection surveys at boat launches
- Providing regular communication and field reports with Aquatic Invasive Species Program Coordinator
- Distributing written information to watercraft users
- Training newly hired watercraft inspectors
- Performing routine check-ins with CLFLWD watercraft inspectors
- Delivering supplies and educational materials to inspectors
- Being the first contact to field phone calls from inspectors on weekends
- Inspecting the CLFLWD's bait disposal bins
- Other duties determined seasonally

Program Funding

The District's Watercraft Inspection Program is funded through a number of avenues, including the District's levy, partner organizations, grants, and other agreements. Many of these avenues provide the program with consistent annual contributions. However, slight changes year to year are common and should be reflected in the program's budget and hour goals for each access. Below is a typical funding breakdown, which can be found annually in the [District's AIS Year Plan](#) document, typically released in March (figures are taken from the 2023 AIS Year Plan).

Forest Lake

- o District Levy = \$30,000
- o Washington County AIS Prevention Grant = \$14,354
- o Forest Lake AIS Cooperative Agreement = \$9,772 in 2022, but can vary greatly

Bone Lake

- o District Levy = \$10,000
- o Washington County AIS Prevention Grant = \$1,000
- o Bone Lake Association = \$2,500
- o City of Scandia = \$1,000
- o Scandia Lions Club = \$500

Comfort Lake

- o District Levy = \$10,000
- o Chisago County AIS Prevention Funds = \$5,000
- o Comfort Lake Association = Up to \$500

Yearend Report

The watercraft inspection surveys are compiled by the DNR and made available to program coordinators throughout the season. District staff use this information to generate yearend comprehensive reports of the program. Its contents detail the number of hours worked, number of inspections performed, number of incoming/exiting violations, risk assessment of new AIS being introduced, and more. Accompanying the report, staff will either give a presentation or send a pre-recorded video summarizing the details of the report to the CLFLWD Board and to partners, typically in November or early December. Yearend reports can fulfill reporting requirements for some grants. Below is list of all past yearend reports and a graph summarizing the results of the watercraft inspection season from 2014 to current (Figure 2).

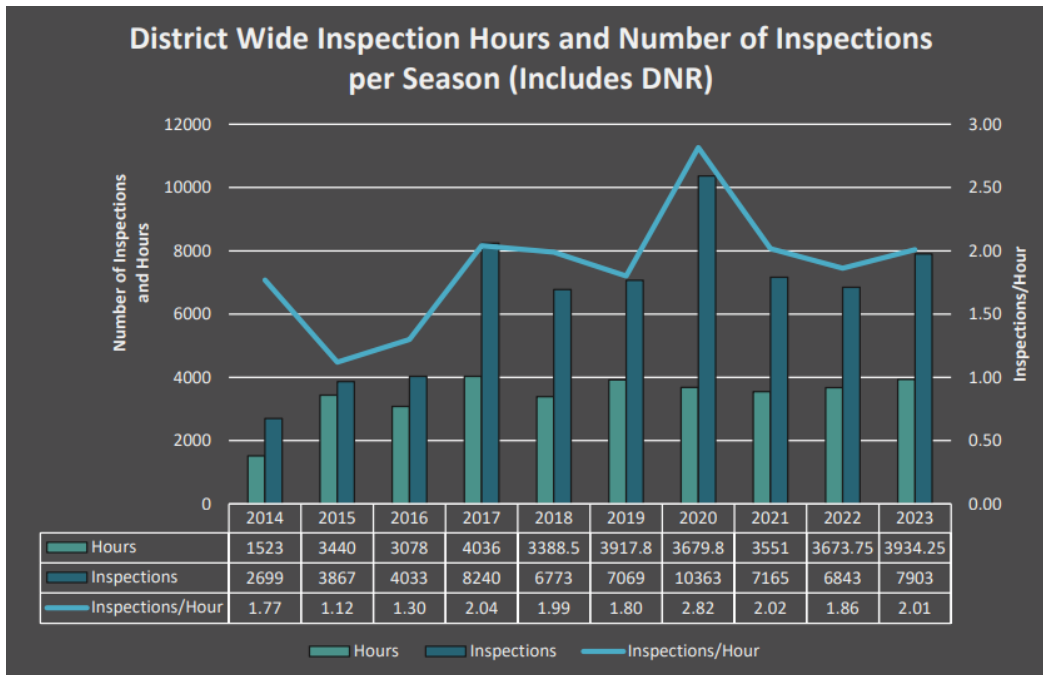


Figure 2 District-Wide Watercraft Inspection Hours and Surveys Performed (2014-2023)

Watercraft Inspection Program Yearend Reports:

[2023 Watercraft Inspection Program Yearend Report](#)

[2022 Watercraft Inspection Program Yearend Report](#)

[2021 Watercraft Inspection Program Yearend Report](#)

[2020 Watercraft Inspection Program Yearend Report](#)

[2019 Watercraft Inspection Program Yearend Report](#)

[2018 Watercraft Inspection Program Yearend Report](#)

[2017 CLFLWD Watercraft Inspection Program Yearend Summary](#)

[2016 Watercraft Inspections Summary](#)

[2015 Watercraft Inspections Summary](#)

[2014 Watercraft Inspection Report](#)

3011C. AIS Prevention at Lake Access Sites

3011C - 10-Year WMP Description

In addition to providing watercraft inspections at multi-user lake accesses, it is a priority of the District to improve signage and resources at such accesses so that boaters, anglers, and other lake users can effectively prevent the spread of invasive species on their own. Resources may include watercraft cleaning guidance and equipment, informational signage, bait disposal receptacles, etc.

The District will work with a variety of local and state partners to assess the needs and opportunities for implementing effective upgrades to public boat launches, beaches, fishing piers and other public access sites. The District may work with private entities, such as marinas, as owner interest allows.

Program Objectives for AIS Prevention at Lake Access Sites

Objectives for AIS prevention at lake access sites will focus on addressing the five primary pathways for AIS in Minnesota, as described in section “AIS Pathways and Spread.” The District will continue to deploy resources and amenities at accesses to reduce the introduction risk from these pathways. For reference, the five pathways and their main mode of transport are shown again below:

1. **Recreational Watercrafts** – Within and between waters on boats
2. **Live Bait** – Release of bait, bait packaging, and bait water
3. **Gear and Equipment** – Within and between waters on gear and equipment
4. **Aquarium Trade** – Intentional and unintentional release/escape of aquatic animals
5. **Aquatic Plant Trade** – Intentional and unintentional release/escape of aquatic plants

Current AIS Prevention at CLFLWD Lake Access Sites

The District and its partners have implemented a number of improvements and amenities at public accesses over the years. A list of current upgrades and resources, as well as their associated AIS pathway addressed, include:

1. **Recreational Watercrafts**
 - Clean In, Clean Out Signage
 - DNR List of Invasive Species Signage
 - Rakes for Watercraft Inspectors
 - Compost bins for aquatic vegetation
 - Boat Ramp Stencils
2. **Live Bait**
 - Bait Disposal Receptacles – (Figure 3)
 - Trash Services at all accesses (FL1 excluded)
3. **Gear and Equipment**
 - Trash Services at all accesses
 - DNR List of Invasive Species Signage
 - Clean, Drain, Dispose Signs – (Figure 1)
 - Boat Ramp Stencils
4. **Aquarium Trade**
 - Watercraft inspector educational handouts on common aquarium trade animals that are invasive (ex. New Zealand Mudsnail).
5. **Aquatic Plant Trade**
 - Watercraft inspector educational handouts on common aquarium trade plants that are invasive (ex. Fanwort and Water Hyacinth).

General Amenities that are not AIS Related

- Portable Restroom at Bone Lake
- No Wake Signs



Figure 3- CLFLWD Watercraft Inspector Next To Forest Lake Middle Bait Disposal Bin

Future AIS Prevention at Lake Access Sites

The DNR hosts a number of meetings (both online and in-person) with AIS program coordinators from across the state during the off season. Among the many topics covered, there is often an annual discussion on upgrades to public accesses. A document tracking many of these ideas has been created and stored internally. As most of the AIS Program's budget is spent on watercraft inspections and treatments, upgrades to the public accesses are often funded through grants and partnerships. Having project ideas in the pipeline allows staff to react quicker to grant opportunities.

Examples of Future Projects:

- Watercraft inspection tool station (CD3, Aqua Weed Stick, DIY)
- Watercraft inspector kiosk
- Boat decontamination station
- Sandpoint wells for bait bucket water refreshing
- Aquatic weed blowers at public accesses to reduce exiting violations

3011D. AIS Early Detection and Rapid Response

3011D. 10-Year WMP Description

According to the DNR, early detection and rapid response (EDRR) is sometimes considered the “second line of defense” after prevention. The purpose of the Early Detection and Rapid Response program is to enable the District to react quickly to a new invasive species introduction. Potential new invasive species present in the state but not yet present in the District include spiny waterflea and starry stonewort. In order to take rapid response steps in a timely manner, the District may set aside funding for this program in its annual budgeting process. A standard format was used to develop early detection rapid response plans for all of the active recreation lakes within the District and will be used for other waterbodies as appropriate. Additionally, the District will continue to educate the public on how to identify AIS so early detection is more likely.

AIS Early Detection Initiatives

When new AIS introductions occur, the speed at which they are found is crucial in limiting their spread within the waterbody. The odds of successful management are directly tied to this speed. If found early enough, management can focus on containment, damage mitigation, and sometimes eradication. Management becomes far more labor intensive and costly once past the point of containment. At that point, in most cases, management shifts to long term strategies that are more focused on population control for seasonal relief and not eradication.

To improve the District’s chances of catching new AIS introductions, several strategies and programs have been implemented into the AIS program. A list of these strategies and programs include:

- Weekly AIS Early Detections by Lead Watercraft Inspector – Throw Rake Surveys
- Zebra Mussel Sampler Plate Program
- AIS ID Training for Watercraft Inspectors
- Assist with [MAISRC's Starry Trek](#)
- [AIS Management 101 Class](#) – Pay Course fee for 10 District Residents Annually
- Staff Performed AIS Detection Meandering Surveys (Annual canoe surveys on Little Comfort and Keewahtin Lakes)
- Hired Early Detection Surveys – Blue Water Science
- Education and Outreach to Local Lake Associations

AIS Early Detection and Rapid Response Plan

The following structure was adopted from the Department of Natural Resource's "[Minnesota Early Detection and Response Plan for Aquatic Invasive Species](#)" and altered slightly to fit the needs of the District.

The following list outlines the steps associated with early detection and rapid response to suspected new aquatic invasive plants and animals (AIS) populations. Collaboration and coordination with the DNR and local partners throughout the process is essential for effective management. Some variability in the order of actions taken may occur as each response scenario is different. However, the general structure of the early detection and rapid response plan will serve as a road map to help guide resources, outreach, and management actions.

The species discovered determines whether all or only some of the steps described in this section are taken or led by CLFLWD staff. Depending on the species detected and the DNR's resource availability and staff capacity, the District may only aid in the response plan. For instance, in 2007 a Brazilian waterweed introduction was identified in a Minneapolis Lake. Being the only known introduction of that species, the DNR coordinated a successful treatment on their own. Another example, one within the District, is the 2019 Bone Lake zebra mussel rapid response treatment. While the District was largely in charge of coordinating and funding the treatment, the DNR helped with a number of aspects of this plan. Specifically, the DNR was very helpful in sections #2 - #7. While not the lead in this case, they helped verify the finding, created public notices and deployed signs at the access, performed veliger tows, and assisted with developing the action plan and implementing it.

Outline of the AIS Early Detection and Rapid Response Plan

1. Detection of AIS
2. Investigating and Verifying Reports or Findings of Suspected AIS
3. Communication to Partners and the Public
4. Assessment of Risk
5. Population Assessment
6. Make Action Recommendations
7. Implement Response Actions
8. Effectiveness Monitoring

AIS Early Detection and Rapid Response Plan Steps Explained:

1. Detection of AIS

- Members of the public make observations of suspected AIS in new locations. This could include lakeshore property owners, lake association members, or visitors to the lake.
- CLFLWD staff make discovery during early detection survey or routine field work.
- Professionals from the DNR, federal organizations, or local organizations (ex. Chisago County, Wild Rivers Conservancy, or Washington Conservation District).
- Watercraft inspectors report discovery during regular shifts or during weekly AIS early detection surveys

2. Investigating and Verifying Reports of Findings of Suspected AIS

- CLFLWD staff will obtain samples or photos and detailed information from individual(s) that reported the finding.
- CLFLWD staff will verify identification of suspected AIS. If needed, information can be shared with partners or other professionals to help ID the specimen (DNR, Blue Water Science, other LGUs).
- If specimen is a suspected new AIS introduction, CLFLWD will contact the DNR's local Aquatic Invasive Species Specialist immediately (Contacts current as of 2023):
 - Washington County Lakes = April Londo – 651-259-5861 – April.Londo@state.mn.us
 - Chisago County Lakes = Chris Jurek – 320-223-7847 – Christine.jurek@state.mn.us
- If the report of new introduction is negative, CLFLWD will communicate to individuals and local organizations involved in the finding and reporting of the suspected new AIS introduction.

3. Communication to Partners and Public

- For a positive report of a new AIS introduction, CLFLWD must communicate findings with local DNR specialists. For certain AIS, the DNR will add the waterbody to the infested waters list. DNR staff post orange “Invasive Species Alert” signs at public water accesses on those water bodies (Depicted in *Figure 4*)
- CLFLWD staff will inform all interested parties of the discovery and provide relevant updates as the investigation and management planning unfold. Interested parties could include: Lake Associations, County Organizations, State Organizations, partner LGUs, Consultants (Ex. Blue Water Science and Treatment Applicators).
- District watercraft inspectors will be notified of the new AIS introduction and provided with educational outreach materials to give to lake visitors. Inspectors will also receive additional AIS

identification training to help monitoring for the new AIS on exiting watercrafts and water related equipment.

- CLFLWD will use its social media accounts and website to post public notices of the finding. Additionally, public notices may be mailed directly to lake residents or published in the local paper depending on the type of severity of the infestation.



Figure 4 - DNR Invasive Species Alert Sign

4. Assessment of Risk

- The CLFLWD will use the most current and available resources, scientific research, and input from experts to assess the risk to the waterbody. CLFLWD staff have conducted literature reviews for several aquatic invasive species of concern. Available resources and reports are available under section “3011G. Aquatic Invasive Species Management”
- Regardless of how much information the District has internally, all new AIS introductions should be discussed with partners, experts, and hired consultants. AIS management is constantly evolving, and partners may have insight into new research and management techniques.

5. Population Assessment

- Depending on staff and resource availability, in some cases the DNR will perform the bulk of the population assessment work. However, in the case of the 2019 Bone Lake zebra mussel introduction, the District performed or hired consultants to conduct much of the survey work. District staff should coordinate with partners to determine who will perform the assessment work and how the work will be conducted for that particular species.

6. Make Action Recommendations

- CLFLWD staff, in coordination with partners, will make action recommendations.
- Action recommendations will be made using information gathered from the population assessment, best available scientific research, experts, project partners, and the DNR and their local AIS Specialist. Additionally, budget considerations will be taken into account.
- For some AIS species, management recommendations have already been developed and documented in section “3011G. Aquatic Invasive Species Management”.
- Recommendations could be one of the following options, but not limited to:
 - Eradication Attempt – If the introduction is caught early enough and is contained to a small area of the waterbody, some treatments can seek to eradicate the species.
 - Population Control and Spread Mitigation – If the introduced species is found in several small distinct locations or is contained to one large area, management will focus on containing the species to only those locations.
 - Long-Term Management – If the introduced species is widespread, management will focus on activities that provide seasonal relief (e.g. curly-leaf pondweed).
 - Long-term Population Monitoring – Introduced species is present but no management is conducted due to budget restrictions, staff limitations, or little predicted impact on the native ecosystem.
 - No Action – No action can be taken if budget or staff limitations inhibit management. Alternatively, some introduced species persist in their new environment but do not pose serious ecological impacts to the native plant and animal communities. In certain instances, management of these types of species can do more harm

than good, depending on the management technique employed.

7. Implement Response Actions

- Coordinate resources amongst partners and designate roles for each.
- Obtain the necessary permits and permissions to implement a response action plan (permits generally through the local DNR AIS Specialist).
- Communicate general response action plan to partners, DNR, and public.
- Provide frequent updates on the status and progression of the response action plan's implementation.

8. Effectiveness Monitoring

- Survey treatment area for effective control of target species and monitor for non-target impacts.
 - Effective Control: If target species are effectively controlled, coordinate periodic surveys with partners to monitor for possible return of treated AIS.
 - NonEffective Control: If target species are not controlled, reassess management approach with partners. Consider cost benefit of reapplication or implementation of a new management strategy.
- Following whatever outcome of the project, communicate to partners, DNR, and the public the results and future management plans.



Figure 5 - Bone Lake Zebra Mussel Rapid Response Treatment – 2019

Rapid Response Partners and Resources

The District's political boundaries and interests overlap with a number of highly valued organizations and partners. Quick coordination and resource sharing amongst these groups can greatly reduce the financial and labor burden when implementing a rapid response plan. Below is a summary of potential rapid response partners and possible associated resources. It is important to note that resource availability can fluctuate year to year, and as such this summary is subject to change.

Minnesota Department of Natural Resources (DNR)

-Survey: Depending on AIS introduced and staff availability, the DNR may send a crew to survey the new infestation. The DNR will for certain assist with ID verification of the suspected AIS find.

-Outreach: Assistance is variable depending on the AIS introduced. In most cases, the newly infested lake will be added to the DNR's infested waters list. Signage might also be displayed at the public access and/or they may post a press release on their webpage.

-Treatment: Infrequent, but for some introductions the DNR may handle the entire treatment process, typically during new to the state infestations. Treatment recommendations and advice can be expected from them if requested.

- Funding: Funding opportunities vary annually, but often the DNR offers AIS control grants for lake associations and other local organizations. While not available to address an immediate infestation, applications can be submitted to potentially secure funds to continue management the following year. The link to the [DNR's AIS Grant Page](#).

- Contacts:

- **April Londo**, AIS Specialist for Central Region (Washington County), 651-259-5861 or April.londo@state.mn.us
- **Chris Jurek**, AIS Species Specialis for Central Region (Chisago County), 320-223-7847 or Christine.jurek@state.mn.us

Chisago County

-Survey: Chisago County's Lake Improvement District (LID) coordinates and pays for point intercept surveys on a scheduled rotation. These periodic surveys could potentially identify a new AIS infestation that the District is unaware of. Chisago County's AIS Specialist could assist with survey efforts during a rapid response project.

-Outreach: For District Lakes that are in Chisago County, the LID could use their website, social media, and other resources to help educate the public of new infestations and ongoing management activities. Educational information could also be given to their team of watercraft inspectors to inform lake visitors.

-Treatment: May provide staff support to implement a rapid response treatment.

- Funding: Aid would likely be in the form of staff support. The LID does offer grants to its area lake associations for AIS management and education. The CLFLWD could possibly partner with the lake association on the infested lake to use these funds to offset the rapid response expenses.

- Other Resources: Chisago County owns and operates a watercraft inspection decontamination unit. This equipment could be used at particular accesses that pose a risk of AIS spread to other local waterbodies.

- Contacts:

- **Susanna Wilson Witkowski**, Water Resource Manager for Chisago County, 651-213-8380 or Susanna.Wilson@chisagocountymn.gov
- **Camden Droppo**, AIS Specialist/Lead Watercraft Inspector for Chisago County, 651-213-8386 or Camden.Droppo@chisagocountymn.gov

Washington County

-Survey: N/A

-Outreach: Possibly willing to use their social media and website to post public notices of new infestations and ongoing management activities.

-Treatment: N/A

- Funding: Annually, Washington County allocates between \$132,169 - \$139,581 in AIS Prevention AID funding to organizations in the county. The CLFLWD has historically received grants to support its watercraft inspection program, Forest Lake flowering rush management, and Forest Lake curly-leaf pondweed management. While funds might not be available for a sudden rapid response, they could be available the following year to continue management activities.

-Contact:

- **Smita Rakshit**, Public Health Program Supervisor for Washington County, 651-430-6661 or Smita.Rakshit@co.washington.mn.us
- **Stephanie Holt**, Senior Management Analyst for Washington County, 651-430-6701 or stephanie.holt@co.washington.mn.us

Washington Conservation District (WCD)

-Survey: The WCD performs periodic early detection surveys at some of the District's public accesses. In the event of a rapid response, WCD would likely be able to provide assistance with survey efforts.

-Outreach: The WCD could possibly use their social media and website to post public notices and educate followers about new AIS introductions.

-Treatment: Could possibly provide assistance with the implementation of a rapid response plan.

- Funding: Possible funding available, but more likely the WCD could provide staff time to assist with surveying and implementation efforts.

- Contacts:

- **Matt Oldenburg-Downing**, MSCWMO Admin. & Senior Water Resource Specialist for the WCD, 651-796-2227 or MDowning@mnwcd.org
- **Angela Herbrand**, Senior Natural Resource Technician for the WCD, 651-796-2225 or AHerbrand@mnwcd.org

Local Lake Associations

Forest Lake Lake Association (FLLA)

-Survey: The FLLA typically hires Blue Water Science to perform diving surveys at the three Forest Lake Public accesses looking for starry stonewort and other new AIS. The FLLA has also done some early detection monitoring for spiny waterflea. To help monitor for new species or survey the extent of a new infestation, the FLLA might be able to find volunteers from their large membership to assist with survey efforts.

-Outreach: The FLLA has been a great partner for sharing information regarding lake management activities with its' members. Information could be shared via their social media channels and their large email listserv.

-Treatment: The FLLA coordinates and pays for its own EWM treatments. There is potential for partnership and cost sharing in the event of a new infestation.

- Funding: From 2022 to current, the CLFLWD, FLLA, and City of Forest Lake have been in a tri-party agreement to cost share AIS and lake management activity expenses on Forest Lake up to \$150,000 annually. Additionally, a separate savings account was created to fund larger projects and rapid response treatments.

- Contacts:

- **Chris Parrucci**, Forest Lake Lake Association President, rcpfla@outlook.com
- **Jerome Grundtner**, Prior Forest Lake Lake Association President who will continue handling AIS activities.

Comfort Lakes Association (CLA)

-Survey: The CLA has occasionally paid the difference to upgrade the District's standard meandering surveys to more thorough point intercept surveys. These more comprehensive surveys have the potential to capture the presence of newly introduced AIS. The CLA may be able to find volunteers from their membership to assist with survey efforts in the event of a rapid response.

-Outreach: The CLA has been a great partner for sharing AIS and lake management activities on Comfort Lake with its' membership. To keep the public informed of a new AIS introduction and rapid response, the CLA could possibly use their social media and listserv to share important updates and information.

-Treatment: The CLA has been conducting its own EWM treatments for several years and has communicated their intentions to aid in the management of other species such as purple loosestrife. There might be some potential for partnership on treatment and management efforts.

- Funding: The CLA has received DNR grants for innovative treatments in the past and now has access to AIS management grant funds through Chisago County. In the event of a new AIS infestation, there is potential for some cost sharing of rapid response expenses.

- Contacts:

- **Mike Crepeau**, Comfort Lakes Association President
- **Jackie Anderson**, Comfort Lakes Association Board Member (Involved in AIS activities)

Bone Lake Association (BLA)

-Survey: The District has found volunteers on Bone Lake to monitor zebra mussels in the past. There is potential to find BLA members to help monitor the distribution of the new species.

-Outreach: The BLA has been a great partner for sharing AIS and lake management activities on Bone Lake with its' membership. To keep the public informed of a new AIS introduction and rapid response, the BLA could possibly use their social media and listserv to share important updates and information.

-Treatment: Potential to find BLA members to help with implementation of rapid response.

- Funding: The BLA generously helps fund watercraft inspections of Bone Lake. Possible opportunity for cost sharing on rapid response expenses.

- Contact:

- **Tom Furey**, Bone Lake Association President

City of Forest Lake

-Survey: N/A

-Outreach: N/A

-Treatment: N/A

- Funding: From 2022 to current, the CLFLWD, FLLA, and City of Forest Lake have been in a tri-party agreement to cost share AIS and lake management activity expenses on Forest Lake up to \$150,000 annually. Additionally, a separate savings account was created to fund larger projects and rapid response treatments.

-Other Resources: The City of Forest Lake Public Works Department stores the District's floating barriers that have been used in the past for a zebra mussel rapid response treatment. They also have access to heavy equipment and trailers to possibly aid in the implementation of a rapid response treatment.

- Contact:

- **Dave Adams**, Public Works Director for City of Forest Lake, 651-209-9736 or dave.adams@ci.forest-lake.mn.us

Minnesota Aquatic Invasive Species Research Center (MAISRC)

- MAISRC's involvement is largely unknown and would likely be dependent on the potential for the rapid response treatment to be tied into some type of research project. In the event of a new AIS introduction, District staff at minimum should contact MAISRC researchers to get treatment and management recommendations.
- For the sake of adding to a growing body of AIS management knowledge, the District should thoroughly document the implementation and outcomes of a rapid response plan. This information can be shared with MAISRC as a resource for any future research.

3011E. Invasive Species Pilot Control Project

3011E. 10-Year WMP Description and Program Objectives and Goals

The District will lead or partner on pilot projects and studies needed to control and minimize the entry of invasive species into District Lakes. The District will also lead or actively partner to implement pilot projects and studies to test innovative methods to limit and control the spread of invasive species within the District's lakes. When determining potential pilot control projects to test, how it addresses the five primary [AIS Pathways and Spread](#) and/or how it improves our understanding of AIS management will be the main criteria for ranking projects. Projects and methods found to be effective will be implemented as appropriate throughout the District.

Examples of invasive species pilot control projects may include:

- Point source nitrogen management to control EWM populations
- Transplanting native species to compete with non-native species
- Utilization of new biological control methods



Figure 6 - CLFLWD Staff Transplanting Native Plants Into Moody Lake

3011F. Point-Intercept Macrophyte Surveys

3011E. 10-Year WMP Description

A widespread survey of aquatic macrophytes will be conducted in priority lakes every five years, or more often as needed, to track the composition and distribution of aquatic vegetation. Aquatic macrophyte surveys provide another metric of lake health, in addition to the water quality data collected by the District.

Point-intercept macrophyte surveys follow a grid system and are more comprehensive than AIS meandering surveys and, as such, often require more time. In some cases, the District may utilize AIS meander surveys to delineate potential treatment areas for invasive species.

Point-intercept macrophyte surveys will be coordinated with the Department of Natural Resources and in some cases are required annually to manage invasive aquatic plants.

Future Point-Intercept Macrophyte Survey Schedule

The following six lakes have been identified as “priority lakes” for point-intercept macrophyte surveys due to their high recreational use, adjacency to water quality improvement projects, influence on downstream water quality, history of AIS management, or high ecological integrity. As such, the District will ensure point intercept surveys are performed every 5-years, either by the DNR or District hired contractors. The 5-year point intercept macrophyte survey schedule will be reevaluated during the drafting of the next 10-year watershed management plan in 2031.

Moody Lake – 2025 and 2030

Bone Lake – 2023 and 2028

Shields Lake – 2025 and 2030

Lake Keewahtin – 2025 and 2030

Forest Lake – 2023 and 2028

Comfort Lake – 2024 and 2029

The CLFLWD encompasses more than 20 waterbodies of varying size, access, recreational quality, and ecological health. For the lakes not listed on the “priority lakes” point intercept macrophyte survey list, surveys will be conducted only once every 10-years to establish baseline macrophyte composition data. This frequency

can be increased if rare, threatened, endangered, or invasive species of concern are found.

Past Point-Intercept Macrophyte Survey Reports

Moody Lake

- [2015 Moody Lake Point Intercept Survey](#)
- [2019 Moody Lake Point Intercept Survey](#)
- [2020 Moody Lake Point Intercept Survey](#)
- [2021 Moody Lake Point Intercept Survey](#)
- [2022 Moody Lake Point Intercept Survey](#)
- [2023 Moody Lake Point Intercept Survey](#)

Bone Lake

- [2013 Bone Lake Point Intercept Survey](#)
- [2018 Bone Lake Point Intercept Survey](#)
- [2023 Bone Lake Aquatic Plant Survey](#)

Shields Lake

- [2015 Shields Lake Point Intercept Survey](#)
- [2020 Shields Lake Point Intercept Survey](#)
- [2021 Shields Lake Point Intercept Survey](#)
- [2022 Shields Lake Point Intercept Survey](#)

Lake Keewahtin

- [2015 Lake Keewahtin Point Intercept Survey](#)
- [2020 Lake Keewahtin Point Intercept Survey](#)

Forest Lake

- [2013 Forest Lake Point Intercept Survey](#)
- [2018 Forest Lake Point Intercept Survey](#)
- [2023 Forest Lake Point Intercept Survey](#)

Comfort Lake

- [2014 Comfort Lake Point Intercept Survey](#)
- [2019 Comfort Lake Point Intercept Survey](#)
- [2022 Comfort Lake Curlyleaf Pondweed, Eurasian Watermilfoil, and Point Intercept Survey Report](#)

Little Comfort Lake

- [2015 Little Comfort Lake Point Intercept Survey](#)
- [2019 Little Comfort Lake Point Intercept Survey \(Contracted by Chisago County\)](#)

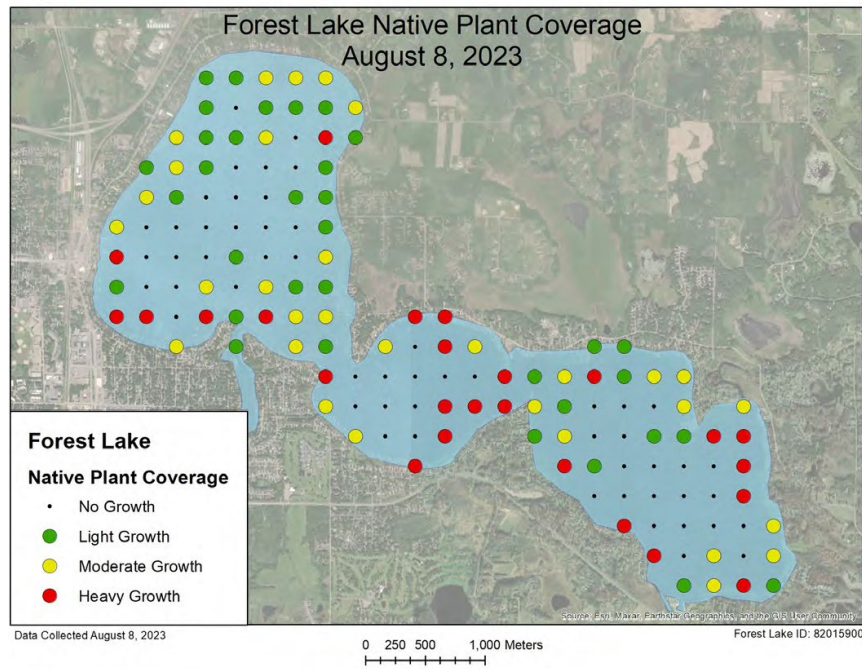


Figure 7 - Example of a Point Intercept Survey's Grid Layout - Forest Lake 2023

3011G. Aquatic Invasive Species Management

3011G. 10-year WMP Description

The District will holistically manage aquatic invasive species in District lakes with a view toward the overall health of the waterbody. Policies and goals in the CLFLWD Watershed Management Plan are designed around the ecological integrity of water resources within the District. Accordingly, the District's involvement in the long-term management of AIS present will be based on the benefit to ecological systems.

3011G. Program Objectives and Goals

The AIS Prevention & Management Program (3011 program), as described in earlier sections of this report, has four over-arching goals. The most applicable of these for Program 3011G. AIS Management, are the following:

- **Goal 2: Manage the existing populations of AIS to reduce phosphorus loading**
 - o The District will manage curly-leaf pondweed, common carp, and other AIS when their populations reach thresholds that

could negatively impact water quality from the release/suspension of phosphorous.

- **Goal 3:** Manage existing populations of AIS to improve native plant diversity by managing AIS populations that pose a risk to native plant health
 - o The District will manage AIS when their population size and density reach a threshold that could negatively impact native plant species through predation and competition for space and resources.
- **Goal 4:** Ensure ecological integrity is protected by providing guidance and technical support to other organizations and residents who manage AIS for recreational benefits.
 - o The District will attend at least one meeting of each lake association per year and perform at least two education and outreach activities. Opportunities for guidance and technical support will be offered at these events.
 - o District staff will continue to update the management resources in the section below and share them with partners: (3011G. AIS Management Resources – Specie Profiles and Management Plans). These resources will guide District staff’s management activities and can aid local organizations and residents in their own management efforts as well.
 - o District staff will continue to forward AIS related inquiries to the AIS Program Coordinator, who can provide technical support and advice.

District Lakes Infested With AIS

The District is unfortunately home to a number of aquatic invasive species, many of which have been actively managed since their introduction. Below is a chart of lakes and the AIS found in them and the year of introduction, if known. This information is taken from the Minnesota Department of Natural Resources’ Infested Waters List, which can be found at this link: <https://www.dnr.state.mn.us/invasives/ais/infested.html> .

Lake	Curly-leaf Pondweed	Eurasian Watermilfoil	Flowering Rush	Zebra Mussels	Common Carp	Purple Loosestrife
Moody	<i>Present</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>Present</i>	<i>X</i>
Bone	<i>Present</i>	<i>2006</i>	<i>X</i>	<i>2019</i>	<i>Present</i>	<i>Present</i>
Little Comfort	<i>Present</i>	<i>Present</i>	<i>X</i>	<i>2017</i>	<i>Present</i>	<i>Present</i>
Shields	<i>Present</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>Present</i>	<i>Present</i>
Keewahtin	<i>Present</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>Present</i>
Forest	<i>Present</i>	<i>2015</i>	<i>1998</i>	<i>2015</i>	<i>Present</i>	<i>Present</i>
Comfort	<i>Present</i>	<i>2014</i>	<i>X</i>	<i>2017</i>	<i>Present</i>	<i>Present</i>

Table 2 - Chart of CLFLWD Waterbodies Infested with AIS

(Year is listed in column if the introduction year is known, otherwise “present” is used as a placeholder. An “X” means the species is not or not known to be in the lake.)

3011G. Funding and Grants

The CLFLWD’s Aquatic Invasive Species Program is funded primarily through the District’s budget levy, but also relies heavily on grants from partners and other state organizations. Similar to grants received for the watercraft inspection program (discussed in 3011B. Watercraft Inspections.), most require the submittal of annual applications. These grants are never a guarantee, but many have a reliable history of being awarded to the District’s program. Additionally, awarded amounts can fluctuate year to year, even for the same grant. Pre-season planning should keep this uncertainty in-mind and have alternative funding sources to cover annual operating costs if a grant is not awarded or dollar amounts change substantially.

Usual Funding Sources – Figures taken from 2023 AIS budget

- Forest Lake Flowering Rush - \$5,800 from the Washington County AIS Prevention Grant
- Forest Lake Curly-leaf Pondweed - \$5,800 from the Washington County AIS Prevention Grant
- Shields Lake Curly-leaf Pondweed - \$1,500 from Minnesota Department of Natural Resources AIS Control Grant
- Moody Lake Curly-leaf Pondweed - \$1,500 from Minnesota Department of Natural Resources AIS Control Grant
- Forest Lake AIS Management – Funding Support Agreement (\$9,772 in 2022) – primarily used for watercraft inspection expenses but AIS management expenses are also eligible

3011G. AIS Management Resources – Specie Profiles, Management Plans, and General Resources

Aquatic Invasive Species management is a fast-growing field of research with new information becoming available all the time. To aid in the District's AIS management activities, staff have compiled a list of priority species based on the Minnesota DNR's Infested Waters List and provided weblinks to helpful resources. For some species, the District has drafted its own management plans using available literature, staff knowledge from management history, and from discussions with contractors, researchers, and field experts. In some instances, management plans have been adopted from other organizations to reduce redundancies. As AIS management is an ever-evolving field, the enclosed management plans and resources are subject to change and improvement over time to stay consistent with best practices. While the content of this report details the current best management practices, it is still advised that all management decisions are referenced with current research and discussed with experts prior to implementation.

Aquatic Invasive Species from the Minnesota DNR's [Infested Waters List](#)

(This list will be a living document and added to as staff find new resources and continue to draft management plans for new species)

- 1. Curly-leaf Pondweed (*Potamogeton crispus*)**
 - a. [University of Wisconsin – Stevens Point – CLP background, lifecycle, identification, and monitoring guidance](#)
 - b. [Minnesota Department of Natural Resources – Management and permitting guidance](#)
- 2. Eurasian Watermilfoil (*Myriophyllum spicatum*)**
 - a. Minnesota Department of Natural Resources
 - i. [Eurasian Watermilfoil Management Program](#) – DNR Programs for EWM Management
 - ii. [DNR Eurasian Watermilfoil Specie Profile – Identification, biology, control methods](#)
 - b. [Minnesota Aquatic Invasive Species Research Center – EWM Control Options](#)
- 3. Flowering Rush (*Butomus umbellatus*)**
 - a. CLFLWD Flowering Rush Management Plan (Available upon request)
 - b. [Minnesota Department of Natural Resources – Flowering rush](#)
- 4. Zebra Mussels (*Dreissena polymorpha*)**
 - a. [Minnesota Aquatic Invasive Species Research Center – Zebra Mussel Research](#)
 - b. [Minnesota Department of Natural Resources – Zebra Mussels](#)
 - c. [2019 Bone Lake Zebra Mussel Rapid Response Report](#)
- 5. Common Carp (*Cyprinus carpio*)**
 - a. CLFLWD Common Carp Management Plan (Available upon request)

- a. [CLFLWD Winter Fish Kill Guidance](#)
 - b. [Minnesota Aquatic Invasive Species Research Center – Common Carp](#)
 - c. [Minnesota Department of Natural Resources – Common Carp](#)
- 6. Purple Loosestrife (*Lythrum salicaria*)**
- a. CLFLWD Purple Loosestrife Management Plan (Available upon request)
 - b. [Minnesota Department of Natural Resources – Purple Loosestrife](#)
 - c. [Wisconsin Department of Natural Resources – Purple Loosestrife Pamphlet](#)
- 7. Starry Stonewort (*Nitellopsis obtusa*)**
- a. CLFLWD Starry Stonewort Management Plan (Available upon request)
 - b. [Minnesota Aquatic Invasive Species Research Center – Starry Stonewort Research](#)
- 8. Spiny Waterflea (*Bythotrephes longimanus*)**
- a. [Minnesota Aquatic Invasive Species Research Center – Spiny Waterflea Research](#)
 - b. [Minnesota Department of Natural Resources – Spiny Waterflea Species Profile](#)
- 9. Invasive Phragmites (*Phragmites australis* subsp. *australis*)**
- a. [Minnesota Aquatic Invasive Species Research Center – Non-Native Phragmites Research and Management Recommendations](#)
- 10. Faucet Snails (*Bithynia tentaculata*)**
- a. [Minnesota Department of Natural Resources – Faucet Snail](#)
- 11. Bighead Carp (*Hypophthalmichthys nobilis*)**
- a. [Minnesota Aquatic Invasive Species Research Center – General Invasive Carp Information](#)
 - b. [Minnesota Department of Natural Resources – Bighead Carp](#)
- 12. Brittle Naiad (*Najas minor*)**
- a. [Minnesota Department of Natural Resources – Brittle Naiad](#)
- 13. Grass Carp (*Ctenopharyngodon Idella*)**
- a. [Minnesota Aquatic Invasive Species Research Center – General Invasive Carp Information](#)
 - b. [Minnesota Department of Natural Resources – Grass Carp](#)
- 14. New Zealand Mud Snails (*Potamopyrgus antipodarum*)**
- a. [Minnesota Department of Natural Resources – New Zealand Mudsnail](#)
- 15. Red Swamp Crayfish (*Procambarus clarkii*)**
- a. [Minnesota Department of Natural Resources – Red Swamp Crayfish](#)
- 16. Round Goby (*Neogobius melanostomus*)**
- a. [United States Geological Survey – Round Goby Factsheet](#)
- 17. Ruffe (*Gymnocephalus cernua*)**
- a. [United State Geological Survey – Ruffe Factsheet](#)
 - b. [Minnesota Department of Natural Resources - Ruffe](#)
- 18. Silver Carp (*Hypophthalmichthys molitrix*)**
- a. [Minnesota Aquatic Invasive Species Research Center – General Invasive Carp Information](#)

- b. [Minnesota Department of Natural Resources – Silver Carp](#)
- 19. VHS – Viral Hemorrhagic Septicemia**
- a. [Minnesota Aquatic Invasive Species Research Center - VHS](#)

MAISRC Priority Species List

Beyond the Minnesota DNR's Infested Waters List, the Minnesota Aquatic Invasive Species Research Center (MAISRC) has an annual process for prioritizing aquatic invasive species for research. Their list includes high priority species that are present in Minnesota or likely to be in the state or areas immediately adjacent and that are likely to cause significant damage. Prioritization is also based on ranking species with key uncertainties that limit our understanding of risk or developing targeted prevention and management plans. In addition to the infested waters list, District staff will monitor this list for future AIS threats and to find the latest research.

- MAISRC Webpage – [What Are Aquatic Invasive Species?](#)
- Document- [MAISRC Priority Species List 2024](#)

The District's AIS Survey and Management Reports

It is a goal of the 3011 AIS Program to perform at least one invasive plant delineation survey per species per year on each lake. As such, Blue Water Science has been hired for many years to perform most of the District's AIS and native plant surveys. At the end of each year, Blue Water Science drafts comprehensive reports detailing the results of their survey work and the outcomes of treatments performed. Since the District has been managing AIS for more than a decade on its various waterbodies, it now has a wealth of historic information. Below is a list of AIS survey reports (*Note – there is some overlap with the reports listed in (3011F. Point-Intercept Macrophyte Surveys)*):

Bone Lake

- [2023 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2022 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2021 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2021 Bone Lake Aquatic Invasive Species Search](#)
- [2020 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2019 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2018 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2017 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2016 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2015 Bone Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)

Comfort Lake

- [2021 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2020 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2019 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2018 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2017 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2017 Comfort Lake Zebra Mussel Report](#)
- [2016 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2015 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2014 Comfort Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)

Forest Lake

- [2023 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2023 Forest Lake Flowering Rush Report](#)
- [2022 Forest Lake Flowering Rush Report](#)
- [2022 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2021 Forest Lake Flowering Rush Report](#)
- [2021 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2020 Forest Lake Flowering Rush Report](#)
- [2020 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2019 Forest Lake Flowering Rush Report](#)
- [2019 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2018 Forest Lake Flowering Rush Report](#)
- [2017 Forest Lake Flowering Rush Sediment Characterization Report](#)
- [2017 Forest Lake Flowering Rush Report](#)
- [2017 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2016 Forest Lake Flowering Rush Report](#)
- [2016 Forest Lake Curlyleaf Pondweed & Eurasian Watermilfoil Report](#)
- [2015 Forest Lake Zebra Mussel Report](#)
- [2015 Forest Lake Flowering Rush Report](#)
- [2013 Forest Lake Curlyleaf Pondweed Report](#)

Keewahtin Lake

- [2015 Keewahtin Lake Purple Loosestrife Survey](#)

Little Comfort Lake

- [2017 Little Comfort Lake Sediment Characteristics Survey](#)
- [2017 Little Comfort Lake Curlyleaf Pondweed Survey](#)

Moody Lake

- [2023 Moody Lake Curlyleaf Pondweed Report](#)
- [2022 Moody Lake Curlyleaf Pondweed Report](#)
- [2021 Moody Lake Curlyleaf Pondweed Report](#)
- [2020 Moody Lake Curlyleaf Pondweed Report](#)
- [2019 Moody Lake Curlyleaf Pondweed Report](#)

- [2015 Moody Lake Curlyleaf Pondweed Report](#)

Shields Lake

- [2023 Shields Lake Curlyleaf Pondweed Report](#)
- [2022 Shields Lake Curlyleaf Pondweed Report](#)
- [2021 Shields Lake Curlyleaf Pondweed Delineation & Assessment](#)
- [2020 Shields Lake Curlyleaf Pondweed Delineation & Assessment](#)
- [2019 Shields Lake Curlyleaf Pondweed Delineation & Assessment](#)
- [2015 Shields Lake Curlyleaf Pondweed Delineation & Assessment](#)

AIS Program Yearend Reports

The District's AIS Program is ambitious, multifaceted, and constantly evolving. To capture the program's activities and achievements, the District drafts a comprehensive yearend summary report annually. This report details all AIS activities performed that year on each waterbody. Not only is this report useful internally, but it is also shared to keep partners and the public informed. Below are links to AIS Yearend Reports ranging from 2014 to current:

- [2023 Aquatic Invasive Species Program Yearend Summary](#)
 - o [2023 AIS Program Yearend Presentation](#) – Video
- [2022 AIS Program Yearend Report](#)
 - o [2022 AIS and WCI Yearend Presentation](#) - Video
- [2021 AIS Program Yearend Report](#)
- [2020 AIS Program Yearend Report](#)
- [2019 AIS Program Yearend Report](#)
- [2018 AIS Program Yearend Report](#)
- [2017 AIS Program yearend Report](#)
- [2016 AIS Program Yearend Report](#)
- [2015 AIS Program Yearend Report](#)
- [2014 AIS Program Yearend Report](#)

3011H. Common Carp Management

3011H. 10-year WMP Description and Program Objectives and Goals

The District will remove common carp to protect aquatic plants, limit resuspension of lake bottom materials, and reduce internal phosphorus load in District lakes. Common carp harvests will be conducted in District lakes to decrease the common carp population to a level that does not detrimentally impact the lake water quality. Scientists have assigned a carp population threshold value of 89.9lbs/acre, above

which water quality impacts are seen. In order to accurately assess the biomass of common carp in District lakes, fish population surveys and/or assessments will be performed on a rotational schedule or as needed. Several different fish surveying techniques will be considered based on specific needs including, but not limited to, standard fyke net, mini-fyke net, seining, and electrofishing.

Why Common Carp Are an Issue – [MNDNR](#)

Common Carp (*Cyprinus carpio*) are large omnivorous fish native to Europe and Asia. In the 1880s, they were intentionally introduced to the Midwest as a game species. They quickly spread across the country and can now be found established in 48 states. They pose a serious ecological threat due to their wide distribution and feeding habits that disrupt lake bottom sediments (release nutrients) and uproot vegetation. This has made them one of the most damaging aquatic invasive species in the US. With less aquatic vegetation and more nutrient release caused by common carp, some lakes with high carp populations experience declines in water quality and aquatic plants. It is for these reasons that many organizations invest great time and resources in managing their populations.

Common Carp Management Techniques

There are many approaches to carp management and the removal technique used can depend on population size, lake conditions, and location. Below are some examples of removal techniques that could be employed. Understanding what tools are currently available is important in setting realistic expectations as each method has its own pros and limitations. Ultimately, a professional contractor should be consulted on any proposed carp removal activities. Their expertise will help pick the best option for the specific waterbody, as well as help to obtain the necessary permits and permission to perform said work.

Examples of common carp removal techniques currently available:

- Longlining
- Gill netting and splash netting
- Seine netting
- Electrofishing
- Water level manipulation
- Bait traps
- Fyke nets
- Trapping and attractants
- Angling

Research and Experimental Carp Management Strategies

Researchers all over the world have for decades been studying ways to manage common carp in invaded waters. Some of the most cutting edge and interesting research has recently been coming out of the Minnesota Aquatic Invasive Species

Research Center (MAISRC) at the University of Minnesota. Their research is investigating novel approaches to carp management that seek more targeted and effective techniques for removal. Some research is focused on using naturally occurring carp diseases to selectively control their populations, while others exploit their foraging behavior by placing toxins in food they will eat but native fish won't. Project managers should watch for any developments made by MAISRC researchers that might aid in their management activities. For more information on MAISRC research, please visit their Common Carp webpage at: <https://maisrc.umn.edu/common-carp> .

CLFLWD Carp Management Reports and Survey Schedule

The CLFLWD has been involved in several carp population assessments and removal projects in its history as an organization. Below are the reports documenting the results of those activities:

1. [2015 Common Carp & Fish Community Survey of Shields, Moody, and Bone Lakes](#)
2. [2018 Shields Lake Carp Survey](#)
3. [2019 Shields Lake Carp Removal](#)
4. 2020 Shields Lake Carp Experimental Removal Project (No Report)
5. [2022 Shields Lake Carp Removal](#)
6. [2023 Forest Lake Carp Assessment](#)

Since the last 10-year watershed management plan, the CLFLWD has identified a need to assess the carp populations on its major waterbodies. The Minnesota DNR conducts fishery surveys on a periodic basis, but these lack the ability to calculate carp populations due to the methods used. The DNR's surveys can at least provide some insight into the presence or absence of carp. A survey schedule has been developed to ensure the District has adequate common carp population data to inform management decisions. A summary of the survey schedule is detailed below:

- **Baseline Monitoring on Major Waterbodies:** Baseline population monitoring will be conducted on major lakes every 5 years. If a lake is near the management threshold (89.9 lbs/acre) but does not exceed, the lake may be considered for a follow-up survey sooner (1-4 years).
- **Waterbodies with Active Common Carp Management:** Lakes with active common carp removals being performed will have effectiveness monitoring conducted annually until biomass is observed below the management threshold (89.9 lbs/acre) for at least two consecutive seasons.
- **Non-Priority Lake Monitoring:** Smaller waterbodies without public lake access will not be scheduled for routine carp population surveys. Instead, these waterbodies will be surveyed on a as needed basis.

Baseline Common Carp Population Monitoring Schedule:

Moody Lake: 2025, 2030

Bone Lake: 2025, 2030

Big and Little Comfort Lakes: 2024, 2029

Shields Lake: 2022, 2027

Forest Lake: 2023, 2028

CLFLWD Passive Carp Management Structures and Devices

The CLFLWD has implemented two types of passive carp management structures and devices, the installation of fish barriers and winter aeration units. While these structures serve several purposes, a major component of each is that they in some way limit the successful recruitment of carp in a waterbody. Below are the details of the structures installed around the District.

Fish Barriers

The District has installed two types of fish barriers in its history, physical barriers with metal bars preventing carp from moving upstream and an electric barrier that uses an electrical current to deter carp. Implementation sites and barrier descriptions are listed below:

- **Bone Lake Fish Barriers** – Culverts connect Bone Lake to the waterbody's inlet (from Moody Lake) and its northwest outlet. Carp in the past have been observed passing through these culverts, under the roads, and into the shallow ponds on the other side. These shallow ponds were ideal spawning areas away from predatory native fish. To stop this migration, physical barriers were installed at both sites. The fish barriers are simply metal gates with horizontal bars, small enough to prevent carp movement but large enough to allow the free movement of water.



Figure 8 - Photos of Bone Lake Fish Barriers (Left Photo: Bone Lake Inlet Barrier. Right Photo: Bone Lake Outlet Barrier)

- **Shields Lake Fish Barriers (Physical and Electrical)** – At the corner of Highway 97 (Scandia Trail N) and Hoekstra Ave. N, near the inlet of Forest Lake from Shield Lake, the District installed an electric fish barrier to prevent carp migration in 1994. This system uses submerged electrodes to generate an electric field that carp will not pass through. This system is still in operation to this date, though aging equipment and high operating costs provoked the District to also install a physical barrier at this location in 2018. The electrical barrier will continue to operate until the system fails, at which time the physical barrier will be the sole carp migration barrier.



Figure 9 - Images of Electrical and Physical Fish Barriers between Shields and Forest Lakes

Aeration Units

[MNDNR](#) – Winter fish kills are the result of dissolved oxygen levels reaching levels too low for fish to survive in. This can happen for several reasons, including depth of the lake, ice thickness, snow depth on the ice, extended periods of overcast, little or no incoming water from streams, and many others. This is problematic for carp management as native fish species will predate on common carp's eggs and young. In a lake with a healthy native fish population, carp populations can remain stable as they are unable to successfully reproduce due to the high levels of predation. Two aeration systems were installed within the District to help protect the native fish. One aeration unit was installed on Moody Lake (2015) and the other on Shields Lake (2020). These aeration systems typically operate from January – March, and provide a steady supply of dissolved oxygen that fish can find refuge in. District staff have not observed any severe winter fish kills on either lake since their installation. If an unforeseen lake-wide winter fish kill were ever to occur, the District has drafted an action plan: Fish Kill Rapid Response Plan.



Figure 10 - Moody Lake Aeration System and Thin Ice Warning Signs