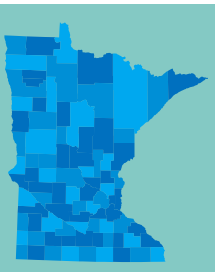
Invasives

April 2023

Standard Operating Procedures

Water Quality Monitoring in Aquatic Invasive Species Infested Locations

MINNESOTA POLLUTION CONTROL AGENCY



Authors

Kelly O'Hara
Kelli Nerem
Mel Markert
Kalley Guerdet

Contributors/acknowledgements

Pam Anderson
Pat Baskfield
Jordan Donatell

Minnesota Pollution Control Agency

520 Lafayette Road North | Saint Paul, MN 55155-4194 |

651-296-6300 | 800-657-3864 | Or use your preferred relay service. | Info.pca@state.mn.us

This report is available in alternative formats upon request, and online at www.pca.state.mn.us.

Document number: wq-s1-68

Forward

This document is specific to the lake, river, stream, and wetland chemistry and bacteria sampling conducted by Minnesota Pollution Control Agency (MPCA) staff and local partners at waterbodies identified with Aquatic Invasive Species (AIS). There are separate Standard Operating Procedures (SOP) for each MPCA program, and this document attempts to dovetail the steps and procedures for the monitoring and sampling at the AIS infested waterbodies. Procedures outlined cover basic MPCA and local partner site management, equipment control, and decontamination procedures to prevent the spread of AIS while conducting surface water quality monitoring activities in Minnesota.

Contents

Executive summary

Scope and application

This Standard Operating Procedure (SOP) describes procedures to be carried out by the Minnesota Pollution Control Agency (MPCA) field personnel and contracted local partners when monitoring lake, river, stream, and wetland locations infested with Aquatic Invasive Species (AIS). The procedures seek to reduce or prevent the transport of mature and immature life stages of invasive and/or harmful species or pathogens (hereafter called "invasive species") including eggs, veligers (larval zebra mussels), pollen, seeds, or vegetative propagules of invasive aquatic invertebrates, plants, and pathogens. A guide to aquatic plant, animal, and diseases which are found within Minnesota waterbodies can be found at the Minnesota Department of Natural Resources (DNR) Guide to Aquatic Invasive Species website.

There are five MPCA programs that will be using this AIS SOP as guidance. Local partners contracted under the MPCA shall also follow this guidance. For more information about the MPCA programs, please see the following websites:

- Watershed Pollutant Load Monitoring Network (WPLMN)
- Surface Water Assessment Grants (SWAG)
- Biological Monitoring (Fish and Invertebrate)
- Wetland Monitoring
- Lake and Stream Chemistry Monitoring

Permitting

The MPCA shall obtain a permit from the DNR for staff to appropriate and transport water from listed infested waters. In addition to being applicable to MPCA field staff, contractors are established as designees under this permit. Any sampling work that does not fall under MPCA contract programming must be conducted under a separate permit that is specific to that work, and staff or contractors are responsible for obtaining this permit from the DNR. The MPCA will not be liable for sampling conducted outside the jurisdiction of each contract.

At a minimum, the following items must be performed at all monitoring locations in compliance with the permit and the Minnesota Invasive Species Laws for transport of water from AIS infested waterbodies.

1. Possess a copy of a current Minnesota DNR General Permit: *Transport Water for Water Quality Sampling* (obtained from MPCA Project Manager). A **signed, physical copy** must be carried while collecting and transporting water during water quality monitoring events.
2. Transport water in tightly sealed, labeled containers designed for holding and transporting water.
3. Proper labeling shall be applied that indicates which water samples were taken from AIS infested waters.
4. Remove all visible vegetation, animals, or mud from boats, sampling equipment and clothing. When possible, spray down with water and scrub equipment/clothing with a brush.
5. Drain water-related equipment (boat, ballast tanks, portable bait containers, motor) *and* drain bilge by removing drain plugs before leaving a water access or shoreline property. Keep drain plugs out and water-draining devices open while transporting watercraft and water-related equipment. Regulations from DNR on the transport of water located here.

The receiving laboratory or anyone disposing of collected water samples must comply with the following protocols:

- To dispose of infested water after analysis, boil the sample water for 5 minutes or autoclave the water before discharging into a sanitary sewer system
- If a sanitary sewer system is not available, sample water may be disposed onto pervious surfaces at least 300 feet from any waterbody, ditch, or storm drain.

Summary of method

When planning a monitoring route, the following best practices shall be applied per each sampling trip to prevent the spread of Aquatic Invasive Species (AIS):

- Trips shall be planned with a route that designates AIS infested waterbodies to be sampled last. Considerations should be applied to those AIS that have a more prolific dispersal mechanism such as zebra mussels, starry stonewort, and spiny water fleas.
- For trips where it is not feasible to sample AIS infested waters last, necessary precautions such as separate AIS designated watercraft and sampling equipment shall be applied.

Following each trip, careful equipment decontamination practices followed by an appropriate amount of drying time shall be completed. According to Minnesota statute, “decontaminate” means to wash, drain, dry, or thermally or otherwise treat water-related equipment in order to remove or destroy AIS. Decontamination procedures must be thorough enough to remove all seeds, veligers, and plant material from equipment and field gear. In general, there are two types of decontaminations that may be performed; manual decontamination uses removal by hand, and mechanical decontamination uses hot water and/or high pressure. No single procedure can be applicable to all sampling situations, but thoroughly decontaminating field clothing and equipment after monitoring must be a standard practice. In certain situations, it may be appropriate to have designated watercraft and sampling equipment or eliminate some of the field measurements at AIS infested waterbodies.

Health and safety

For sampling AIS infested waterbodies, care should be given for each decontamination procedure. High power pressure washers may be used for rinsing and cleaning equipment. Please read and review all instructions before using this equipment to ensure safe operation. Always wear proper personal protective equipment (PPE) when working with hot water to avoid burns.

Personnel qualifications/responsibilities

The MPCA field crews commonly have designated positions each with their own responsibilities. Field staff must be familiar with proper sampling techniques, sample handling, safety procedures, and record keeping regarding AIS infested waters.

The field crew lead is responsible for implementing the action steps of this Invasives protocol and ensuring that this and other protocols are followed during all sampling activities. It is primarily the field crew lead’s responsibility to determine the proper level of concern, and the extent to which decontamination practices in accordance with this protocol must be used.

When applicable, the field assistant or seasonal staff are responsible for implementing the action steps of this procedure including the maintenance, stocking, and storage of sampling equipment; data collection; and data recording. The field assistant or intern/student worker is encouraged to use their judgment and discretion in recommending to the field crew leader whether decontamination following a site visit is warranted.

Designated MPCA or local partner field staff must be familiar with proper basic sampling techniques, sample handling, safety procedures, and record keeping. New field staff must be trained and accompanied in the field by experienced staff until competence is assured. Permanent field staff should prioritize attendance at refresher training events. Seasonal staff and interns will be provided written SOPs/instruction and be trained in the field.

Procedures

This section details the steps necessary to properly prepare for sampling an AIS infested waterbody, decontaminating field equipment and field gear after sampling, and preparing samples from AIS infested waterbodies for shipping or delivering to the certified analyzing laboratory.

Pre-trip requirements

Field planning

The MPCA and local partner field crew leads must consult the most current Infested Waters List or DNR mapping resources to determine whether the sites they will be monitoring are located in AIS infested waterbodies*. Additionally, it is recommended that MPCA staff coordinate activities with the DNR Regional Invasive Species Specialist to ensure accurate planning. To the extent possible, AIS infested waterbodies should be sampled after non-infested sites. This may mean visiting the AIS infested waterbody at the end of the day or scheduling a separate sampling trip for the AIS infested waterbodies. In the event that this standard practice is not feasible, AIS designated field equipment and proper decontamination practices shall be applied.

During reconnaissance field visits, field crews should note whether proposed waterbodies support known or newly observed populations of AIS. If a new infestation of an invasive plant or animal is suspected, the MPCA and contractors are responsible for reporting any new populations. In the instance of suspected new infestations, refer to the DNR's reporting new possible AIS website.

**The Infested Waters List is not a comprehensive database of all AIS in Minnesota. This list does not include some prohibited invasive species such as curly-leaf pondweed (Potamogeton crispus) and common carp (Cyprinus carpio). It is imperative that every step for risk reduction, as detailed in this SOP, be administered at every waterbody visited.*

Equipment preparation

A variety of sampling equipment is needed for surface water sample collection. Please refer to the program specific SOP for basic equipment usage and monitoring procedures. This list entails items that may be needed when sampling AIS infested waters:

AIS equipment checklist

- ☐ Designated* samplers for a specific AIS (integrated sampler, weighted bucket, Kemmerer/Van Dorn sampler, extendable telescoping rod, plankton tow net, kick nets, or ice sampling rod)
- ☐ Fish sampling equipment for specific AIS
- ☐ Invert sampling equipment for specific AIS
- ☐ Designated* sonde or field meter for a specific AIS

- ☐ Designated Secchi disk or 100 cm Secchi tube for a specific AIS
- ☐ Tap water for rinsing
- ☐ Bottle labels for AIS samples, or green permanent marker
- ☐ Low-pressure spray tank and hose
- ☐ High-heat (120 – 140° F) water source and hose
- ☐ Muff attachment for outboard motor
- ☐ Personal Protective Equipment (PPE) for decontamination:
    - o Protective eye wear
    - o Heat resistant gloves
    - o Rubber boots
    - o Loose long sleeve shirt and pants
    - o Heavy duty rain gear (heat index depending)
    - o Hearing protection
- ☐ Scrub brush

**Local partners must communicate their concerns and designated equipment needs with their MPCA project manager.*

Before departure, confirm that all equipment necessary to complete decontamination procedures is present and in proper working condition. Ensure that an adequate amount of water is in the spray tank or sprayer. There are no soaps, bleaches, or chemicals used or recommended at this time. Chemicals are not as reliable as temperature at killing AIS and are a liability because they can damage water-related equipment. For additional information on DNR decontamination procedures see: Decontamination Inspection Manual (state.mn.us)

On-site procedures

Field staff conduct sampling in a variety of habitats (e.g., lakes, rivers, streams, wetlands, and shoreline/stream bank surveys) while using numerous types of sampling gear. The steps below describe the procedures for arriving and leaving the site, walking or wading through habitats, the use of boats and canoes/kayaks, and bridge sampling.

Site approach

All field crews shall take care when approaching sites through vegetated areas to avoid contact with invasive terrestrial plants whenever possible. Stream banks should be carefully examined to determine if invasive species are present. Alternate approaches should be taken if invasive species are present. At no time should felt bottom waders be worn when approaching sites through vegetated areas.

Sampling requirements

Where possible, a separate set of equipment should be maintained solely for use on AIS infested waterbodies. This is especially important for waterbodies infested with spiny waterflea (*Bythotrephes cederstroemi),* starry stonewort (*Nitellopsis obtusa*), or zebra mussels *(Dreissena polymorpha)*.

Dedicated sampling gear must be used for each type of AIS present or combination thereof. This equipment must be decontaminated after sampling each site.

Since it is not always practical to purchase multiple sondes or field meters, one sonde or field meter may be used between non-AIS and AIS infested waterbodies but must be decontaminated between sites. Depending on the program requirements, sonde or field meter measurements may not be collected at AIS infested waterbodies. Consult your MPCA project manager or field crew leader for guidance. Due to their tolerance to decontamination methods, additional caution and dry time considerations should be made when using sondes and field meters on waterbodies containing viral hemorrhagic septicemia or spiny waterfleas.

Post sampling best management practices

The following is required under state statute upon exiting any body of water to prevent the spread of aquatic invasive species. For the intents and purposes of water quality monitoring practices, the following general practices shall be applied post sampling of any waterbody regardless of AIS designation before entering another waterbody*:

1. Clean: Remove all visible aquatic plants, zebra mussels, and other prohibited invasive species from watercraft, trailers, and water-related equipment before leaving any water access or shoreland.
2. Drain: Keep drain plugs out and water-draining devices open while transiting watercraft. Drain water-related equipment (boat, ballast tanks, motor) and drain bilge, live-well and bait-well by removing drain plugs before leaving a water access or shoreline property.

For waters designated with AIS infestations applicable decontamination procedures must be carried out before entering another waterbody, see the **Post sampling decontamination requirements section for more information. Additionally, if a waterbody does not have an AIS designation, but a new infestation is suspected, applicable decontamination procedures must also be carried out before entering another waterbody*.

Best management practices for waders, boots, and raingear

1. Upon exiting a river, stream, or wetland, field crew members must rinse and scrub all field equipment and personal protective equipment that has been in contact with aquatic habitats. This must include raingear, waders, and wading boots. It is recommended that field crews be equipped with and use brushes and low-pressure spray equipment. It is recommended that local partners discuss the best option with their MPCA project manager to determine adequate equipment needs.
2. Raingear, waders, and wading boots are best cleaned while being worn. Field crewmembers should cooperatively spray each other's waders and wading boots, including lug soles. Spraying is considered complete when all visible debris, mud, invertebrates, pollen, and seeds are removed from waders, wading boots and field equipment. Typically, this will take three – five minutes to fully clean individual waders, boots, and field equipment.
3. Whenever possible, waders and wading boots should be positioned in the field vehicle to allow water to run off during transit between study sites; ideally, they will dry between sites.

Best management practices for sampling equipment

1. Rinse samplers thoroughly with sprayer. Open and invert between sites to drain and allow to dry.
2. Visually check sondes and field meters (including cables) and remove foreign matter. Spray (low pressure) or rinse with water and wipe dry.
3. Visually check Secchi disks and tubes for foreign matter. Rinse or spray with water and invert between sites to drain and allow to dry.

4. Visually inspect working surfaces and remove foreign matter. Spray or rinse with water and wipe dry.
5. During winter months, visually inspect ice augers and remove foreign matter. Spray or rinse with water and wipe dry.
6. Rinse kick nets or D nets thoroughly with sprayer (low pressure). Lay nets in boat or vehicle to allow drying between monitoring sites. Separate nets are required if monitoring in an area known to have spiny waterfleas, starry stonewort, or zebra mussels.
7. Rinse plankton nets thoroughly with sprayer (low pressure). Spread the net out in boat as space allows to allow drying between monitoring sites. Separate nets are required if monitoring in an area known to have spiny waterfleas, starry stonewort, or zebra mussels.

Best management practices for watercraft

1. Once trailered, move vehicle/boat away from access.
2. Inspect the entire boat (boat, motor, and trailer) and clean/remove any aquatic plants and animals from hull, trailer, water intake grate, and steering nozzle before leaving water access.
3. Complete a thorough inspection of the anchor rope and remove any foreign material. Use sprayer to wash and lay within the boat to dry. The best practice is to use a separate anchor rope when monitoring in an area known to have AIS infestations, particularly for spiny waterfleas, zebra mussels, or starry stonewort.
4. Complete a thorough inspection of oars and paddles and remove any foreign material. Use a sprayer to wash and lay within the boat to dry.
5. Spray boat if plant residue remains after initial cleaning.
6. Remove boat plug and allow water to drain from the bilge after each lake. Run bilge pump if equipped. Boat plug must always be removed when traveling to ensure complete draining.
7. The outboard motor should be fully lowered to allow all cooling water to completely drain. Once draining has finished return the outboard motor to the raised position and secure for travel.

Post-sampling AIS decontamination requirements

Decontamination should begin immediately upon arrival to a designated decontamination facility after accessing or sampling a stream, river, lake, or wetland with aquatic invasive species. Watercraft decontamination consists of a hot water rinse. No chemicals, bleaches, or soaps are necessary for decontamination. The hot water is sufficient in killing targeted AIS and preventing the potential for spread. Per the Minnesota DNR AIS decontamination handbook, rinsing watercraft/water-related equipment at 140° F for 10 seconds will kill all adult mussels. At 120° F, a contact time of 2 minutes is needed to kill zebra mussels.

Minnesota Statutes, chapter 84D, Invasive Species, makes it illegal to possess or transport certain AIS in Minnesota. While decontamination is not required of the public under Minnesota statutes, use of boat decontamination ensures compliance with this rule. State statute allows authorized personnel to require on-site decontamination when specific conditions are met. In these circumstances decontamination is legally required and shall occur on-site where a decontamination unit is present. For more information on specific scenarios when legally required on-site decontamination shall occur see the Minnesota DNR AIS decontamination handbook.

The DNR offers courtesy decontaminations at designated locations throughout the state. For more information and a map of scheduled decontamination locations see the DNR website for Courtesy Decontaminations.

For MPCA staff and local contractors, it is recommended that watercraft and water-related equipment that were in infested waters with the following species: zebra mussel, spiny waterflea, and starry stonewort are thoroughly decontaminated.

For the practices listed below, location awareness must be considered when performing decontaminations. It is important to consider the ground surface, slope, and distance from waterbody, drainage ditch, or storm sewers. Avoid locations where decontamination water runoff may drain into surface water or storm sewers.

Decontamination protocols for waders, boots, and raingear

1. Once all best management practices have been followed as detailed in the **Best management practices for waders, boots, and raingear** section, all gear will need to be taken to a designated facility for decontamination.
2. A hot water source capable of maintaining 120 - 140° F water temperature shall be used to rinse gear. High-pressure sprayers are not required for preventative decontamination. Hoses with comparable velocities to those of garden hoses are recommended. Follow safety precautions when rinsing with high-heat water temperatures. Any rinsing with high-heat water shall have a contact time of 2 minutes at 120° F, or 10 seconds at 140° F. An alternative option is to rinse gear by immersing in containers capable of holding and maintaining water at a temperature of 120° F.
3. After rinsing, waders and wading boots should be positioned to allow water to run off and thoroughly dry before use again.
4. If the practices for decontamination listed above are not applicable, it is recommended that, at minimum, a low-pressure warm water wash of any gear be applied. Gear must then be staged in a well-ventilated location to allow to completely dry for a minimum of **5-days before field use again**. This practice allows sufficient dry time to reduce the risk of spreading AIS when high-heat decontamination is not accessible.

Decontamination protocols for sampling equipment

1. Once all best management practices have been followed as detailed in the **Best management practices for sampling equipment** section, all gear will need to be taken to a designated facility for decontamination.
2. Rinse samplers thoroughly with water capable of maintaining 120 - 140° F temperatures. An alternative option is to immerse the equipment in containers capable of holding and maintaining water at a temperature of 120 - 140° F. When rinsing via immersion contact time should be a minimum of 2 minutes at 120° F, and 10 seconds at 140° F. It is recommended that anchors and any ropes/lines be treated at 140° F; all other equipment is recommended to be treated at 120° F. Open and invert equipment to drain and allow to dry.
3. Visually check sondes and field meters (including cables) and remove foreign matter. Sonde/field meter cable cords, probes, and instruments shall be decontaminated following manufacturer specifications.
4. Visually check Secchi disks and tubes for foreign matter. Rinse with water at a temperature of 120° F for 2 minutes and allow to dry. An alternative option is to immerse equipment into containers capable of holding and maintaining water at a temperature of 120° F. When rinsing via immersion contact time should be a minimum of 2 minutes at 120° F.

5. Collection vessels used at multiple sample sites shall be decontaminated by rinsing with water at a temperature of 120° F for 2 minutes. Invert to drain and allow to dry.
6. Rinse kick nets or D nets thoroughly by immersing the equipment in containers capable of holding and maintaining water at a temperature of 120° F for a minimum of 2 minutes. Separate nets are required if monitoring in an area known to have spiny water flea or zebra mussels and shall also be decontaminated following the same practices. Nets should be hung to thoroughly dry.
7. Rinse zooplankton nets thoroughly by immersing the equipment in containers capable of holding and maintaining water at a temperature of 120° F for a minimum of 2 minutes. Separate nets are required if monitoring in an area known to have spiny water flea or zebra mussels and shall also be decontaminated following the same practices. Nets should be hung to thoroughly dry. Zooplankton tow lines shall be rinsed by immersing lines in containers capable of holding and maintaining water at a temperature of 140° F. It is recommended that anchors and any ropes/lines be treated at 140° F; all other equipment is recommended to be treated at 120° F. Tow lines shall be staged in a manner that allows the line to dry thoroughly.
8. Visually check anchors and anchor ropes and remove foreign matter. Rinse anchors and anchor ropes thoroughly with either a hose capable of maintaining 140° F water temperatures, or by immersing the equipment in containers capable of holding and maintaining water at a temperature of 140° F. It is recommended that anchors and any ropes/lines be treated at 140° F; all other equipment is recommended to be treated at 120° F. Place the anchor and ropes in an area where they can dry thoroughly.
9. If the practices for decontamination listed above are not applicable, it is recommended that, at minimum, a low-pressure, warm water wash of any field equipment be applied. Field equipment must then be staged in a well-ventilated location to allow to completely dry for a minimum of **5-days before field use again**. This practice allows sufficient dry time to reduce the risk of spreading AIS when high-pressure, high-heat decontamination is not accessible.

Decontamination protocols for watercraft

1. Once all best management practices have been followed as detailed in the **Best management practices for watercraft** section, the watercraft will need to be taken to a designated facility for decontamination.
2. A hot water source capable of maintaining 120 - 140^{o} F water temperature shall be used to rinse gear. High-pressure sprayers are not required for preventative decontamination; hoses with comparable velocities to those of garden hoses are recommended. Follow safety precautions when rinsing with high-heat water temperatures. **Should any AIS be found attached to the watercraft, such as zebra mussels, a high-pressure wash must be administered**. Follow manufacturer's guidelines for safe operation of any hot water pressure washer. In the event that high-pressure spraying equipment is not readily available, the DNR List of Permitted Lake Service Providers lists facilities (by county) approved for high-pressure decontamination. It is recommended that these resources be utilized.
3. **Internal:** The inside compartments, ballast tanks, holding areas, and accessories should be decontaminated first, then motor can be flushed. This will allow fluids, and potential AIS, to drain. The areas inside a watercraft will require a low-pressure, high-temperature (120°F) water flush for decontamination. Temperatures shall not exceed 120° F (2 minute contact time) for internal decontamination to prevent damage to the ballast pumps.
4. **Exterior:** Rinse each section of the hull for at least 10 seconds with low flow 140° F water. Rinse the thru hull fittings, motor, gimbal area, trim tabs, trailer, and any other exterior part that may have been exposed to the water.

5. **Engine:** Inboard/outboard and outboard motors have a water intake on the lower unit. A motor muff attachment or flush bag must be used in this procedure to supply water to the lower unit. The engine must run long enough during this process to allow the thermostat to open for a thorough flush. During this procedure the fluid discharge temperature must be monitored to ensure 120 degrees minimum is reached for at least two minutes. Lower water temperatures must be used in engines to help reduce the risk of damaging the engine from water temperature swings. **Water temperatures should never go above 140 degrees**.
6. If the practices for decontamination listed above are not applicable, it is recommended that, at minimum, a low-pressure, warm water rinse of each area of the watercraft be applied. The watercraft must then be staged in a well-ventilated location to allow to completely dry for a minimum of **5-days before field use again**. This practice allows sufficient dry time to reduce the risk of spreading AIS when high-pressure, high-heat decontamination is not accessible.

Sample processing

Chlorophyll-a

Chlorophyll-a sample filtration should be done while on (or at) the AIS infested waterbody. If this is not an option, filtering should be done in a location that eliminates the movement the AIS. Filtrate should be discarded in a grassy area and kept off paved surfaces and out of stormwater drainage systems. Filtering the sample should not be done at a boat landing or in the parking lot of a boat landing.

Sample labeling

All sample bottles containing water from AIS infested waterbodies must be labeled with the letters AIS, preferably in permanent marker, or labels provided by the lab must be used. Samples labeled 'AIS' shall be autoclaved or boiled by designated labs once analysis has been completed.

Any samples collected from AIS infested waters shall also be identified and labeled in the Chain of Custody (COC), in accordance with the designated labs COC documentation procedures.