

Guidance for Conducting Aquatic Invasive Species Early Detection and Baseline Monitoring in Lakes

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Executive Summary

- This document was developed to standardize aquatic invasive species (AIS) early detection and baseline monitoring efforts throughout Minnesota.
- These protocols are for people with considerable experience in searching for and identifying AIS.
- Search methods include a lake-wide meander, wading, snorkeling, netting, and rake sampling.
- Data collected should be maintained by those conducting the monitoring and may be submitted to Minnesota Department of Natural Resources (DNR) AIS staff.



Introduction

This guidance document is intended for public and private entities that have training and experience in aquatic invasive species (AIS) identification and monitoring. These entities should have sufficient resources (proper equipment, support, and partners) available to carry out the monitoring protocols described in this document. Staff resources may include: AIS/water resource coordinators, field biologists, and/or water resource professionals with significant experience in aquatic species identification. Staff using this document should follow their employer's procedures on safety while working in the field. Organizations that may benefit from this document include local units of government, private consultants, lake organizations and/or universities. **This document is not intended for groups with little experience in AIS monitoring.**

At this time, data collected for all AIS monitoring should be managed by the collecting entities, unless a new AIS is discovered. **If you find a new AIS not known to be present in the water body, or a suspicious species that you cannot identify, it is important that you provide a detailed report to the DNR as soon as possible** (*Appendix D* or

at www.mndnr.gov/ais). DNR encourages using the field data sheet and data inventory form. The DNR will request survey information 1) when a new AIS is discovered, and 2) to update the DNR infested waters list.

Objectives

- To standardize methods and procedures for searching, documenting and reporting new occurrences of AIS in Minnesota.
- To supplement DNR efforts in detecting and responding to new infestations of aquatic invasive species. Early detection and rapid response is crucial for minimizing impacts of invasive species as there may be a greater likelihood of containment and/or control.
- To supplement DNR efforts in gathering baseline data on the presence/absence of ALL aquatic invasive species in Minnesota. DNR encourages collecting data on the general location and estimated densities of AIS within a given water body. In general, establishing baseline data on statewide AIS distributions will help the DNR evaluate AIS program efforts and develop appropriate management strategies.



This AIS early detection and baseline monitoring guidance is adapted from portions of the Minnehaha Creek Watershed District's [AIS Early Detector How-To-Guide](#) and the Wisconsin Department of Natural Resources [Wisconsin Aquatic Invasive Species Early Detectors Handbook](#).

Early Detection & Baseline Monitoring Overview

Species Monitored

Priority is given to the detection of the following species (listed alphabetically, not by priority). A comprehensive list of prohibited and regulated invasive species can be found in [Minnesota Administrative Rule Chapter 6216](#). Additional equipment and protocols are needed to monitor for invasive zooplankton (e.g. Spiny and Fishhook waterfleas) and fishes (e.g. invasive carps); therefore these species are not listed here.

Shoreline/Emergent Plants: Australian Stone Crop (*Crassula helmsii*), Chinese Water Spinach (*Ipomoea aquatica*), Flowering Rush (*Butomus umbellatus*), non-native Phragmites (*Phragmites australis*), Purple Loosestrife (*Lythrum salicaria*), Water Soldiers (*Stratiotes aloides*), Yellow Iris (*Iris pseudacorus*).

Submerged Plants/Algae: African Oxygen Weed (*Lagarosiphon major*), Brazilian Elodea (*Egeria densa*), Brittle Naiad (*Najas minor*), Curly-Leaf Pondweed (*Potamogeton crispus*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Fanwort (*Cabomba caroliniana*), Hydrilla (*Hydrilla verticillata*), Indian Swampweed (*Hygrophila polysperma*), Parrot Feather (*Myriophyllum aquaticum*), Rock Snot (*Didymosphenia geminata*), Starry Stonewort (*Nitellopsis obtusa*).

Floating-Leafed Plants: European Frog-Bit (*Hydrocharus morsus-ranae*), Giant Salvinia (*Salvinia molesta*), Water Chestnut (*Trapa natans*), Water Hyacinth (*Eichhornia crassipes* or *E. azurea*), Water Lettuce (*Pistia stratiotes*), Yellow Floating Heart (*Nymphoides peltata*).

Animals: Asian Clam (*Corbicula fluminea*), Banded Mystery Snail (*Viviparus georgianus*), Chinese Mystery Snail (*Cipangopaludina*), Faucet Snail (*Bithynia tentaculata*), New Zealand Mudsnail (*Potamopyrgus antipodarum*), Red Swamp Crayfish (*Procambarus clarkii*), Rusty Crayfish (*Orconectes rusticus*), Quagga Mussel (*Dreissena bugensis*), Yabby (*Cherax destructor*), Zebra Mussel (*Dreissena polymorpha*).

Additional Species Information can be found on the [DNR website](#):

- [Animals](https://www.dnr.state.mn.us/invasives/aquaticanimals/index.html); <https://www.dnr.state.mn.us/invasives/aquaticanimals/index.html>
- [Plants](https://www.dnr.state.mn.us/invasives/aquaticplants/index.html); <https://www.dnr.state.mn.us/invasives/aquaticplants/index.html>
- [Early detection plant targets](https://www.dnr.state.mn.us/invasives/aquaticplants/earlydetection.html) (either not present in Minnesota currently or with a limited distribution); <https://www.dnr.state.mn.us/invasives/aquaticplants/earlydetection.html>
- Distribution in Minnesota: Waters of the state are designated as infested if it is determined that they contain aquatic invasive species that could spread to other waters. You can refer to the [DNR Infested Waters List](#) or [EDDMaps Interactive Infested Waters Map](#); <https://www.dnr.state.mn.us/invasives/ais/infested.html>.

If you are targeting one species (e.g. zebra mussels) or a specific group of species (e.g. invertebrates only), a more intensive monitoring protocol may be needed. Consult your local DNR Invasive Species Specialist for more information.

Areas Monitored

This survey is designed for lake systems. High sampling intensity targeted in areas most vulnerable to invasion is recommended. These areas may include but are not limited to 1) public water accesses, 2) other areas of high boat traffic (e.g. privately owned water accesses), 3) near-shore/littoral zone (< 15 feet water depth), 4) areas of high human activity (e.g. beaches), 5) docks/boat lifts, and 6) areas connected to other waterbodies (vulnerable to dispersal).



Sampling Period

Sampling is recommended at least once per year between June and September. Intensity and frequency of sampling may vary. If possible, monitor each lake twice per year to account for early season (e.g. curly-leaf pondweed) and late season (e.g. purple loosestrife) species.

Safety

You are responsible for your own safety. Follow your employer's procedures on safety while working in the field.

Prevention

A variety of equipment will be used for this work, all of which have some risk associated with spreading AIS. All parties must comply with State [AIS Laws](#). Additional prevention precautions are recommended such as utilizing decontamination protocols after each monitoring/collection event. See the [DNR Aquatic Invasive Species Watercraft Inspection Handbook](#) for more detail on inspection and decontamination protocols.

Specimen Collection

All new AIS found must be reported immediately to a local DNR Invasive Species Specialist. Refer to the “New Detections and Sample Transport Procedures” section for details.

- Document the species by collecting a sample and/or taking high quality photos.
 - For aquatic plants collect flowering parts (if present), leaves, stems, roots and any underground organs such as tubers or turions.
 - For invertebrates (mussels, clams, crayfish, and snails): collect up to five individuals.
- Include these key details in your report: species, GPS point (if possible), waterbody name, county, date, your name and your contact information.
- Report by phone, in person, or electronically. Find more information on [how to report an invasive species](#); https://www.dnr.state.mn.us/invasives/report_invasives.html.



Data Collection and Data Management

Field Data Sheet: for collecting and recording data in the field.

Data Inventory: for maintaining a database of collected field data in a standard format.

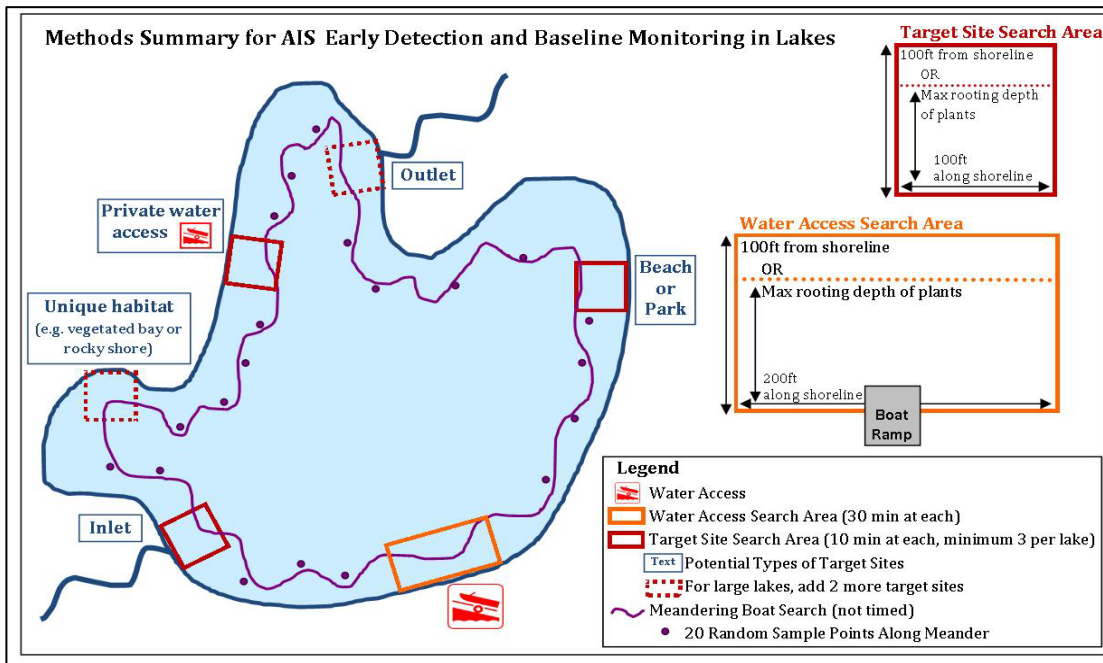
Survey Methods

This monitoring is not meant to be scientifically rigorous, but rather to gather information on the presence/absence and distribution of as many AIS as possible in a given water body (as staff time and availability permits). A recommended equipment list is found in *Appendix A* and an example completed field data sheet is provided in *Appendix B*.

In preparation for the survey, refer to the Minnesota DNR’s [Infested Waters List](#) and the [EDDMapS Midwest website](#) to determine if the lake or river contains AIS. Only report invasive species not known to be present in the water body.



Figure 1. A schematic of the AIS Early Detection & Baseline Monitoring survey methods.



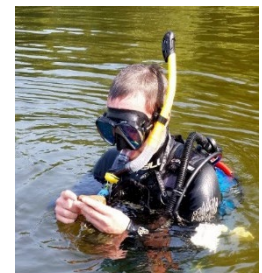
Water Access(es): A minimum of two people should spend a total of 30 minutes at each water access conducting snorkel and shoreline searches. The snorkel search could be conducted by one swimmer for 20 minutes or two swimmers for 10 minutes each.

Target Sites: A minimum of two people should spend a total of 10 minutes at each site conducting snorkel and shoreline searches. Conduct searches at a minimum of three (up to five) scattered lake sites representing different within-lake habitat, substrate or shoreline characteristics. For larger lakes with a variety of habitat, a minimum of five sites is recommended. Sites should maximize areas most vulnerable to invasion within a lake such as inlets, highly developed shorelines, private water accesses, plant filled bays, rock bars/points, etc.

Lakewide Meander: At 20 random points along the meander, collect samples with a rake and/or D-net. This search is not timed and is typically done in between the water access and target site locations.

Notes on Snorkel Searches: A dive flag should be present once a snorkeler is in the water. Additionally, one spotter should remain on shore to monitor for incoming and outgoing boats. The spotter will also keep track of time, help identify species, and record necessary data. A life jacket or flotation device should be within reach or a throwable distance from snorkeler(s). Use discretion and snorkel only when safe.

If snorkeling is not possible (due to blue-green algae, stained water, heavy boat traffic, or other unsafe conditions) record reason(s) in the “Notes” column of the field data sheet for future reference and examine area(s) for AIS as possible either through wading or other means. Indicate how the search was completed (e.g., “water was shallow so we waded with goggles or collected D-net and rake samples”). An underwater camera mounted to a pole is another alternative when visibility on lakes is low.



Searches

Snorkel Search

Follow standard snorkel/diving safety procedures as directed by your employer.

Water Access (20 minutes)

- Snorkel or SCUBA covering approximately 200 feet of shoreline out to the maximum rooting plant depth (<15 feet water depth) or 100 feet from shore, whichever is closest.
- Examine the dock itself for attached plants and invertebrates.

Target Site (5 minutes)

- Snorkel or SCUBA covering approximately 100 feet of shoreline out to the maximum rooting depth (<15 feet water depth) or 100 feet from shore, whichever is closest.

Both

- Use a spotter to monitor for boat traffic, assist snorkeler(s) when needed, and alert snorkeler(s) when time is up.
- Visually inspect areas for AIS and collect specimens if identification is questionable.

Shoreline Search

Water Access (10 minutes)

- Walk or wade along 100 feet of the shoreline on either side of the access (200 feet total).

Target Site (5 minutes)

- Walk or wade along 100 feet of the shoreline.

Both

- Be aware of your surroundings - do not trespass on private shoreland property. If necessary, remain in the watercraft or in the water while conducting this portion of the survey.
- Look for riparian/wetland plants (e.g. purple loosestrife or yellow iris).
- Use an aquatic plant rake to collect and closely examine submerged plants.
- Look for aquatic invertebrates under rocks or attached to hard substrates. Use a D-net to sample for invertebrates that may be out of sight of the snorkeler (e.g. in very shallow water, slightly buried in the substrate).
- Collect specimens if identification is questionable.

Meandering Boat Search

- Determine the maximum rooting depth of aquatic vegetation in the lake (approx. <15 feet water depth). Conduct search by driving a boat in a meandering pattern between the shoreline and the maximum rooting depth. The boat speed should be slow enough for spotters to scan submerged rooted vegetation and confidently identify AIS.
- Select 20 random points throughout the meander to collect plant samples with a rake (a double sided rake is recommended) or invertebrate samples with a D-net.
- If weather conditions (e.g., wind/waves) or water quality (e.g. algae blooms or high turbidity) significantly impair visibility, note this on the field data sheet. Rake samples should still be collected (recommend to do more than 20 rake samples) in order to assess for AIS presence.

Complete the field data sheet

- Record "WA" (Water Access) + number under the "Site" column in the field datasheet (e.g. if there are two water accesses, you would have WA1 and WA2 listed in the site column).
- Record "TS" (Target Site) + site number under the "Site" column in the field datasheet (e.g. with a minimum of 3 sites, you will have at least TS1, TS2, and TS3).
- Record "B" (Boat) + point number under the "Site" column in the field datasheet if an AIS is found in the point sample during the meander. Do not record a meander point if no AIS were detected.
- Record invasive species found and depth of water in which it was found. If no AIS were found at an WA or TS, record "none" or "—"
- Provide an estimate of density by ranking each species on a scale of 1-3. See field datasheet for density rankings.
- Record if a specimen was collected and other observations about the site.
- Every "WA" and "TS" and each "B" point with AIS should be documented by GPS.

Boat and Equipment Decontamination

It is essential that all equipment that was used in the water be cleaned thoroughly between uses.

Required by Law:

CLEAN 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.

DRAIN water-related equipment (boat, ballast tanks, portable bait containers, motor) and drain bilge, livewell and baitwell by removing drain plugs before leaving a water access or shoreline property. Keep drain plugs out and water-draining devices open while transporting watercraft.

DISPOSE of unwanted bait, including minnows, leeches, and worms, in the trash. It is illegal to release bait into a waterbody or release aquatic animals from one waterbody to another. If you want to keep your bait, you must refill the bait container with bottled or tap water.

Additional Best Management Practices:

- [MNDNR Aquatic Invasive Species \(AIS\) Watercraft Inspection Handbook](#)
- The Minnesota Pollution Control Agency's "[Standard Operating Procedures \(SOP\): Protocols for Decontamination after Sampling Water Resources with AIS](#)"
 - Scrub any visible material (mud, invertebrates, seeds, vegetation and other organic matter or debris) off footwear and gear with a stiff brush.
 - Rinse off all field equipment and personal protective equipment that has been in contact with aquatic habitats with tap water.
 - Drain trays, containers, scoops, scopes, boots, snorkel and mask, nets, rakes, etc.
 - Wipe equipment dry with a towel.
- Some invasive species are small and difficult to see at the access. To remove or kill them, take one or more of the following precautions:
 - Spray with high-pressure water.
 - Rinse with very hot water. These water temperatures will kill zebra mussels and some other AIS: 120°F for at least 2 minutes; or 140°F for at least 10 seconds.
 - Dry for at least 5 days.
- [A map of staffed decontamination locations and hours](#) can be found online (www.mndnr.gov/decon).
- The Aquatic Nuisance Species Task Force's [Voluntary Guidelines to Prevent the Introduction and Spread of Aquatic Invasive Species: Recreational Activities](#)



New Detections and Sample Transport Procedures

If you find a new AIS not known to be present in the water body, or a suspicious species that you cannot identify, it is important that you provide a detailed report to the DNR as soon as possible. It is better for the DNR to receive dozens of false positives than to have a new infestation overlooked.

If you believe you found a new occurrence of an AIS: Report by phone, in person or electronically, and be sure to include these key details in your report: **species, waterbody name, county, access name, date, your name and your contact information.**

By Phone: Call your DNR Invasive Species Specialist (*Appendix D*).

In Person: Collect a sample as described below and deliver it to your DNR Invasive Species Specialist or [nearest DNR office](#).

Electronically: Submit a report using the [EDDMapS Midwest website](#) or the [GLEDN Application](#) (*Appendix C*). Or take photos as described below and email them to your DNR Invasive Species Specialist (*Appendix D*).

- Once uploaded, EDDMapS/GLEDN will automatically send the report to the appropriate DNR AIS Specialist.
- It is strongly recommended that you contact your DNR Invasive Species Specialist to confirm they received your report.

Collect a Sample, if Needed

In most situations, detailed location information and high quality pictures of a suspect AIS is enough information for the DNR to confirm or deny the report. If you still wish to collect a sample, follow these steps:

- **Preserve:** Wrap aquatic plants in a damp paper towel, then seal it in a plastic sampling bag. Store animals in a sealed container. Store all samples on ice if possible.
- **Label:** On the outside of the container in permanent marker and on a slip of paper inside the container in pencil record: waterbody name, county, access name, date, your name, and your contact information.
- **Deliver:** Bring the labeled sample to your area's DNR Invasive Species Specialist or nearest DNR office. State law allows you to transport invasive species *directly* to the Minnesota DNR in a sealed container for purposes of identifying the species or reporting the presence of the species.

Take Multiple Photos

Without a sample, DNR staff require high quality pictures of the identifying features of a suspect AIS in order to confirm or deny a report. If using a smartphone or tablet, save images at 8 MP or higher.

The entire plant or animal



The species with object for scale (e.g. coin, ruler, hand)



Close-up of the species identifying features



General area where it was found



Appendix A: Recommended Equipment List

- _____ Lake Access point / Map
- _____ Bathymetric map of lake
- _____ Data Sheets on waterproof paper
- _____ Pencils
- _____ Double sided rake
- _____ Plant ID books / AIS identification sheets
- _____ Polarized sunglasses
- _____ Ziploc bags / collection containers
- _____ Sharpie marker
- _____ Sorting trays for plants and invertebrates (white or light color)
- _____ Hand lens
- _____ Digital camera
- _____ Stopwatch / watch
- _____ Depth Pole
- _____ Transect measuring tape
- _____ Boat / Canoe
- _____ Life Jackets [1 each wearable (USCG Type 1, 2, 3, or 5) and 1 throwable (USCG Type IV)]
- _____ Whistle
- _____ GPS Unit & Depth Finder
- _____ Boat ladder (for entering and exiting a boat in deep water)
- _____ Snorkeling gear (mask, snorkel, fins)
- _____ Hi-viz snorkel vest
- _____ Dive warning flag
- _____ Snorkel mask defog solution
- _____ Wetsuit/swimsuit
- _____ Waders

Appendix B: Example of a Completed Field Datasheet

x Sample Datasheet x



Last updated: 5/30/2018

AIS Early Detection and Baseline Monitoring Datasheet

Reminder: Know the presence of AIS before visiting the site and clean all equipment before leaving the site. See detailed instructions on reverse. If you suspect you found an aquatic invasive species (AIS) new to the water body, the following is required: collect a specimen and/or take high quality photos, record the exact location(s) using a GPS unit or hardcopy map, and contact your Minnesota DNR Invasive Species Specialist immediately (www.mndnr.gov/AIS).

Location Information

Lake Name: Linwood Lake County: Anoka DOW#: 02002600 Known AIS present: none

Data Collector Information

Primary Data Collector Name: Conservation Corps Phone or Email: 651-209-9100 Date: 8/14/18 Start Time: 9:17am End Time: 2:00pm

Species Searched For: (list here OR write "see back" and circle species on list provided) ALL AIS

Field Data

Site (WA/TS/B + site number) e.g. WA#001	AIS Found (List Species)	Depth (ft)	Density Ranking (1-3)	Specimen Collected? (Y/N)	Observation Notes
WA# 227	—	—	—	—	water murky, difficult to snorkel
TS# 228	EWM	>6	3	Y	lots floating
TS# 229	EWM + PLS (shore)	>6	2	N/Y (PLS)	
TS# 230	EWM	>6	3	N	lots of natives
B# 231	—	—	—	—	—
B# 232	—	—	—	—	—
B# 233	EWM	2.5	1	N	—
B# 234	EWM	5.5	3	N	large patch (start)
B# 235	EWM	6	3	N	large patch (end)

List ALL AIS discovered: EWM, PLS

New AIS detection? — Contact MN DNR Invasive Species Specialist (required)

Page 1 of 1

Appendix C: Reporting with the EDDMapS Midwest website and GLEDN Application

Image credits: EDDMapS Midwest Training Smartphone App

Getting Started

1. Create an account at [EDDMapS Midwest](#).
2. Download the [Great Lakes Early Detection Network](#) (GLEDN) Application onto your work tablet. Log in to the App using your EDDMapS Midwest account. The App also has a field guide to assist with identification.

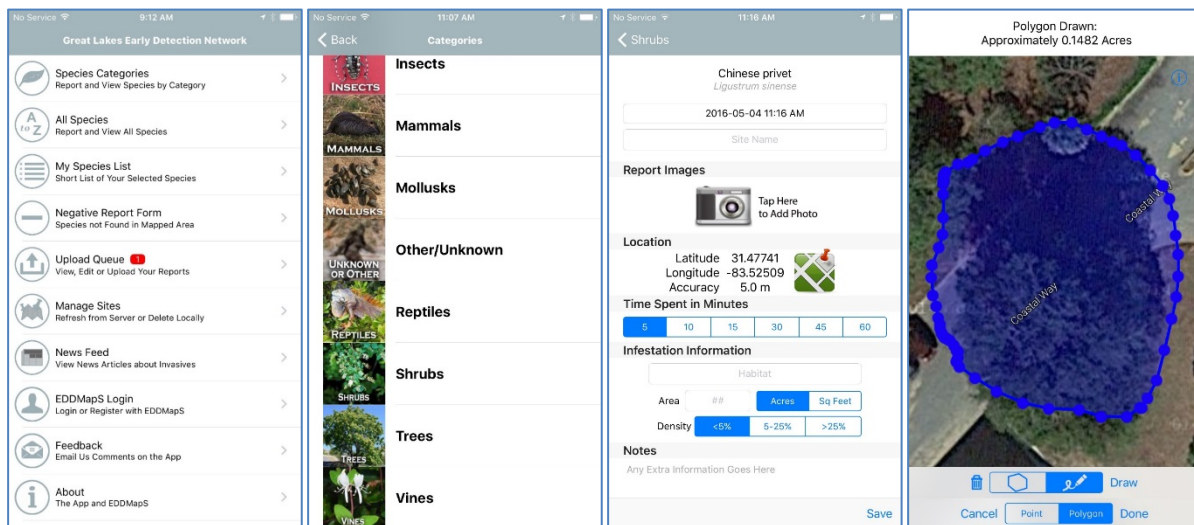
Reporting New Occurrences of AIS using EDDMapS Midwest

1. Log in to EDDMapS Midwest (requires connection to the internet).
2. Click on the type of species you would like to report (plant or animal).
3. Fill out as many fields as possible in the reporting form.
4. Always include images with your reports.
5. Click submit report.

Reporting New Occurrences of AIS using the GLEDN App

1. Open and log in to the GLEDN App.
2. Click All Species in the main menu.
3. Find the species you would like to report. Most AIS are found in the aquatics, crustaceans or mollusks categories. Select the species you would like to report by clicking on the species name or image. If you are unsure of the species or the species is not listed, click “other/Unknown” category.
4. Fill out these fields in the reporting form: time spent, habitat, area, density and notes. Automatically populated fields include: species name, date and time, latitude and longitude.
5. You may use the App’s mapping function to more precisely map the infestation.
6. Always include images with your reports. Click the camera icon to take pictures.
7. **Click Save**. The report will be saved in your Upload Queue on the main menu.
8. **Upload your report when your device is connected to Wi-Fi**. Open the App, click on Upload Queue, click Actions on the top right, select the report to upload, and click Upload at the bottom of the screen.

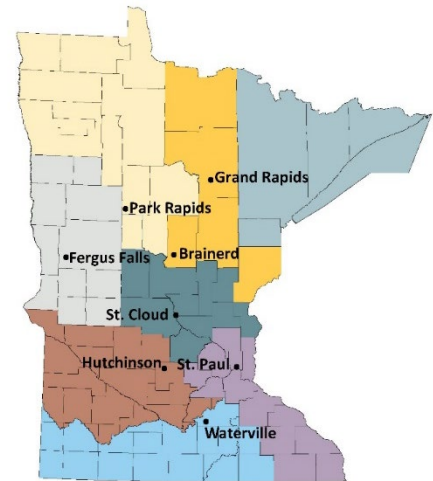
Images: From left to right, GLEDN App main menu, species categories, reporting form and mapping function.



Appendix D: DNR Invasive Species Specialists by Region

Refer to the online [AIS Contacts](http://www.mndnr.gov/ais) (found at www.mndnr.gov/ais) for current information.

Map Color and Region Number	Region Name	District	Office Location
1	Northwest Region	North District	Park Rapids
1	Northwest Region	South District	Fergus Falls
2	Northeast Region	West District	Brainerd
2	Northeast Region	East District	Grand Rapids
3	Central Region	North District	Sauk Rapids
3	Central Region	South District	St. Paul
4	Southern Region	North District	Hutchinson
4	Southern Region	South District	Waterville



Primary contact for local AIS issues and permits. Provide technical support for invasive species management and prevention activities for their respective work areas.

Office Location	DNR Region and District	Name	Phone Number	Email
Park Rapids	1 North	Nicole Kovar	218-732-8960	nicole.kovar@state.mn.us
Fergus Falls	1 South	Mark Ranweiler	218-739-7576 x254	mark.ranweiler@state.mn.us
Brainerd	2 West	Tim Plude	218-203-4354	timothy.plude@state.mn.us
Grand Rapids	2 East	Richard Rezanka	218-328-8821	richard.rezanka@state.mn.us
Sauk Rapids	3 North	Christine Jurek	320-223-7847	christine.jurek@state.mn.us
Sauk Rapids	3 North	Vacant (NRS)		
St. Paul	3 South	Keegan Lund	651-259-5828	keegan.lund@state.mn.us
St. Paul	3 South	Kylie Cattoor (NRS)	651-259-5729	kylie.cattoor@state.mn.us
St. Paul	3 South	April Londo (NRS)	651-259-5861	april.londo@state.mn.us
Hutchinson	4 North	Eric Katzenmeyer	320-234-2550 x237	eric.katzenmeyer@state.mn.us
Waterville	4 South	Allison Gamble	507-362-8786	allison.gamble@state.mn.us