

Preventing the Spread of Aquatic Invasive Species:

DECONTAMINATION STEPS FOR FIELD EQUIPMENT



Credit: Dave Brenner

Welcome

Completion of this training will help you reduce the risk of moving aquatic invasive species by:

- 1 Reducing your contact with them
- 2 Assessing the level of risk of spreading them based on site conditions
- 3 Properly decontaminating clothing, equipment, vehicles and boats to reduce their spread



This module is for *anyone* who works, plays, or volunteers in lakes, rivers, streams, or wetlands.

Examples include but are not limited to:

Monitoring and Teaching

- Volunteers
- Researchers
- Educators
- Invasive species weed management areas
- Lake associations

Businesses

- Aquatic herbicide applicators
- Aquatic weed harvesters
- Boat haulers
- Dock installers
- Landscapers
- Lake consultants/managers
- Marina owner/operators
- Private contractors

Governments

- County health and water resources departments
- Lake associations
- Municipalities
- Parks
- Police/sheriff departments (that patrol in lakes/rivers)



This module focuses on decontaminating field equipment and vehicles to reduce the risk of spreading aquatic invasive species (AIS). To learn more about AIS; including identification, negative impacts, and reporting, see:

The DEQ invasive species web site: michigan.gov/invasives

Midwest Invasive Species Information Network: misin.msu.edu

Michigan Invasive Species Coalition: michiganinvasives.org/about

Clean Boats, Clean Waters Program: mymlsa.org/cbcw

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Aquatic Invasive Species (AIS)



"An invasive species is one that is not native and whose introduction causes harm, or is likely to cause harm to Michigan's economy, environment or human health."

— Michigan's Invasive Species Program

Aquatic invasive species include:

- Algae
- Aquatic vascular plants
- Zooplankton
- Macroinvertebrates
- Fish
- Reptiles
- Amphibians
- Mollusks
- Crustaceans

Invasive Hitchhikers!

Invasive species are often nicknamed “hitchhikers” because the primary way they spread is by hitching a ride on humans and their equipment.

Once in a new location, these animal, plant, and fungi species reproduce rapidly and damage ecosystems, even to the extent of endangering human economies or health.

Invasive species can outcompete native species for food and habitat, leading to excessive plant growth, loss of ecosystem diversity and function, and in some cases, causing algal blooms and fish die-offs.



Credit: Michigan Department of Environmental Quality



*Quagga Mussels
Credit: Ohio Sea Grant*

Spreading Disaster

As people move from one waterbody to another, they can pick up hitchhikers on boots, waders, car tires, bilge water from boats, nets, and other equipment.

Imagine a volunteer monitoring crew wading through a stream, taking water samples and kicking gravel into dip nets to collect aquatic invertebrates.

What else might they be collecting?

New Zealand mud snails can become lodged in the laces of their waders. Mud stuck in boot treads may contain purple loosestrife seeds. Curly leaf pondweed fragments may get caught in nets. Even car and tractor tires can harbor the seeds of invasive plants.



Credit: Unknown



Credit: Huron River Watershed Council

Don't Be a Vector!

This module will show anyone working in or enjoying Michigan's lakes, rivers, streams, and wetlands how to reduce the risk of spreading invasive species from one waterbody to another. You will learn how to:

- 1 Assess the level of risk for picking up hitchhikers.
- 2 Avoid or prevent hitchhiking AIS.
- 3 Properly decontaminate clothing, equipment, vehicles, and boats based on the level of risk.



Vector:

the physical means by which an aquatic invasive species is transported to a new region, primarily by humans, whether deliberate or accidental.”

— MDEQ

Assessing the Risk of Contamination

Given the variety of ways clothing and equipment including vehicles and boats can become contaminated, and the variety of situations encountered, it makes sense to **assess the risk of AIS contamination to determine the appropriate decontamination steps.**

For example, a volunteer monitoring team gathering samples from a single site that day on a creek with no observed invasive species will have a lower risk of spreading invasive species than a team collecting samples from several different waterbodies with differing levels of contamination.



Credit: Huron River Watershed Council

Follow these guidelines to assess the level of risk of AIS contamination.

You may not always have all of the information to confidently assess a situation. In these cases, use your best judgment to assess risk.



When in doubt, err on the side of higher risk to ensure a higher level of decontamination.

Contamination Risk: LOW

Risk is considered **low** if **ANY** conditions on **ANY** of the **low** risk slides are met

- One field site* visited a week
EXAMPLE: One lake or a single sample location on a stream

* An entire lake could be considered one field site, while a single sample location along a stream length should be considered one field site.



Credit: Huron River Watershed Council

Contamination Risk: LOW

Risk is considered **low** if **ANY** of the following are met

- One field site visited a week, or
- No contact with AIS or water

EXAMPLE: A visit where only visual inspection is done.



Credit: Michigan Department of Environmental Quality

Contamination Risk: LOW

Risk is considered **low** if **ANY** of the following are met

- One field site visited a week, or
- No contact with AIS or water, or
- No documented or observed AIS

EXAMPLE: During planning and monitoring of a public beach the county health department employee does not find a record of or observe any invasive species.



Credit: Michigan Department of Environmental Quality

Contamination Risk: LOW

Risk is considered **low** if **ANY** of the following are met

- One field site visited a week, or
- No contact with AIS or water, or
- No documented or observed AIS, or
- Visiting multiple field sites per week with invasive species present. But no risk of spread due to lack of seeds, eggs, or propagules.

EXAMPLE: A stream monitoring team finds phragmites on a stream with several more sites to sample. But it is mid-summer and seeds are not present.



Propagule: Noun
[prop-uh-gyool]
1. Botany, Mycology. any structure capable of being propagated or acting as an agent of reproduction.

Contamination Risk: MEDIUM

Risk is considered **medium** if BOTH of the following are met

- More than one field site visited per week
EXAMPLE: Researcher sampling several lakes in a single week
- Contact with any AIS infested water where propagules are present
EXAMPLE: Volunteer stream monitoring when purple loosestrife is present and seeds are present.



Phragmites
Credit: Todd Marsee, Michigan Sea Grant

Contamination Risk: HIGH

Risk is considered **high** if ANY of the conditions on ANY of the **high** risk slides are met

- More than one field site is visited in a day (the risk is increased with a shorter time between visits)

EXAMPLE: A dock installer setting up docks in several lakes in the same day.



Zebra Mussels
Credit: Todd Marsee, Michigan Sea Grant

Contamination Risk: HIGH

Risk is considered **high** if ANY of the following are met

- More than one field site is visited in a day, or
- Contact with AIS or water where propagules are present

EXAMPLE: An aquatic herbicide applicator is conducting routine plant management in several waterbodies.



Credit: Michigan Department of Environmental Quality

Contamination Risk: HIGH

Risk is considered **high** if ANY of the following are met

- More than one field site visited in a day, or
- Contact with AIS or water where propagules are present, or
- Both pristine and AIS-infested locations are visited

EXAMPLE: Volunteers are conducting a river cleanup that will cover several rivers and streams. Invasive species are known in several systems and several are known to be invasive species-free.



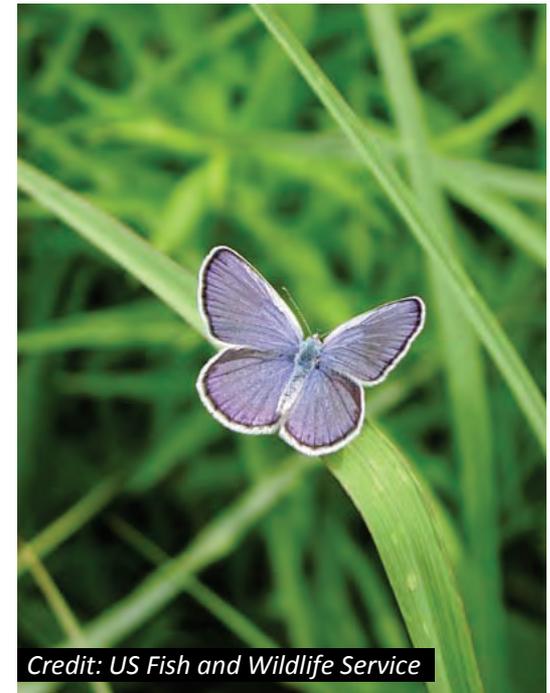
Contamination Risk: HIGH

Risk is considered **high** if ANY of the following are met

- More than one field site visited in a day, or
- Contact with AIS or water where propagules are present, or
- Both pristine and AIS-infested locations are visited, or
- Contact with water or AIS in multiple watersheds, or
- Visiting locations with rare, endangered, or threatened species (imperiled species and habitat are especially susceptible to the threats of invasive species)



HIGH



Credit: US Fish and Wildlife Service

Recommended Practices

PREVENTION

The best way to avoid spreading aquatic invasive species is to avoid contact with hitchhiking eggs, seeds, and other invasive plant or animal material in the first place.

DECONTAMINATION

Thoroughly removing all invasive species and their eggs or seeds from clothing and equipment, and taking a number of steps to ensure their removal is also essential to avoid the spread of AIS.



Credit: Michigan Sea Grant

Prevention

REMEMBER: The best way to avoid spreading aquatic invasive species is to avoid picking up hitchhiking eggs, seeds, and other invasive plant or animal material in the first place.

ALWAYS PRACTICE THESE STEPS:

- Go to more pristine areas without aquatic invasive species first.
- Conduct activities when seeds or eggs are not present (*if you know and can*).
- Park on paved surfaces to avoid picking up seeds, eggs, or plant materials hiding in soils.
- Use existing paths, sidewalks, and roads when possible instead of bushwhacking through areas that may contain invasive species.
- Choose equipment that is less likely to trap and transport seeds or eggs.
- Decontaminate clothing, equipment, vehicles, and boats before leaving the site.

Choose Clothing and Equipment with an Eye Toward Preventing Hitchhikers

- Use clothing and equipment that is less likely to transport invasive species.
- One-piece rubber waders deprive aquatic hitchhikers seams to hide in.
- Rubber-soled boots on waders are more easily cleaned, whereas felt soles can trap water, becoming vectors for New Zealand Mud snails, didymo, and other plant seeds.



Felt-soled waders in front; one-piece rubber waders in rear.
Credit: Huron River Watershed Council



Crevices and laces of shoes provide places for hitchhikers to latch on.
Credit: USFWS

Decontamination

REMEMBER:

Decontaminate clothing, equipment, vehicles, and boats **before leaving the site.**

- **Inspect and remove** all plants, dirt, mud, and debris from clothing, equipment, and vehicles
- **Drain** water from equipment and boats
- **Disinfect** items exposed to invasive species
- **Dry** all items exposed to invasive species

Steps for decontaminating clothing and equipment will vary and should be based on the level of contamination risk at each waterbody.

Inspect and Remove Plants, Dirt, Mud, and Debris



Invasive seeds, shoots, and eggs can be **tiny** and can hide in plants, dirt and mud and cling to or **hide in the creases and cracks** of clothing and equipment, including tire treads and other **parts of vehicles and boats**. From there, they can work free at the next lake or stream you visit.

Thoroughly inspect and remove all plants, dirt, and mud, and any other visible debris like seeds, shoots, animals, and eggs from clothing, equipment, vehicles, and boats.



Remove Invasive Materials From Equipment and Clothing



- Hand pick or scrub equipment
- Brush or pick boots, waders, and clothing
- Use adhesive roller on clothing and boots
- Vacuum out interior of vehicles and heavy equipment (like excavators)
- Clean **and sanitize** sensitive equipment like sondes, hydrolabs, and dataloggers **every time**, following the manufacturer's instructions.

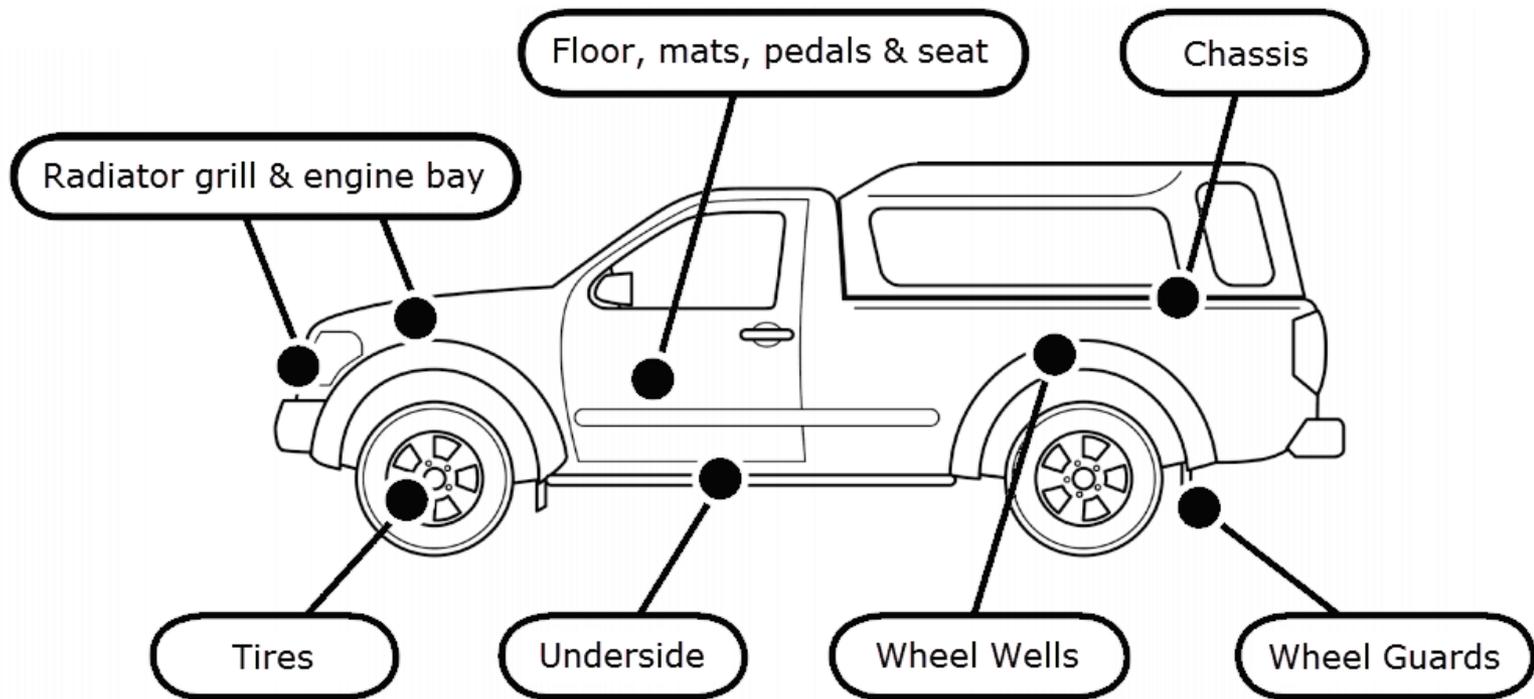


Vehicles

Thoroughly inspect and remove all plants, dirt, and mud, and any other visible debris like seeds, shoots, animals, and eggs from vehicles.



Where to look in/on VEHICLES:

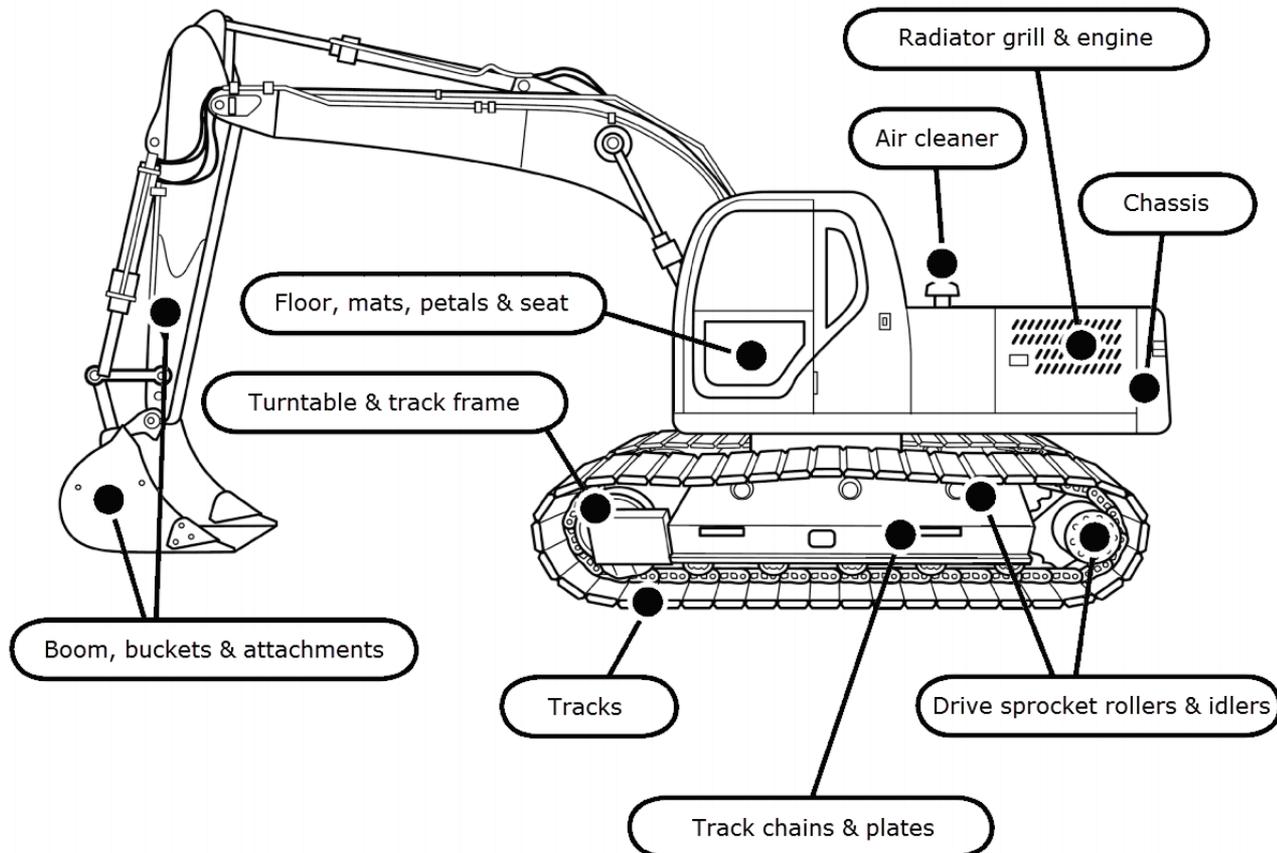


Heavy Equipment

Thoroughly inspect and remove all plants, dirt, and mud, and any other visible debris like seeds, shoots, animals, and eggs from heavy equipment.



Where to look in/on HEAVY EQUIPMENT:

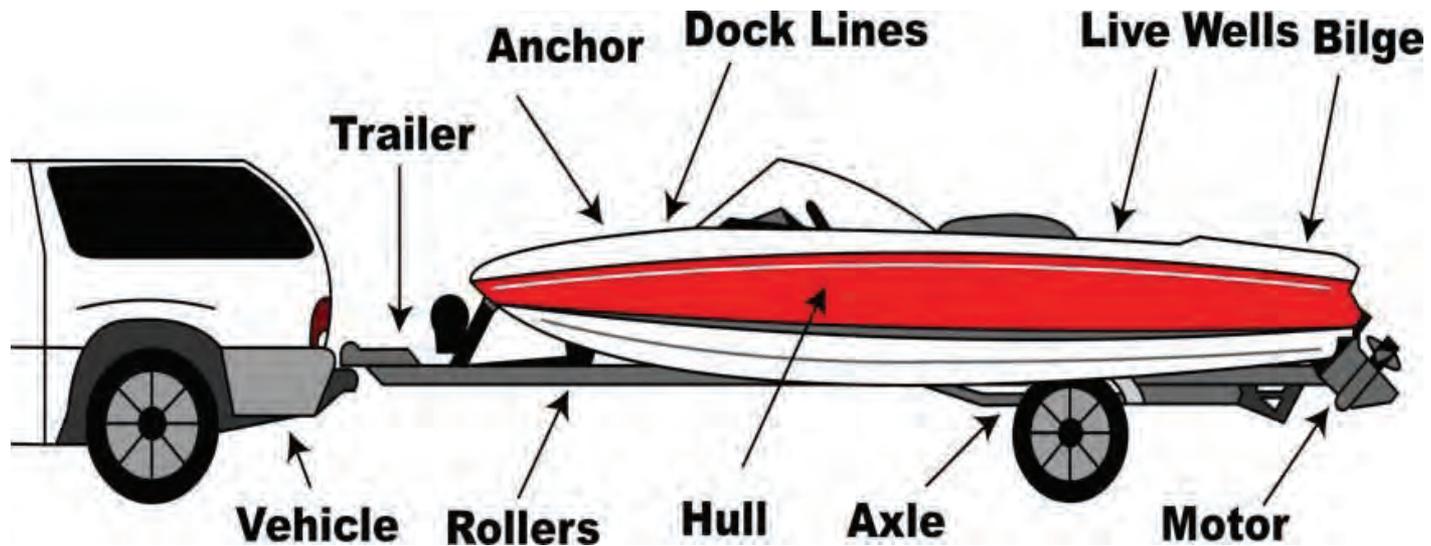


Boats and Trailers

Thoroughly inspect and remove all plants, dirt, and mud, and any other visible debris like seeds, shoots, animals, and eggs from boats and trailers.



Where to look in/on BOATS AND TRAILERS:



Drain and Rinse Boat Bilge, Pumps, Tanks, Wells



Microscopic zebra mussel larvae, spiny water fleas, and other tiny invasive species can float freely in water, and therefore easily flow into a boat's bilge and pumps or get into live wells, buckets, and coolers. They can be transferred between waterbodies in standing water. When the boat enters the next lake or stream, these hitchhikers have a new home.

Before leaving the site:

- 1 Drain water from the **bilge, pumps, water tanks, and live wells** at boat ramp.
- 2 Pull boat plug.
- 3 Turn over engine to dispel water.
- 4 **Rinse with water.**



Credit: Michigan Department of Environmental Quality

Rinse and Dry Equipment and Boats



Some aquatic invasive species can survive on boats and other equipment for many hours, even days, after leaving their home waterbody.

Boats still wet from an infested lake can spread the problem to lake after lake, stream after stream.

- 1 Rinse boats and equipment with potable water.
- 2 Let equipment and boats **dry** before entering a different waterbody.



Extra Steps for Medium Risk Situations



If you know you are working in AIS-infested waters, or you will be visiting multiple waterbodies, your chances of coming into contact with an AIS increase. You will need to **take more action** to remove them.

- You will do all of the **Prevention and Decontamination** steps for Low Risk situations.
- Your level of effort to **Inspect and Remove** goes up.
- There will be additional requirements to **Disinfect** and **Dry**.

MEDIUM RISK CRITERIA

- Multiple field sites visited
- AIS-infested water body
- **Propagules** present

Inspection and Removal— Vehicles and Heavy Equipment



In **addition** to Low Risk steps for vehicles and heavy equipment:

- Clean heavy equipment like excavators with compressed air or water. Use a high pressure washer (with undercarriage flush, if available); run fans in reverse to clean air intakes.



Credit: Huron River Watershed Council

Inspection and Removal— Clothing



In addition to Low Risk steps for clothing:

- Launder clothing before visiting another waterbody.
- Use a boot wash station or sink to disinfect waders and boots. **DISINFECT** by exposing to bleach solution* for 10 minutes, away from the waterbody, then rinse with water (in the boot wash) to prevent corrosion.



Credit: Michigan Department of Environmental Quality

**Additional information provided in later slides*

Disinfect and Dry

In **addition** to Low Risk steps for boats and equipment:

- **DISINFECT** by exposing to bleach solution* for 10 minutes, away from the waterbody, then rinse with water to prevent corrosion.
- If you are working in a waterbody where New Zealand mud snails might be present, use Virkon® Aquatic* and soak for 20 minutes, away from the waterbody.
- Use a hot water (140 degrees) pressure washer for 10 seconds.
- Let it all DRY for at least 2 days.



Credit: Huron River Watershed Council

**Additional information provided in later slides*

Extra Steps for High Risk Situations



If you **KNOW** you are working in **invasive-infested waters AND visiting multiple waterbodies**, you will need to take extra decontamination steps before you move on to the next site.

You do not want to be responsible for infesting a clean, ecologically pristine lake with zebra mussels, round gobies, or Eurasian milfoil.

- You will do all of the **Prevention and Decontamination** steps for **Low and Medium Risk** situations.
- There will be additional requirements to **Disinfect and Dry**.

HIGH RISK CRITERIA

- More than one field site visited in a day
- Contact with AIS or water where propagules are present
- Both pristine and AIS-infested locations are visited
- Contact with water or AIS in multiple watersheds
- Visiting locations with rare, endangered, or threatened species

Disinfection with Heat and Pressure



In **addition** to Medium Risk steps for Disinfection:

- Heat clothing, waders, and boots with a household steamer (1 minute) or hot water (140 degrees) pressure washer for 10 seconds.
- Clean vehicles that have been in contact with AIS with a hot water (140 degrees) high pressure washer (can be rented) or use a commercial car wash with undercarriage flush (confirm water temperature).
- Flush boat engine cooling systems with hot water (140 degrees) for 5 minutes with exiting temperature of 120 degrees or flush for 10 minutes at ambient temperature.
- Dry thoroughly for five or more days.



Credit: Jo Latimore



Credit: Sylvia Kay

Extended Drying Time for High Risk Situations

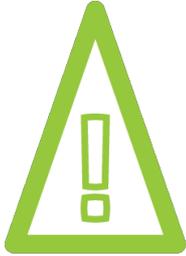


Make sure your clothing, waders, and boots have a chance to dry for **5 days**, or use alternative equipment that has not been exposed to infected waters within 5 days.



Credit: Huron River Watershed Council

SUMMARY OF ACTIONS BASED ON LEVEL OF CONTAMINATION RISK

	 LOW	 MEDIUM	 HIGH
Prevention (always practice)	●	●	●
Decontamination (steps depend on level of risk, details on slides that follow)			
Inspect & Remove	●	● + compressed air and vacuuming	● + compressed air and vacuuming
Drain	●	●	●
Disinfect		● + heat for boats, equipment	● + heat for clothing, waders, boots, vehicles, boat engines
Rinse	●	●	●
Dry	●	● (2 days)	● (5 days)

Emergency Situations

In cases of emergency situations:
Safety, rescue, and containment should take priority.



Credit: Michigan National Guard



Credit: Michigan National Guard

Decontamination Materials

Decontaminating heavy equipment, vehicles, and boats may require additional efforts depending on the contamination risk level. The presence of zebra or quagga mussel larvae or New Zealand mud snails in the waterbody also requires additional steps to **Disinfect**.

LOW RISK

1. Basic decontamination kit
2. Vacuum cleaner for vehicles

MEDIUM RISK = LOW + the following

1. Bleach solution (diluted) for soaking or spraying equipment
2. Virkon® Aquatic, a concentrated disinfectant (if New Zealand mud snails might be present)
3. Air compressor to blow off heavy equipment like excavators
4. Hose with running water for rinsing equipment, and boats to remove bleach solution or disinfectant
5. Hot water pressure washer (can be rented) for boats and heavy equipment

HIGH RISK = LOW + MEDIUM + the following

1. Commercial car wash **with undercarriage flush** for vehicles
2. Household clothing steamer for clothing and equipment
3. Marine engine or outboard motor flusher for boats



You can accomplish most **LOW** and **MEDIUM** risk clothing and equipment decontamination with the following **basic kit**. Always come to the site prepared.

FOR DECONTAMINATION

- Boot brush
- Hand towel
- Scrub brush
- Lint roller
- Bleach wipes
- Spray bottle with diluted bleach solution (dated)

FOR PERSONAL PROTECTION

- Gloves
- Eye wash
- Safety glasses
- Apron



Credit: Huron River Watershed Council

**If you work with sondes, hydrolabs, dataloggers or other sensitive equipment, follow the manufacturer's instructions for cleaning after each use and plan to add recommended cleaning supplies to your basic kit.*

Disinfection Recipes

Bleach = MEDIUM, HIGH risk of contamination, include in basic kit.

Use commercially available bleach in a 5.25% or 8.25% solution and further dilute it as per the following:

- 5.25% solution: 36.05 mL/gallon or .15 cup/gallon or 1.22 oz./gallon.
- 8.25% solution: 22.94 mL/gallon or .097 cups/gallon or .78 oz./gallon. Or, 3 mL to 16 oz. spray bottle and fill that with water.

Undiluted chlorine degrades in two months. Diluted chlorine bleach solution degrades after 24 hours. Apply with sprayer or sponge or use to soak equipment. 10 minutes contact time.

Virkon Aquatic = MEDIUM, HIGH risk of contamination

Virkon Aquatic, a concentrated disinfectant is recommended for killing New Zealand mudsnails. Dilute to 20 g/L water. Apply with sprayer or sponge. 20 minutes contact time. Product degrades after 7 days once mixed.



Additional Resources

- 1 Removing all plants, soil and mud, and animals is the basis of proper invasive species decontamination. Being able to properly identify invasive species is not absolutely necessary but can be beneficial. A good resource to improve invasive species identification skills is the Midwest Invasive Species Information Network (MISIN) at:

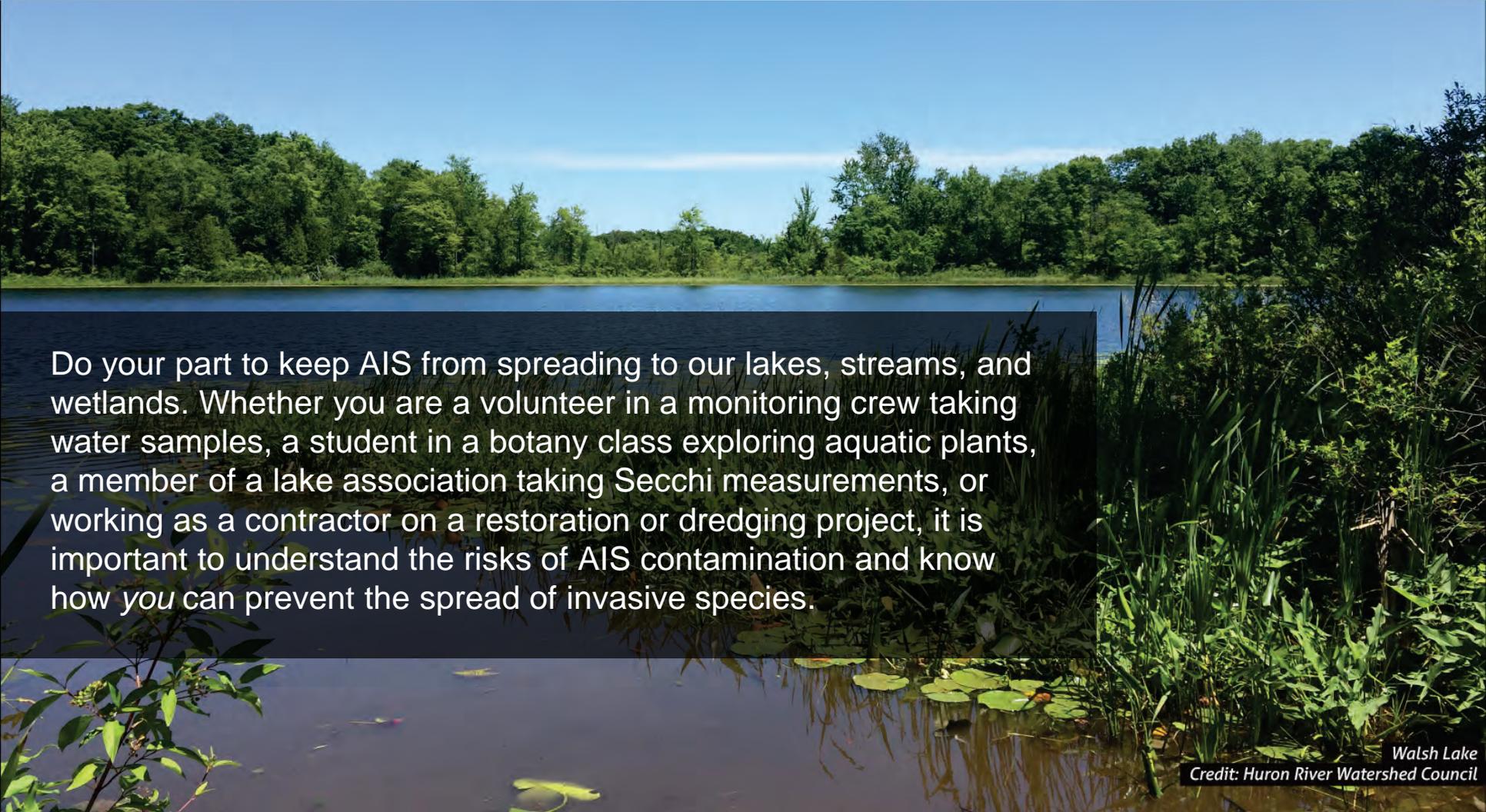
<http://www.misin.msu.edu/>

In addition to identification training, MISIN also allows registered users to view and report where invasive species have been observed.

- 2 A short video on decontamination

<https://www.youtube.com/watch?v=ESnJ2SI25Mo>

You Can Make a Difference!



Do your part to keep AIS from spreading to our lakes, streams, and wetlands. Whether you are a volunteer in a monitoring crew taking water samples, a student in a botany class exploring aquatic plants, a member of a lake association taking Secchi measurements, or working as a contractor on a restoration or dredging project, it is important to understand the risks of AIS contamination and know how *you* can prevent the spread of invasive species.

Walsh Lake
Credit: Huron River Watershed Council