Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan Department of Agriculture and Rural Development
POLICY AND PROCEDURE

Original Effective Date: December 9, 2014 Revised Date: March 1, 2025	Subject: Invasive Species Decontamination for Field Operations in Michigan	
	Number: QOL-2-2014	Page 1 of 5

A Quality of Life (QOL) Policy and Procedure cannot establish regulatory requirements for parties outside of the QOL. This document provides direction to QOL staff regarding the implementation of rules and laws administered by the QOL. It is merely explanatory; does not affect the rights of, or procedures and practices available to, the public; and does not have the force and effect of law.

POLICY:

The Michigan Department of Environmental Quality (MDEQ), Michigan Department of Natural Resources (MDNR), and Michigan Department of Agriculture and Rural Development (MDARD) will aim to perform basic decontamination steps for field equipment in order to minimize the risk of invasive species transfer between work locations. Each division/office within each QOL department will develop decontamination steps that are practical and reasonable to perform by field staff to accomplish the goal of limiting the spread of invasive species.

INTRODUCTION:

Preventing new introductions and limiting the dispersal of established invasive species is the most cost-effective approach to management. The purpose of this policy and procedure is to assist employees of the MDEQ, MDNR, and MDARD in minimizing the risk of transferring invasive species while performing job activities in the field.

While this is a QOL policy and procedure, this document can be used by other departments (e.g., the Michigan Department of Transportation).

A decontamination guidance document, Invasive Species Decontamination for Field Operations in Michigan, is attached for staff conducting field activities including, but not limited to, research, management, monitoring, inspections, and site surveys that may result in contact with invasive species. Many types of field activities are conducted by State of Michigan employees. The attached guidance document provides the basic decontamination steps every employee should take to minimize the risk of invasive species transfer, as well as options specific to types of equipment used by QOL staff. Selection of specific decontamination methods is dependent on the type of work and the situation (e.g., time between site visits, risk level, or emergency response). Specific decontamination methods may be developed by a division/office for routine work or for special projects. In addition to preventing the dispersal of invasive species, decontamination methods are becoming increasingly important with the use of sensitive invasive species detection techniques, like environmental DNA (eDNA) sampling, to prevent false positives.

This policy and procedure and attached guidance document do not preclude any decontamination policies or procedures currently being followed by any of the QOL departments.

AUTHORITY:

Michigan's Aquatic Invasive Species (AIS) and Terrestrial Invasive Species (TIS) Core Teams are composed of representatives from each of the state agencies with environmental or natural resource responsibilities. In general, the MDEQ, MDNR, and MDARD share responsibility for invasive species policy, legislation, regulation, education, monitoring, assessment, management, and control.

Relevant sections of Michigan Laws include:

Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).

Part 413, Transgenic and Nonnative Organisms, of the NREPA:

> **324.41303 Possession of live prohibited or restricted organism; prohibition; exceptions; notification of location where found.**
> Sec. 41303. (1) Subject to subsection (2), a person shall not knowingly possess a live organism if the organism is a prohibited species or restricted species ….
>
> **324.41305 Introduction of prohibited or restricted species, or genetically engineered or nonnative aquatic plant, bird, crustacean, fish, mammal, or mollusk; exceptions.**
> Sec. 41305. A person shall not introduce a prohibited species, a restricted species, or a genetically engineered or nonnative aquatic plant, bird, crustacean, fish, mammal, or mollusk unless the introduction is authorized ….
>
> **324.41325 Boat, boating equipment, or boat trailer with aquatic plant attached; placement in state waters prohibited; order to remove aquatic plants; notice; posting; violation as civil infraction; penalty; definitions.**
> Sec. 41325. (1) A person shall not place a boat, boating equipment, or boat trailer in the waters of this state if the boat, boating equipment, or boat trailer has an aquatic plant attached.

MDNR, Fisheries Division, Fisheries Order 245, Fish Disease Control:

> General Statewide Provisions. 16. A person who trailers a boat over land shall drain all water from the live well(s) and the bilge of their boat upon leaving any body of water.

PROCEDURE:

Selection of specific decontamination methods is dependent on the type of work and the situation (e.g., time between site visits, risk level, or emergency response). Specific decontamination methods may be selected by a division/office for routine work or for special projects. Staff should be aware of their work environment, the level of risk of transporting invasive species, and how their actions may contribute to the dispersal of invasive species; and based on this information, select and implement appropriate decontamination methods.

There are a variety of ways boats, vehicles, and field equipment can be decontaminated. Divisions/offices within each QOL department will develop their own tailored decontamination requirements; however, field crews will need to use best professional judgment when assessing risk. Field crews can tailor decontamination methods to be site-specific based on risk (as long as they are within their own division/office's decontamination requirements). Not every decontamination method will apply to all types of fieldwork; therefore, field crews should assess their level of risk in spreading invasive species.

Responsibilities for implementing this policy and procedure are as follows:

AIS and TIS Core Teams:

- Provide divisions/offices within each QOL department an invasive species decontamination guidance document (see attached). The AIS and TIS Core Teams will review and make revisions if needed, as appropriate, to the attached guidance document annually.

Divisions/Offices:

- Identify decontamination methods appropriate for type of work being completed or special projects that are reflective of the guidance document provided to the divisions/offices by the AIS and TIS Core Teams.

- Provide staff with the required tools and supplies to perform decontamination activities.

- Provide staff with training as to why, how, when, and where decontamination activities need to be conducted.

- Ensure staff performs decontamination activities as required by their division/office.

- Summarize and communicate to the AIS and TIS Core Teams the decontamination methods being used and recommended modifications to the guidance document.

Staff:

- Each employee is responsible for performing decontamination activities as required by their division/office.

SAFETY PRECAUTIONS:

When using chemicals for disinfection, certain safety protocols should always be followed. Read the Material Safety Data Sheet or Safety Data Sheet and product labels for chemicals being used (e.g., Virkon®, bleach, and Formula 409) and follow instructions to avoid inhalation and eye/skin irritation problems. Wear chemical splash goggles, gloves, and an apron to prevent contact with eyes or skin. Spray downwind.

When decontaminating equipment (e.g., the underside of mowers), field crew safety must always be a priority. Use best professional judgment and consider safety in every decontamination step.

SPECIAL CIRCUMSTANCES:

Emergency Situations

There may be some cases, especially in the MDNR's Law Enforcement Division and Forest Resources Division (fire), when field staff is required to respond to an emergency situation. In these cases, safety/rescue/containment is the priority, not equipment decontamination. Situations requiring quick response times because of environmental or human health threats, like pollution emergencies, may require different levels of decontamination methods. The responding agency is responsible for determining priorities and risks to the environment, public health and safety, and staff safety.

Birds and Mammals

Diseases of birds and mammals can be as important as the birds and mammals themselves. When handling birds or mammals, attention needs to be given to protecting human health and the health of other animals; it is as important to stop the spread of the diseases as it is to stop the spread of the invasive animals (see attached guidance document for additional information).

REVIEW:

This policy and procedure will be reviewed one year following the effective date and every five years thereafter, as a minimum. The attached guidance document will be reviewed annually.

Approved:

Dan Wyant, Director
Michigan Department of Environmental Quality

Keith Creagh, Director
Michigan Department of Natural Resources

Jamie Clover Adams, Director
Michigan Department of Agriculture and Rural Development

Attachment

INVASIVE SPECIES DECONTAMINATION FOR OUTDOOR OPERATIONS IN MICHIGAN

A GUIDANCE DOCUMENT FOR THE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY;
MICHIGAN DEPARTMENT OF NATURAL RESOURCES;
AND
MICHIGAN DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT

REVISED March 2025

The Michigan Department of Environment Great Lakes and Energy (EGLE), Michigan Department of Natural Resources (MDNR) and Michigan Department of Agriculture and Rural Development (MDARD) will aim to perform basic decontamination steps for outdoor equipment to minimize the risk of invasive species transfer between work locations. Each division/office in each department will develop decontamination steps that are practical and reasonable to perform by staff to accomplish the goal of limiting the spread of invasive species.

INTRODUCTION

Preventing new introductions and limiting the dispersal of established invasive species is the most cost-effective approach to management. The purpose of this document is to assist employees of the EGLE, MDNR and MDARD in minimizing the risk of transferring invasive species while performing outdoor job activities.

While this is a Quality of Life (QOL) guidance document, the guidance may be used by any group or organization working outdoors (*e.g.*, the Michigan Department of Transportation [MDOT], Cooperative Invasive Species Management Areas [CISMAs]).

This document provides guidance on various decontamination methods for staff conducting activities that may result in contact with invasive species, including research, management, monitoring, inspections, inventory, site surveys, construction, treatments to land and water resources, and other outdoor work. Decontamination options for specific types of equipment used by QOL staff are also provided. Selection of an appropriate decontamination method is dependent on the type of work and the situation (*e.g.*, time between site visits, risk level, or emergency response). The definition of a “site” may be dependent on the project, scale, or type of work being conducted (*i.e.*, statewide vs. smaller regions).

Specific training and implementation guidance regarding decontamination methods will be developed by all divisions/offices for routine work or for special projects. In addition to preventing the dispersal of invasive species, decontamination methods are becoming increasingly important with the use of sensitive invasive species detection techniques, like environmental DNA (eDNA) sampling, to prevent false positives.

This document does not preclude any decontamination policies or procedures currently being followed by any of the QOL departments.

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ACKNOWLEDGEMENTS

This document was produced by the State of Michigan's Aquatic Invasive Species (AIS) and Terrestrial Invasive Species (TIS) Core Teams. The Core Teams considered various scientific studies on decontamination practices and other states' decontamination protocols, including California, Nebraska, New York, Pennsylvania, Washington and Wisconsin.

AUTHORITY

Michigan's AIS and TIS Core Teams are composed of representatives from each of the state agencies with environmental or natural resource responsibilities: EGLE's Water Resources Division; MDNR's Fisheries Division, Wildlife Division, Parks and Recreation Division, Forest Resources Division, Law Enforcement Division and Marketing and Outreach Division; MDARD's Pesticide and Plant Pest Management Division, Animal Industry Division and Environmental Stewardship Division; and MDOT's Environmental Services Section. In general, the EGLE, MDNR and MDARD share responsibility for invasive species policy, legislation, regulation, education, monitoring, assessment, management and control.

Relevant sections of Michigan laws include:

Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA)

Part 413, Transgenic and Nonnative Organisms, of the NREPA

324.41303 Possession of live prohibited or restricted organism; prohibition; exceptions; notification of location where found.
Sec. 41303. (1) Subject to subsection (2), a person shall not knowingly possess a live organism if the organism is a prohibited species or restricted species ….

324.41305 Introduction of prohibited or restricted species, or genetically engineered or nonnative aquatic plant, bird, crustacean, fish, mammal, or mollusk; exceptions.
Sec. 41305. A person shall not introduce a prohibited species, a restricted species, or a genetically engineered or nonnative aquatic plant, bird, crustacean, fish, mammal, or mollusk unless the introduction is authorized…

324.41325 Boat, boating equipment, or boat trailer with aquatic plant attached; placement in state waters prohibited; order to remove aquatic plants; notice; posting; violation as civil infraction; penalty; definitions.
Sec. 41325. (1) A person shall not place a boat, boating equipment, or boat trailer in the waters of this state if the boat, boating equipment, or boat trailer has an aquatic plant attached. A person should not transport any watercraft over land without first removing all plugs from bilges, ballast tanks and live wells, draining all water from any live wells and bilge and ensuring that the watercraft, trailer and any conveyance used to transport the watercraft or trailer are free of aquatic organisms, including plants.

OVERVIEW

Selection of specific decontamination methods is dependent on the type of work and the situation (*e.g.*, time between site visits, risk level, or emergency response). Specific decontamination methods may be selected by a division/office for routine work or for special projects. Staff should be aware of their work environment, the level of risk of transporting invasive species and how their actions may contribute to the dispersal of invasive species. Based on this information, staff should select and implement appropriate decontamination methods.

Basic Steps to Decontamination:

1. When possible, decontaminate at the location before leaving.
2. Inspect and remove plants, animals, mud, dirt and debris. Dispose of plants and animals in a responsible manner. Check your:
    a. Boat, trailer, vehicle (inside and out), equipment; If possible, scrub all equipment or use pressurized air to free it of sediment or debris. Rinse with tap water when possible.
    b. Clothing/footwear, hair and gear (DiVittorio *et al*., 2012).
3. Drain all water from your boat and boat related equipment, including motor, live well, bilge, transom wells and any other equipment and gear used.
4. Drying is the most effective way to minimize risk for many aquatic species; however, a busy work season typically does not allow the 5-7 days needed for a total drying of equipment. If minimum drying time cannot be met, then these instances are considered "high risk" (see below), and disinfecting may be required to prevent the spread of AIS.
5. For high-risk scenarios:
    a. Utilize high pressure washes, hot water washes, or chemical disinfecting, as appropriate OR
    b. Use different gear for each site, if possible.

Additional Ways to Minimize Risk of Spread:

1. Know your management area and level of risk whenever possible (Cal-IPC, 2011). Visit areas without documented invasive species first, followed by least to most infested areas (lowest risk to highest risk).
2. In aquatic environments, consider using waders or boots that are one-piece, rubber and non-felt soled. The more complicated a wader set is, the easier it is for invasive species to hitch a ride (*i.e*., multipiece waders with fabric, detachable boots and felt soles).
3. If possible, conduct activities when the risk of spreading the invasive species is minimal or nonexistent. Avoid traveling in infected sites when propagules of an invasive species are present. Propagules are any part of an organism that can independently grow without the parent (Brooks and Lusk, 2008).
4. Avoid infested areas, if possible.

LEVELS OF RISK

There are a variety of ways vehicles, boats and outdoor equipment can be decontaminated as noted above. Divisions/offices within each department will develop their own tailored decontamination requirements based on best professional judgment when assessing risk. The following work conditions should be considered to assist staff in determining risk. **Only one High Risk criterion needs to be met to elevate the risk level.**

NORMAL RISK
- Visiting a single aquatic site per week.
- Visiting an area but not entering aquatic or terrestrial habitat (*i.e.*, staying on paved surfaces).
- No documented invasive species in the area and none observed during site visit.
- Invasive species known or observed in area have no risk of spreading at the time of the visit (*e.g.,* hemlock woolly adelgid sites in winter).

HIGH RISK
- Visiting multiple aquatic sites in a week.
- In contact with an invasive species-infested site.
- Working in locations with muddy/sticky soil.
- Visiting rare and imperiled communities or known habitat for threatened and endangered species.

PROCEDURAL GUIDANCE FOR DECONTAMINATION BASED ON LEVEL OF RISK

VECTORS

Humans
Situations where visible debris may be picked up are considered normal risk. Situations where humans pose high risk include immersion in water bodies and when dealing with microscopic contaminants, pathogens, and propagules. Decontamination may be necessary in situations where propagules and pathogens are too small to see.

Normal Risk: Basic decontamination steps
1. Physical removal
    a. Remove particles from self, including hair, beard, hands, under nails, *etc.*
    b. Wear clothing (hats, swim caps, long pants, gaiters, etc.) to minimize skin exposure to invasive propagules.

High Risk: Perform steps in normal risk, then appropriate additional following steps
1. Wash hair and facial hair after submerging in water. Use shampoo to wash hair and facial hair to remove any contaminates.
2. If handling microscopic contaminants, wash hands and contaminated skin with soap and water for at least 20 seconds; wipe with clean cloth.
    a. If not possible, use 65% isopropanol hand sanitizer or 70% isopropanol spray and allow to air dry.

Apparel, Gear and Handheld Equipment
Normal risk situations include working in a single body of water or working in a field or forest under relatively dry conditions. High-risk activities include working in muddy conditions, moving between multiple water bodies, or working in an area where high-priority invasive species are known or suspected. For sensitive equipment (*e.g.*, data loggers), always consult the operating manual to determine the manufacturer's recommendation for cleaning.

Examples of apparel and handheld equipment: boots, waders, personal clothing, weed-whips, nets, shovels, rakes, chainsaw, etc.
Normal Risk: Basic decontamination steps
1. Physical removal

a. Cleaning Options
    i. Before leaving a site, remove all sediment, plants, or debris from boots, waders, clothing, shovels, knives and other gear.
    ii. Use a boot brush or pick to remove clods of dirt from boot or wader treads. If there is a nap to clothing material, brushing with the nap will remove plant material and seeds rather than embed it further.
    iii. Use an adhesive roller over all fabric clothing and footwear to remove small or embedded seed and plant material. Bag used adhesive sheets and dispose of in trash.
    iv. Rinse all surface areas with potable water or clear with compressed air, if possible.
    v. Clear out crevices in equipment (*e.g*. run equipment "backwards," light dismantling and brush out, use compressed air to blow out air intake).
b. For aquatic situations,
    i. Drain all water from equipment.
    ii. Flush any pumps with clean water.
    iii. Soak diving equipment (*e.g*., wet suit, mask, snorkel and fins) in a salt solution (½ cup salt per gallon of water) for 30 minutes. Rinse thoroughly with clean water.
    iv. If possible, dry all equipment and gear thoroughly (≥5 days), preferably in the sun, before using in a different water body.

High Risk: Perform steps in the Normal Risk category first and then follow appropriate additional steps.

1. Launder clothing and footwear.
    a. Wash footwear in sink or boot wash station before using in a site.
    b. Use disposable boot covers when appropriate.
    c. (Aquatic) Wash and dry clothing (including flotation and high-vis apparel) before using in a different site.
2. Disinfection: perform the most appropriate of the following:
    a. Clean, soak, or flush equipment with <u>one</u> of the following options:
        i. Household steamer: Expose waders, boots, or clothing to steam for 1 minute.
        ii. Pressurized hot water: Expose other equipment such as shovels, knives, augers, *etc.*, for 10 seconds at 140˚F/60°C.
        iii. Rub plant-cutting tools with 70% isopropanol to kill viruses, nematodes and other pathogens.
        iv. (Aquatic) 500 PPM bleach solution (See Table 2). Apply by spraying or use a sponge so surface is thoroughly exposed to the bleach solution. Contact time should be at least 10 minutes.
        v. (Aquatic) Virkon Aquatic. Soak for 20 minutes. Spray solution so surface is thoroughly exposed to disinfectant.
            1. NOTE: This may constitute use of pesticides as a part of a job. Ensure compliance with Department pesticide use and handling policies. E.g., DNR Policy and Procedure 28.46-03 – Pesticide Use, Storage and Disposal in Department Programs (Revised: 03/22/2023)
        vi. (Aquatic) Formula 409. Spray 100% Formula 409 with a contact time of 10 minutes.
    b. Rinse with clean water.

Vehicles, Trailers and Heavy Equipment
Vehicles that stay on roads have a normal risk of spreading invasive species. Vehicles utilizing "backcountry" roads or other areas with low maintenance schedules pose a higher risk. Vehicles entering areas with or carrying humans and equipment working in areas with high-priority invasive species pose a higher risk.

Whenever possible, park on a paved lot or in an area mowed or maintained with little or no vegetation to minimize contact with plant materials, soils and water to reduce the likelihood of invasive species hitching a ride on your vehicle.

Examples of vehicles: passenger cars, trucks and recreational vehicles such as all-terrain vehicles (ATV) and snowmobiles.
Examples of heavy equipment: tractors, treaded vehicles, MarshMaster.

Normal Risk: Basic Decontamination Steps
1. Physical removal - Before leaving each site visually inspect interior and exterior of the vehicle (Figure 1) and remove plants, animals and debris.
    a. Interior of vehicles.
        i. Inspect and remove debris from interior.
        ii. Shake out interior mats; use rubber/plastic floor mats if possible for ease of cleaning.
    b. Exterior of vehicles.
        i. Knock off all large clods of dirt and any attached materials; a broom, tile shovel, or stick may be useful for hard-to-reach areas.
        ii. Inspect and remove debris from truck bed, windshield and running boards.
        iii. If available, use leaf blower/compressed air to remove debris in hard-to-reach areas.

High Risk: Perform steps in the Normal Risk Category first and then perform appropriate additional steps.
1. Physical removal
    a. Take additional caution when cleaning interior and exterior of vehicles.
        i. Sweep, vacuum, or use compressed air.
        ii. Scrape, brush, or pressure wash soil, debris and plant material from exterior surfaces.
        iii. Equipment with the ability to run fans in reverse should use this feature to clean air intakes.
        iv. Clean with water using a high-pressure washer.

2. Disinfection
    a. Take vehicle through car wash with undercarriage flush.
    b. Disinfect tires, interior mats, *etc.*
    c. Chemical disinfection (bleach, isopropanol) of affected surfaces (*i.e.* cutting/digging and other exposed surfaces) as appropriate (*e.g*. when dealing with microscopic pathogens).

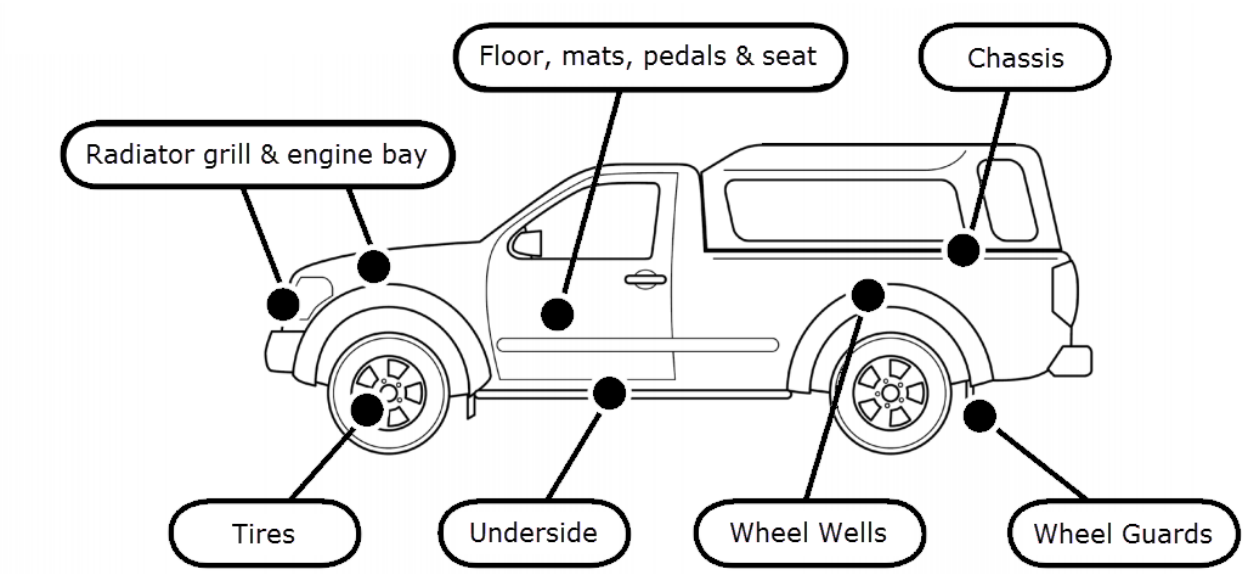

Figure 1: Vehicle with key spots to check and clean. Diagram modified from Clean Equipment Protocol for Industry, Ontario Invasive Plant Council (Halloran *et al*., 2013).

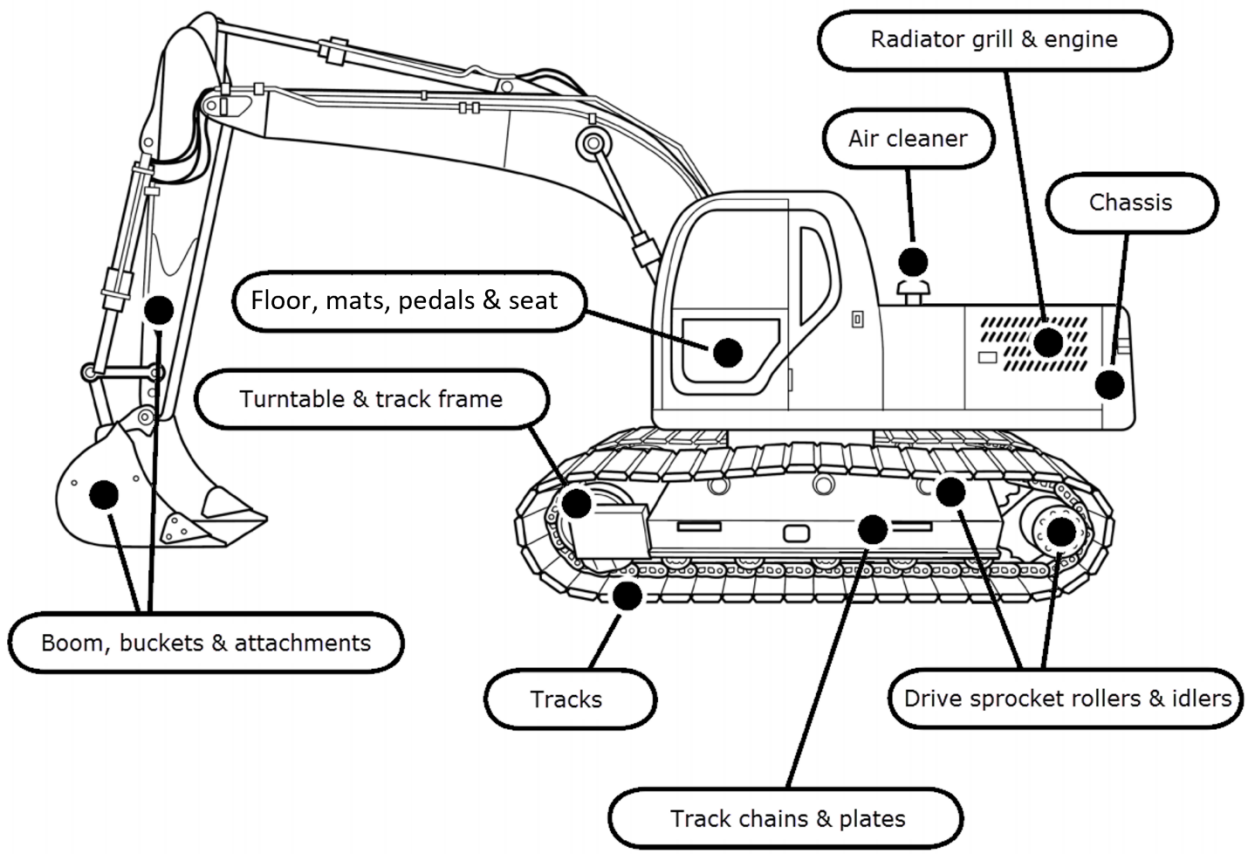

Figure 2: Key spots to check and clean for large equipment. Diagram modified from Clean Equipment Protocol for Industry, Ontario Invasive Plant Council (Halloran *et al*., 2013).

Boats, Boat Trailers and Motors

Boats and equipment that remain in one waterbody have a normal risk of spreading invasive species. Equipment that visits multiple waterbodies, especially without time to dry between visits, pose a higher risk. All parts of the boat, trailer and/or motor exposed to the water are at risk of spreading invasive species, including hulls, live wells and internal motor parts.

By law (NREPA Part 413), debris removal needs to happen before leaving the site – there is often a place to pull over after leaving a launch ramp to avoid creating a traffic backup on the ramp itself.

Whenever possible, use separate equipment for separate waterbodies to reduce the risk of spreading invasive species.

Normal Risk: Basic Decontamination Steps (Figure 2)

1. Physical removal
   a. **Clean** by hand picking or scrubbing attached sediment, plants, or debris from boat, motor and trailer before leaving access area. Rinse all surface areas with potable water, if possible.
   b. **Drain** water from motor, bilges, pumps and live wells at the ramp before leaving.
   c. **Dry** boats & equipment thoroughly before leaving an access area.

High Risk: Perform steps in the Normal Risk Category first and then perform the following additional steps:

1. Clean all surfaces, live wells and bilges of aquatic equipment with <u>one</u> of the following (When using either bleach or Virkon Aquatic, make sure the boat is away from the water body to reduce the chance of the disinfection solution going into surface waters):
   a. Bleach solution; 500 PPM bleach solution (see Table 2). Apply by spraying or use a sponge so surface is thoroughly exposed to the bleach solution. Contact time should be at least 10 minutes.
   b. Virkon Aquatic (20 grams of Virkon powder to 1 liter of water). Spray solution so surface is thoroughly exposed to disinfectant. Leave the solution on for 20 minutes.
   c. Use a hot water pressure washer with a minimum exposure time of 10 seconds at 140°F/60°C to kill most AIS.
   d. Motor flush – flush engine cooling system with fresh tap water at 140°F/60°C for a minimum of 5 minutes at an exiting temperature of 120°F/49°C or at ambient temperature for 10 minutes.

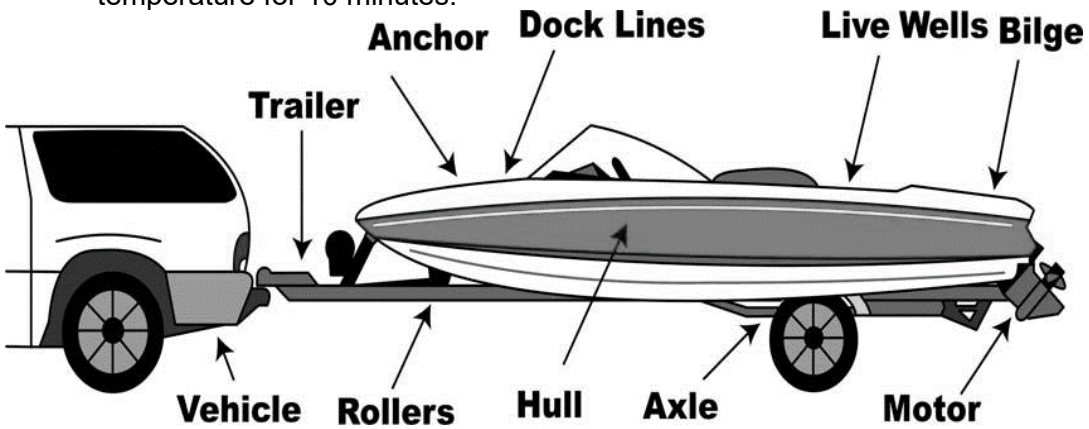

Figure 3: Inspect key areas on boats and trailers for plants, animals, mud, and water. Diagram from California Department of Fish and Wildlife.

Table 1. Summary of decontamination options to help minimize the transfer of invasive species. For High-Risk decontamination, perform all steps in the Normal Risk category first, then perform the decontamination steps in the High-Risk category.

Vectors	Normal Risk *Prior to leaving each site*	High Risk *In addition to normal risk methods*	Tools Needed	Estimated Time
Humans	**Inspect and Remove** • Soil/debris • Plants • Animals	**Clean** • Wash hair prior to next site (as needed e.g., covered in seeds or other propagules). **Disinfect** • Wash hands & contaminated skin or use hand sanitizer.	• Comb/brush • Nail cleaners • Soap, shampoo • Hand sanitizer	5-10 minutes
Apparel Gear Handheld Equipment	**Inspect and Remove** • Soil/debris • Plants • Animals **Drain, Rinse and Dry** (aquatic only)	**Clean** • Launder or otherwise wash items. **Disinfect** • Disinfectant solution OR • Heated pressure wash* or steamer.	• Adhesive roller • Boot brush • Scrub brush • Rinse water • Towels • Heated pressure washer/steamer • Pump sprayer w/ disinfectant	5-15 minutes
Vehicles Heavy Equipment Trailers	**Inspect and Remove** • Soil/debris (interior & exterior) • Plants • Animals	**Clean** • Sweep, vacuum, scrape, pressurized air • Pressure wash OR • Car wash with undercarriage flush. **Disinfect** (for pathogen risk) • Heated pressure wash*. • Chemical disinfection.	• Long-handled brush • Long-handled grabbers • Compressed air and/or vacuum • Pressure washer • Towels • Pump sprayer w/ disinfectant	10-45 minutes
Boats Trailers Boat motors	**Inspect and Remove** • Soil/debris • Plants • Animals **Drain** • Bilges, live wells, pumps **Dry**	**Clean** • Perform freshwater flush on boat motors. **Disinfect** (all surfaces, bilges, *etc*.) • Heated pressure wash or • Disinfectant solution.	• Outboard motor flush muff • Heated pressure washer • Towels • Pump sprayer w/ disinfectant • Long-handled brush • Long-handled grabbers	10-45 minutes

SPECIAL CIRCUMSTANCES

Emergency Situations

There may be some cases, especially in the MDNR's Law Enforcement Division and Forest Resources Division (fire), when staff are required to respond to an emergency. In these cases, safety/rescue/containment is the priority, not equipment decontamination. Situations requiring quick response times because of environmental or human health threats, like pollution emergencies, may require different levels of decontamination methods. The responding agency is responsible for determining priorities and risks to the environment, public health and safety and staff safety.

Birds and Mammals

When handling birds or mammals, attention needs to be given to protecting human health and the health of other animals; it is as important to stop the spread of the diseases as it is to stop the spread of the invasive species.

When dealing with birds or mammals, note that:

- Personal biosecurity is important as there are zoonotic diseases that can be transmitted between people and animals.
- Diseases can be spread by objects such as boots, truck tires, unwashed hands, *etc.* (also called fomites) and through the air. For example, driving a truck containing feral swine infected with pseudorabies virus could allow the disease to be spread to farms along the route of travel.
- Disinfectant choices for birds and mammals may be different than choices for aquatic species or terrestrial plants.
    - Flushing and pressure spraying without disinfectant can spread disease.
    - Using compressed air to clean vehicles could spread disease.
    - Bleach, Virkon® S, TB-Cide, benzalkonium chloride and isopropanol are usually acceptable disinfectants.
    - Virkon Aquatic, Formula 409, vinegar and salt solution are not acceptable disinfectants for birds and mammals.
- If you have questions about personal biosecurity, decontamination, or disinfection pertaining to birds and mammals, contact the MDNR's Wildlife Division or the MDARD's Animal Industry Division.

EXPLANATION OF SELECTED METHODS

Physical Removal

Visual inspection and removal of plants, insects and debris:

Inspecting and removing vegetation by hand picking can reduce the quantity of plants on boats and trailers by 88% (Rothlisberger *et al*., 2010). This method is effective for terrestrial plants as well. Pull vegetation; brush, sweep, or remove mud and seeds; and inspect areas that can hold seeds. Remove vegetation and mud before leaving a site and leave materials on site or dispose of materials in a trash receptacle (LeDoux and Martin, 2013).

Flushing or high pressure washing:

Pressure washing or rinsing physically removes invasive species but does not necessarily kill them (Aquatic Nuisance Species Task Force, 2013). Pressure washing will remove most invasive plants and animals; however, to prevent their spread, power washing should be limited to the actual site location (as defined by the division/office), if possible. Using a wash station or

car wash is more effective if the facility has an underbody blast feature. Washing with a hose and high-pressure nozzle will work well, but getting to the underbody of the vehicle may be more difficult.

Disinfection

Table 2. Breakdown of where disinfection methods are commonly applied. Please note additional details may be included in the text descriptions following the table.

Disinfection method	TIS	AIS	Pathogens
Hot water pressure washing	X	X	X
Bleach	X	X	X
Virkon Aquatic			Aquatic
Formula 409		X	X
Salt Solution		X	
Benzalkonium chloride			TIS
Isopropanol			Terrestrial plants

Hot water pressure washing

Hot water can be an effective tool used to kill many AIS and TIS, including viruses and diseases. Specifically, hot water sprays have been shown to cause 100% mortality of zebra and quagga mussels when sprayed for 10 seconds and 5 seconds, respectively, at 140°F/60°C (Morse, 2009; and Comeau *et al*., 2011). Hot water pressure washers may not be locally available and some commercial hot water car washes cannot reach the recommended 140°F/60°C. A feasible alternative for some equipment and situations is to use a household steamer in conjunction with an additional decontamination method. Household steamers are typically available at grocery or housewares stores.

Chemical treatments

When used appropriately, chemical solutions can effectively kill many AIS and TIS, including viruses and diseases. Many are commonly available and relatively low cost. Care should be taken when mixing, diluting and handling any chemical. It is also important to ensure that products do not make their way into surface waters (either directly as runoff or via storm drains) when being used for decontamination purposes. It is important to properly dispose of any unused products. Items being disinfected should be clean and free of debris (*i.e.* low risk decontamination steps taken) *before* disinfection.

Bleach

Chlorine bleach (*i.e*., household bleach [sodium hypochlorite] or equivalent products) 5.25% (EPA Reg. No. 5813-1) is commercially labeled for use as a disinfectant and is widely available. Be sure to check the amount of active ingredient (sodium hypochlorite) as a more concentrated chlorine bleach can also be purchased, with 8.25% concentration. Bleach should be diluted to 500 PPM for effective invasive species disinfection; therefore, it is important to know the bleach concentration being used and dilute it with the correct amount of water (Table 2). While bleach is effective in killing most invasive species, it may not be as effective for species such as zebra/quagga mussels or New Zealand mudsnails. Bleach can be corrosive to metal, rubber and some fabrics, so care should be taken when using as disinfectant. Bleach will also degrade over time or with exposure to light, rendering it less effective. Always refer to the manufacturer's directions for additional guidance.
SDS: www.thecloroxcompany.com/responsibility/healthy-lives/product-stewardship/sds/

Table 2. Volume of bleach required to achieve 500 PPM concentration in one gallon of water.

Bleach concentration	mL/gallon	Cups/gallon	oz/gallon
8.25%	22.94	0.097	0.78
5.25%	36.05	0.15	1.22

- Apply by spraying or using a sponge to thoroughly expose the surface to the bleach solution. Contact time should be at least 10 minutes. Some gear types may require rinsing with tap water after contact with bleach.
- Chlorine bleach degrades over time and its effectiveness as a disinfecting agent is diminished. After opening the original bottle of bleach, it may only be used for a maximum of two months. Write the date the container was opened on the original container. Bleach is best stored out of heat and sun.
- Use diluted bleach within a 24-hour period because chlorine dissipates rapidly. The words "Bleach Solution" and the date and time of dilution must be written on the container holding the diluted bleach.
- Dispose of unused bleach and diluted bleach solution into a sanitary sewer.
- **Caution should be taken to not mix chlorine bleach with other chemicals (*e.g.*, vinegar). After using bleach, rinse well with water and before applying any additional chemicals.**

Staff may elect to rinse equipment with sodium thiosulfate after using bleach for decontamination to neutralize chlorine and reduce potential damage to equipment. Follow label instructions for use and disposal.

Virkon Aquatic®
Virkon Aquatic is a contact disinfectant in the hydrogen peroxide family. It is a powder and 99.9% biodegradable. It breaks down to water and oxygen and is not corrosive at the working dilution. Note: Virkon Aquatic is labeled for use only as a bactericide and viricide. Do not depend on its use against other invasive species, including invertebrates, plants and vertebrate species. One study showed a 15-20 minute bath immersion of 20 grams per liter (g/L) Virkon Aquatic was effective in killing 99% of New Zealand mudsnails (Stockton and Moffitt, 2013). Always refer to the manufacturer's directions for additional guidance.
SDS: syndel.com/wp-content/uploads/2019/01/VirkonTM-Aquatic-USA.pdf

- NOTE: This may constitute use of pesticides as a part of a job. Ensure compliance with Department pesticide use and handling policies. E.g., DNR Policy and Procedure 28.46-03 – Pesticide Use, Storage and Disposal in Department Programs (Revised: 03/22/2023)
- Prepare Virkon Aquatic by mixing 20 grams per liter of water.
- Apply straight to surfaces by spraying or using a sponge so surface is thoroughly exposed to the Virkon Aquatic solution. Contact time should be at least 20 minutes.
- Use Virkon Aquatic within 7 days post-mixing because the product degrades. The word "Virkon" and the mix date should be written on the container holding the solution.
- Dispose of unused Virkon Aquatic into a sanitary sewer.

Formula 409® Antibacterial All-Purpose Cleaner
Formula 409 is a popular household disinfectant and can be purchased at any grocery store. The active ingredient in Formula 409 is Alkyl C1216 Dimethylbenzyl Ammonium Chloride. A 10-minute submersion treatment of 100% Formula 409 causes 100% mortality in New Zealand mudsnails (Schisler *et al*., 2008; Geist *et al*. 2022). In 2023, a small study conducted by the Great Lakes Environmental Center with funding by EGLE found that

Formula 409® Antibacterial All-Purpose Cleaner was also effective on Didymo. In as little as 1 minute of exposure, survival of Didymo cells can be reduced by over 60% (unpublished data). In addition to the documented effectiveness, anglers have also indicated Formula 409 is more likely to be used compared to bleach and Virkon Aquatic (Geist *et al.* 2022).

- Other Formula 409 products and other products marketed as all-purpose cleaners have not been tested and should not be substituted for Formula 409® Antibacterial All-Purpose Cleaner. Look for "EPA Reg. No. 5813-73" on the product's label to ensure you're choosing the right product.
- Because Formula 409® is not labeled for aquatic uses, the product should be applied to waders and gear on land, at a reasonable distance from the water, to avoid accidental discharge into surface waters. Always refer to the manufacturer's directions for additional guidance.

SDS: www.easternct.edu/environmental-health-and-safety/documents/409_MSDS.pdf

Salt solution
Table salt (sodium chloride) is an effective decontamination method for certain species and gear. Zebra and quagga mussel veligers are killed when gear is submersed in a salt solution (½ cup salt per gallon of water) for 30 minutes (Kilgour and Kepple 1993). Dispose of salt solution into a sanitary sewer.

*Benzalkonium chloride (*i.e. *Lysol):*
Recommended for use to eliminate bacteria, fungi and viruses, on small hand tools like pruners. Does not corrode metal or damage fabric. Spray directly or soak for 2 minutes (undiluted or diluted 1:5) and let air dry (Teviotdale *et al.*, 1991). Always refer to the label/manufacturer's instructions for use.
SDS example: content.oppictures.com/master_images/master_pdf_files/rac04675easds.pdf

Isopropanol
When working with plant pathogens, rubbing alcohol (isopropyl alcohol, isopropanol; 70%) is an effective method of decontamination (though less effective than bleach or Lysol; Teviotdale *et al.*, 1991) that may pose a lower risk to tool degradation. Spray directly and wipe, then leave to dry. Shelf life is indefinite if sealed and kept in a cool, dry place. Small amounts of unused alcohol may be disposed of via a sanitary sewer.
SDS example: www.airgas.com/msds/001105.pdf

SAFETY PRECAUTIONS

When using chemicals for disinfection, certain safety protocols should always be followed. Read the Material Safety Data Sheet or Safety Data Sheet and product labels for chemicals being used and follow instructions to avoid inhalation and eye/skin irritation problems. Wear chemical splash goggles, gloves and an apron to prevent contact with eyes or skin. Spray downwind.

When decontaminating equipment (*e.g.*, the underside of mowers), crew safety must always be a priority. Use best professional judgment and consider safety in every decontamination step.

EQUIPMENT, SUPPLY, & ACCESS LIST

Depending on the type of decontamination method chosen by the division/office, items that may be needed include:

- ☐ Boot brush
- ☐ Screwdriver or hoof pick
- ☐ 5-gallon bucket(s)
- ☐ Spray bottles (*e.g.*, hand-held sprayers used for pesticides)
- ☐ Adhesive rollers
- ☐ Hand sanitizer, soap, shampoo, comb, nail cleaner
- ☐ Handheld brush
- ☐ Trash bags
- ☐ Household steamer
- ☐ Broom (small and/or long handle)
- ☐ Shovel
- ☐ Vacuum
- ☐ Pressure washer
- ☐ Air compressor
- ☐ Towel
- ☐ Fresh water
- ☐ Boat/car wash station
- ☐ Chemical disinfectants (*e.g*. bleach, salt, Virkon, Formula 409)
- ☐ Personal protective equipment (*e.g.*, chemical goggles, gloves, apron)

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