



Ontario 

# Best Management Practices for Preventing the Spread of Aquatic Invasive Species

Guidance for watercraft users

[ontario.ca/invasivespecies](https://ontario.ca/invasivespecies)

ISBN 978-1-4868-5380-9 PDF

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Printed in Ontario, Canada

How to cite this document:

Ministry of Northern Development, Mines, Natural Resources and Forestry 2021.  
Best Management Practices for Preventing the Spread of Aquatic Invasive Species –  
Guidance for Watercraft Users. Queen's Printer for Ontario. Toronto, ON.

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Cover photo: Matt Vardy

## PREAMBLE

The best management practices (BMPs) outlined in this document are intended to provide practical options to help those who transport watercraft or watercraft equipment overland in Ontario to comply with provincial rules<sup>1</sup>. This document also includes additional steps that boaters may wish to take to enhance measures aimed at preventing the spread of aquatic invasive species in Ontario.

## INTRODUCTION

### Purpose

The purpose of the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) Best Management Practices for Preventing the Spread of Aquatic Invasive Species is to provide watercraft (e.g. a boat) users with practical, effective methods to decontaminate watercraft and watercraft equipment before transporting them to new waterbodies. The movement of watercraft and watercraft equipment between waterbodies is a significant pathway for the spread aquatic invasive species (AIS). By following the BMPs outlined in this document, boat users will reduce the risk of spreading AIS.

These BMPs are intended for use by anyone who transports a watercraft or watercraft equipment overland. They are based on best available knowledge of the most effective and environmentally safe control practices.

### Invasive Species Act and Regulations

In 2016 Ontario's Invasive Species Act (ISA) came into force. The ISA gives Ontario the tools to manage invasive species by regulating activities which may lead to their introduction or spread.

As of January 1st, 2022, under Ontario Regulation 354/16 it is now mandatory to clean and drain watercraft (e.g. a boat) and watercraft equipment when transporting them overland in Ontario. These rules are intended to reduce the movement of AIS between waterbodies attached to or moved with watercraft and watercraft equipment.



Pressure washing  
Photo: Invading Species Awareness Program

### Definitions:

“Watercraft” means any conveyance used or designed for navigation on water, including a motorboat, rowboat, canoe, punt, sailboat or raft;

“Watercraft equipment” means any thing that is used to aid in the operation, movement or navigation of a watercraft including ropes, fenders or anchors.

For additional information, visit the government website or read the full text of the legislation on e-Laws using the links provided below.

[Managing invasive species in Ontario](#)

[Invasive Species Act, 2015 on e-Laws](#)

[Ontario Regulation 354/16 on e-Laws](#)

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1. These best management practices are intended to complement legal requirements. They are not themselves legal requirements or approvals and must not be taken to be, and they are subject to and do not replace legislation or legally binding documents of other kinds. Those who transport watercraft or watercraft equipment overland in Ontario must be familiar with and remain responsible for complying with all applicable legislation and other legal requirements.



## BACKGROUND

Invasive species are defined as harmful non-native species whose introduction or spread threatens the environment, the economy, or society, including human health. AIS can include aquatic plants, algae, invertebrates, fish, and pathogens. While some AIS are not visible to the naked eye, many species are large enough to see and can be easily removed by hand. Species that are hard to see may be difficult to remove by hand (e.g. species that are very small or that are firmly attached to surfaces like zebra mussels) and may require a little more effort, but can still be effectively removed by following some simple decontamination procedures such as the ones outlined in this document.

AIS may be hidden in various places on watercraft or equipment. Pieces of aquatic plants such as Eurasian water milfoil (*Myriophyllum spicatum*) can become wrapped on the boat motor or trailer. Small, hard to see invaders such as very young zebra mussels, called “veligers” (*Dreissena polymorpha*), and spiny waterfleas (*Bythotrephes longimanus*) can be hidden in lake or river water stored in the bilge,

livewells, or other parts of the watercraft or equipment. If these invaders are not removed, they can hitch a ride from one waterbody to another. Once AIS become established in a new waterbody, it is extremely difficult, costly, and often impossible to eradicate them. Therefore, prevention is critical for stopping the spread and establishment of AIS in new waterbodies.

These BMPs and the associated regulation under the ISA are based on the assumption that every waterbody may contain AIS; therefore, boats and equipment should always be considered contaminated. As such, all watercraft and equipment must be decontaminated before being moved overland and prior to reaching a launch site. Not all of the decontamination methods outlined in these BMPs are practical to implement in each situation. Thus, it is important for individuals transporting watercraft and equipment to choose and implement a specific suite of decontamination procedures according to location, time of year, available resources, and watercraft or equipment type.



Contaminated watercraft and trailer

Photo: Heather Smith, Ontario Federation of Anglers and Hunters

## DECONTAMINATION METHODS

### VISUAL INSPECTION AND MANUAL REMOVAL



A visual inspection of boats, trailers, and equipment is always the **first step** in the decontamination process. Visually inspect equipment for aquatic plants, animals, or mud that may be attached and remove any that are found. Pay attention to hard to reach, or hidden spaces that may hide or trap organisms and other material. Visual inspection should be carried out immediately upon removing the watercraft and equipment from the water to prevent the spread of organisms to new waterbodies. **When removing a watercraft from a body of water, boaters are required to take reasonable precautions to remove any aquatic plants (weeds), animals, and algae from any boat, boat equipment, vehicle, or trailer before transporting a boat or boat equipment overland.** Removed plant parts, animals, or mud can be disposed of in a garbage can. If a garbage can is not available, dispose of these materials on dry land at least 30 metres from any waterbody.

### DRAIN WATER



**When removing a watercraft from a body of water, boaters are required to remove or open drain plugs to allow water to drain from the boat or boat equipment before transporting a boat or boat equipment overland.**

Water (e.g. bilge, livewells, fish-holding containers) must be drained from boats or equipment at the waterbody where it came from. For outboard motors, when on dry land, drain all water starting with the motor in the operating position then trimming (pull up) motor up, and tip the motor from side to side to drain additional water.

If the motor is being removed from the boat, stand the motor upright to allow the water to drain from the engine. The engine cooling system should also be fully drained and then flushed with clean water if available.

### SCRUB WITH BRUSH, SOAP, AND RINSE



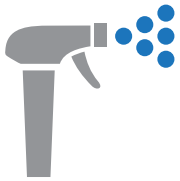
A watercraft-friendly brush may be used with water to help remove AIS from your watercraft and equipment, or to clean hard to reach areas. A watercraft-friendly soap can be added to the water to increase effectiveness.

After completing the visual inspection and manual removal step outlined in this guide, scrub your boat and gear thoroughly using your brush and soapy water. This step can be completed at home or at your watercraft storage facility. Make sure the wash water draining off your watercraft and equipment will not drain into and contaminate another river or lake.

Rinsing your boat down with hot water if available will maximize effectiveness. If hot or pressurized water is not available at your wash site, rinse your boat with cold water.



## PRESSURE WASHING



Pressure washers are an effective method for removing aquatic plant parts, animals, and mud that can attach to the surface of boats and equipment and that may not be easily visible at the boat launch site.

While using any pressure washer will help with the removal of AIS, use of a pressure

washer that reaches at least 1,000 psi has been shown to be most effective to ensure that all organisms attached to boats and other equipment are dislodged. When using a pressure washer to clean boats or equipment it is important to ensure thorough coverage of all surfaces which may harbour attached organisms that may not be visible to the naked eye, and to ensure removed materials are not draining towards a new waterbody. To be most effective, pressure washing should occur with the nozzle at a slight angle and approximately 30 cm from the boat hull and equipment. Care should be taken when pressure washing sensitive equipment to avoid damage to your boat or equipment. This method can be completed at home or off-site where equipment is stored, as long as it is done before launching in any waterbody.

While pressure washing is effective at removing aquatic invasive species, it does not necessarily kill the attached organisms. However, a combination of either air drying, hot water treatment, or chemical decontamination (described below) prior to pressure washing is effective at both killing and removing all aquatic invasive species.

Note, pressure washing may not be appropriate for all types of equipment, such as fragile equipment like fish finders or underwater cameras.

## HOT WATER



For this method, rinse or spray watercraft and equipment with hot water ensuring that all surfaces being cleaned receive a minimum of 10 seconds of exposure to the hot water.

Equipment or gear such as ropes, nets, or anchors can also be soaked in hot water for at least 30 seconds, ensuring that the item is

completely submerged and in direct contact with water at all times. Hot water is also useful for decontaminating areas such as livewells and bilges. While some species are killed at lower temperature, to ensure that all aquatic organisms are killed or destroyed, hot water needs to be at least 60°C. Note that most tap water, hot water pressure washers, and self-serve car washes may not provide water hot enough for effective disinfection, so additional heating may be required. At the time of this publication, the Ontario Building Code regulates household hot water to be maintained at 45°C to 60°C. If sufficient temperatures cannot be reached, a combination of hot water and drying (see below) is recommended. Alternatively, the use of steam (see below) can achieve high temperatures necessary to kill aquatic organisms.

This method can be completed at home or off-site where equipment is stored, as long as it is done before launching in any waterbody. While hot water is effective at killing aquatic invasive species, it may not be sufficient to dislodge or remove attached organisms from your watercraft or equipment. To ensure that all aquatic organisms are removed from your watercraft or equipment prior to launching in any waterbody, this method is most effective when combined with pressure washing.

Note that hot water can delaminate Gore-Tex® fabric and damage other sensitive clothing items or equipment. Before beginning to clean or decontaminate clothing or equipment, consult the owner's manual and the manufacturer's specifications to make sure the areas or items being treated can withstand required temperatures.



## STEAM



The use of steam is an effective method for destroying aquatic organisms and pathogens and decontaminating watercraft and equipment. It is a good alternative for items or equipment that may be

too fragile for pressure washing, or that cannot be treated with chemicals. This method is also useful to decontaminate items or areas that cannot be fully dried due to time constraints. Steam cleaning is particularly effective for areas that are hard to reach with pressure washing or hot water including bilge, livewells and other confined spaces.

This method can be achieved with the use of household steam cleaners or steamers, which are relatively inexpensive and readily available for sale. To ensure maximum effectiveness when decontaminating with steam, use short strokes of the spray nozzle and maintain steam contact with all surfaces for at least 30 seconds.

This method can be completed at home or off-site where equipment is stored, as long as it is done before launching in any waterbody. While steam cleaning is effective at killing aquatic invasive species, it may not be sufficient to dislodge or remove attached organisms from your watercraft or equipment. To ensure that all aquatic organisms are removed from your watercraft or equipment prior to launching in any waterbody, this method is most effective when combined with pressure washing (see above).

Be careful when steaming over items held together with adhesives, or items made of material which may not be resistant to high temperatures. High steam temperatures can melt surfaces and bonds. Be sure to avoid decals, as the heat may remove or damage them.

Take extra caution when using a steam cleaner to avoid burns. The use of proper personal protective equipment such as heat resistant gloves and clothing is recommended. Refer to the equipment's operation manual to learn about safe operation.

## DRYING



If there is sufficient time to do so, watercraft and equipment should be dried prior to launching in any waterbody. During hot, dry summer temperatures, at least 5 days of sunny weather is sufficient to kill most AIS, but a longer drying time of 10 to 30 days is required to effectively kill AIS during cool, damp weather. If possible, it is recommended that this method be combined with other appropriate methods (for example using the pressure washing method or cleaning with hot water along with the drying method). When combining these methods, drying time can be reduced to 12 hours. Wiping surfaces with a cloth to dry your watercraft and equipment will also significantly improve the effectiveness of AIS removal.

While drying for the recommended minimum time is effective at killing most aquatic invasive species, it is not sufficient to dislodge or remove attached organisms from your watercraft or equipment. To ensure that all aquatic organisms are removed from your watercraft or equipment prior to launching in any waterbody, this method is most effective when combined with pressure washing or manual washing (see above).

## EXPOSURE TO SUB-FREEZING TEMPERATURES



-10°C

Most aquatic organisms cannot survive prolonged exposure to very low temperatures. Exposing watercraft or equipment to temperatures below -10°C for three consecutive days is an effective decontamination method that can be used to kill AIS.

Note that exposure to sub-freezing temperature will not dislodge or remove attached organisms from your watercraft or equipment. To ensure that all aquatic organisms are removed from your watercraft or equipment prior to launching in any waterbody, this method is most effective when combined with pressure washing or manual washing (see above).

## CHEMICAL TREATMENTS



Decontamination with common household chemicals can be used as an alternative to other decontamination methods listed above to kill certain AIS. Note that chemical treatments will not necessarily dislodge or remove attached organisms from your watercraft or equipment. To

ensure that all aquatic organisms are removed from your watercraft or equipment prior to launching in any waterbody, these methods are most effective when combined with pressure washing or manual washing (see above). When decontaminating in the field, use chemicals and complete all rinsing activities on land and away from waterbodies (i.e. so that chemicals will not flow into natural waters and harm or kill native organisms).

NOTE: When using chemicals for disinfection, certain safety protocols should always be followed. Read the Material Safety Data Sheet (MSDS) and product labels for chemicals being used (e.g. bleach). Follow necessary precautions and wear appropriate protective equipment (gloves, safety glasses, etc.). Some chemicals are not appropriate for some materials and may damage some surfaces. Always research whether a chemical is safe to use on the surface to be treated, and test on a small area before use.

### BLEACH



A solution of 20 mL of household bleach to 1 L of water can be used to wash down transportation equipment, boats, trucks, motors or trailers. Disinfection with bleach may be of particular use to decontaminate hard to reach/spray areas like livewells and bilges, and for equipment that can be soaked for

30 minutes. A solution of 100 mL of household bleach to 900 mL of water is recommended if you suspect the presence of invasive pathogens or diseases, including Viral Hemorrhagic Septicemia (VHS). For more information on VHS in Ontario, and guidelines to prevent its spread visit: <https://www.ontario.ca/page/viral-hemorrhagic-septicemia-vhs>.

When considering the use of bleach for decontamination please be aware of the following:

- While it is effective at killing most AIS, in particular fish diseases such as VHS, bleach has not been shown to be effective at killing spiny water flea resting eggs, New Zealand mud snail or Asian clam.

- Bleach is a caustic substance that can be corrosive to metal and rubber and other sensitive fishing and boating equipment. However, these effects can be reduced by thoroughly rinsing equipment with clean water after disinfection is complete.
- **Caution should be taken to never mix chlorine bleach with other chemicals** (e.g. vinegar). After using bleach, rinse well with water before applying other chemicals.

### VINEGAR



Because of its acidic properties, vinegar is effective at dissolving zebra/quagga mussel shells and can therefore be used to decontaminate watercraft or equipment where these organisms may be suspected. However, there have been no peer reviewed studies investigating vinegar as a disinfectant for other invasive species.

For this method use white distilled vinegar without dilution. White distilled vinegar can be purchased at any grocery store. Apply by spraying or use a sponge to ensure that the surface being treated is thoroughly exposed to the vinegar. Alternatively, equipment could be submerged in undiluted vinegar. Contact time should be at least 60 minutes.

**Caution should be taken to never mix vinegar with chlorine bleach.**

### SALT












The use of a table salt (sodium chloride) solution can be an effective decontamination method for equipment that can be safely submerged in salt water. Salt water will kill many freshwater AIS. For this method, fully submerge equipment in a solution of 10-15 mL (or approximately 1 tablespoon) of table salt per 1 L of water for 24 hours. Rinse equipment well with clean water after treating in salt water.






## DECONTAMINATION METHODS QUICK REFERENCE TABLE

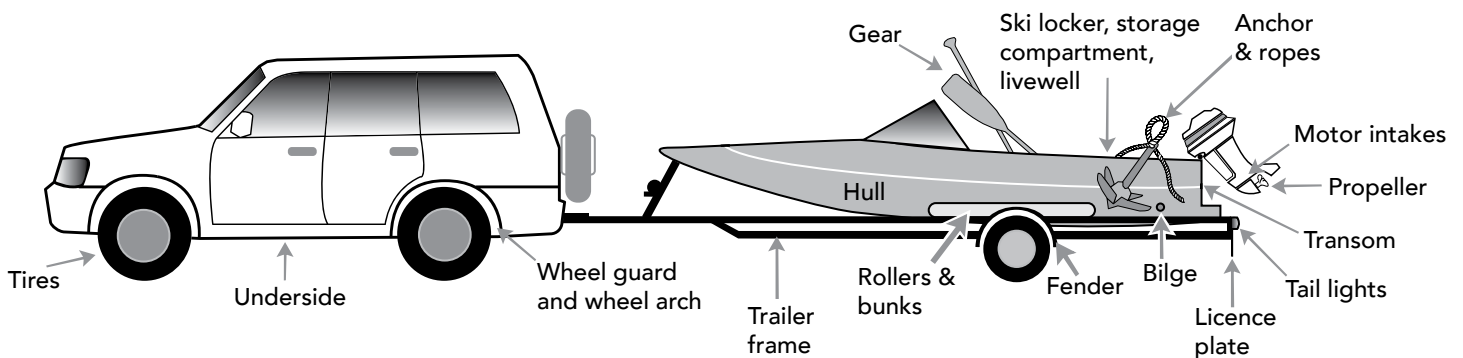
Note: Not all decontamination methods in these BMPs are practical in each situation. It is important to choose and implement a specific suite of decontamination procedures according to location, time of year, available resources, and equipment type. For maximum effectiveness, try to combine a method which both **removes AND kills** aquatic organisms. For example, visual inspection and hand removal combined with drying time.

Method	Description	Additional consideration	Kills organisms?	Removes organisms?
<b>Visual inspection and hand removal</b> 	Visually inspect equipment for aquatic plants, animals, or mud that may be attached and remove any that are found by hand.	<p>This is always <b>the first step</b> in the decontamination process and should be undertaken as soon as the boat and equipment is removed from the water body.</p> <p><b>When removing a watercraft from a body of water, boaters are required to take reasonable precautions to remove any aquatic plants (weeds), animals, and algae from any boat, boat equipment, vehicle, or trailer before transporting a boat or boat equipment overland.</b></p>	No	Yes
<b>Drain all water</b> 	Drain all water from watercraft and equipment (e.g. bilge, livewells, fish-holding containers). Water must be drained from boats or equipment at the waterbody where it came from.	<p>This step should be undertaken as soon as the watercraft is removed from any waterbody.</p> <p><b>When removing a watercraft from a body of water, boaters are required to remove or open drain plugs to allow water to drain from the boat or boat equipment before transporting a boat or boat equipment overland.</b></p>	No	Yes
<b>Scrub with brush, soap and rinse</b> 	After completing the visual inspection and manual removal step outlined above, scrub your boat and gear thoroughly using a watercraft friendly brush (or something similar) and hot water if available. Soap can be added to the hot water to increase effectiveness.	<p>This step can be completed at home or at your watercraft storage facility.</p> <p><b>Boaters are required to ensure their boat, boating equipment, vehicles, or trailers are free of any aquatic plants, animals, and algae before reaching a launch site, or placing a watercraft in any body of water in Ontario. It is illegal to place a boat, boating equipment, or any vehicle or trailer into any body of water if there are any aquatic plants, animals or algae attached to it.</b></p> <p>Rinsing your boat down with hot, or pressurized water if available will maximize effectiveness.</p>	No	Yes
<b>Rinse with hot water (60°C or higher)</b> 	Rinse or spray watercraft and equipment with hot water ensuring that all surfaces being cleaned receive a minimum of 10 seconds of exposure to the hot water.	This method can be completed at home or off-site where equipment is stored. While hot water is effective at killing AIS, it may not be sufficient to dislodge or remove attached organisms from your watercraft or equipment.	Yes	No

Method	Description	Additional consideration	Kills organisms?	Removes organisms?
<b>Submerge in hot water</b> (60°C or higher) 	Equipment or gear such as ropes, nets, or anchors can be soaked in hot water for at least 30 seconds, ensuring that the item is completely submerged and in direct contact with water at all times.	This method can be a good alternative for items or equipment that may be too fragile for pressure washing, or that cannot be treated with chemicals.	Yes	No
<b>Steam</b> 	Using a household steam cleaner or steamer apply short strokes of the spray nozzle and maintain steam contact with all surfaces for at least 30 seconds.	This is an effective method for killing aquatic organisms and pathogens to decontaminate watercraft and equipment. It is a good alternative for items or equipment that may be too fragile for pressure washing, or that cannot be treated with chemicals.	Yes	No
<b>Pressure Washer</b> (1,000 PSI) 	Pressure washing should occur with the nozzle at a slight angle and approximately 30 cm from the boat hull and equipment.	While pressure washing is effective at removing AIS, it does not necessarily kill the attached organisms. A combination of either air drying, hot water treatment, or chemical decontamination prior to pressure washing is effective at both killing and removing all aquatic invasive species.	No	Yes
<b>Drying Time</b> 	During hot, dry summer temperatures, <b>at least 5 days</b> of sunny weather is sufficient to kill most AIS, but a longer drying time of <b>10 to 30 days</b> is required to kill AIS during cool, damp weather.	Time permitting, this method is very effective at killing AIS. It is recommended that surfaces are wiped with a cloth, sponge, or something similar to dry your watercraft and equipment first. This will significantly improve the effectiveness of AIS removal.	Yes	No
<b>Exposure to sub-zero (below freezing) temperatures</b> (below minus 10°C) 	Expose watercraft or equipment to temperatures below -10°C (minus 10°C) for three consecutive days.	This method is effective to kill AIS and can be completed using a standard freezer set to a temperature of -10°C or lower, or in winter months with sustained cold temperatures.	Yes	No

Method	Description	Additional consideration	Kills organisms?	Removes organisms?
<b>Household Bleach</b> (5.25 to 8.25% sodium hypochlorite) 	A solution of 20 mL of household bleach to 1 L of water can be used to wash down watercraft and equipment.  Note: A solution of 100 mL of household bleach to 900 mL of water is recommended if you suspect the presence of invasive pathogens or diseases such as Viral Hemorrhagic Septicemia (VHS).	Disinfection with bleach may be of particular use when in remote locations, to decontaminate hard to reach/spray areas like livewells and bilges, and for equipment that can be soaked for 30 minutes.	Yes	No
<b>Vinegar</b> 	Use white distilled vinegar without dilution which can be purchased at any grocery store. Apply by spraying or use a sponge to ensure that the surface being treated is thoroughly exposed to the vinegar. Alternatively, equipment could be submerged in undiluted vinegar. Contact time should be at least 60 minutes.	Vinegar is effective at dissolving zebra/quagga mussel shells and can therefore be used to decontaminate watercraft or equipment where these organisms may be suspected. However, there have been no peer reviewed studies investigating vinegar as a disinfectant for other invasive species.	Yes	No
<b>Table Salt</b> (sodium chloride) 	Submerge equipment in a solution of 10 mL of table salt per 1 L of water for 24 hours.	This method can be a good alternative for items or equipment that may be too fragile for pressure washing, and when access to alternatives such as hot water is unavailable.	Yes	No

### Where to look for Aquatic Invasive Species





## CONSIDER THE RISK

On Jan 1, 2022, Ontario introduced regulations requiring specific actions to clean and drain watercraft when traveling overland. This regulation requires boaters take reasonable precautions to remove any aquatic plants, animals, or algae, and drain all water from the bilge, livewell etc. before transporting the watercraft overland. In addition, all watercraft must be free of any aquatic plants, animals or algae before transporting it to a launch site or launching it into any waterbody (see above for a more detailed explanation of regulatory requirements).

While these requirements will significantly reduce the risk of spreading aquatic invasive species, additional decontamination measures may be taken to increase effectiveness and are strongly recommended, especially if the movement of your watercraft is considered to be a higher risk activity to spreading AIS. The following list outlines some examples of higher risk activities for the spread of AIS. Note this is not an exhaustive list, and is intended to provide only some examples of high risk activities:

High risk activities for the spread of AIS by watercraft transporting between waterbodies:

- Moving watercraft to a new waterbody which have been moored (docked) in a waterbody for more than one day.
- Moving watercraft over long distances, especially across watershed boundaries.
- Moving watercraft from waterbodies known to contain high risk or regulated invasive species. (visit [www.eddmaps.org/ontario](http://www.eddmaps.org/ontario) to see distribution maps of invasive species in Ontario).
- Moving watercraft between waterbodies within a very short period of time (e.g. within the same day, or over the course of a weekend).
- Moving watercraft which has been exposed to areas containing high amounts of aquatic plants (for example, a fishing boat in a small bay with many aquatic plants (also known as weeds).