

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

Aquatic Invasive Species (AIS) Watercraft Decontamination Handbook for Lake Service Providers



June 2013



**STOP AQUATIC
HITCHHIKERS!**

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Portions of this handbook were adapted with permission from a publication originally produced by the Colorado Division of Wildlife and State Parks with input from many other partners in Colorado and other states.

Why watercraft decontamination?

Aquatic invasive species (AIS) such as zebra or quagga mussels are able to travel long distances over land on watercraft, either attached to the hull, on aquatic plants, or in on board water. They can survive up to 30 days out of water depending on temperature and/or humidity. Through an extensive education, inspection, and decontamination program, we can more effectively reduce the spread of these costly invasives in Minnesota and beyond. Once detected on watercraft, zebra mussels and other AIS can safely and effectively be killed and removed from the watercraft or other water-related equipment by authorized personnel to protect state waters from invasion.

The State of Minnesota prohibits the possession, import, purchase, sale, propagation, transport, or introduction of prohibited invasive species, except in the cases laid out on page 7 of this manual. The statutes additionally state that inspection of watercraft is an express condition of operating or transporting water-related equipment. This includes decontamination (defined on page 6 of this manual) when a watercraft fails to pass inspection by an authorized inspector or licensed peace officer.

The object of decontamination is to kill and remove, to the extent practical, all visible mussels or suspected AIS. Killing AIS prevents establishment of new populations as a result of watercraft/equipment transfer.

What does watercraft decontamination consist of?

The MN DNR protocol requires the use of hot, high-pressure water to decontaminate boats, motors, trailers, personal gear, and other water-related equipment. The objective of decontamination is to KILL, REMOVE, and FLUSH to the extent practical all visible mussels, aquatic plants, and infested water. Killing prevents the establishment of new populations as a result of undetected AIS on watercraft/equipment during transport.

Watercraft decontamination consists of a very hot water rinse and spray at high pressure. There are no soaps, bleaches, or chemicals used or recommended at this time. Use of any of the aforementioned substances would just result in them being rinsed off in the next water body the watercraft or equipment is placed in. The hot water kills the AIS, and the high pressure removes them.

The general recommendation is to use 140 °F water at high pressure (2,500 psi) to decontaminate the hull and 140 °F at low pressure to decontaminate motors/engines. Interior compartments are decontaminated with 120 °F water at low pressure to avoid damaging pumps.

At 140 °F (60 °C) hot water rinse for 10 seconds to each spot will kill all adult mussels.

A 0% survival rate of mussel veligers (larvae) has been shown in water temperatures of 95 °F (35 °C) and above, therefore rinsing the interior compartments at 120 °F during standing water flushes will kill the veligers. This research reinforces the importance of standing water decontaminations for boats leaving infested waters, even if no adults are found on the vessel. Research on other species also supports the use of 140°F water to kill Eurasian watermilfoil, faucet snails, New Zealand mud snails, and spiny water fleas at various exposure times.

What types of decontaminations will I do?

There are different aspects of watercraft decontaminations you may need to perform. Each will be described in greater detail later in the manual. You will perform decontaminations as needed and document how many, and what kind were conducted in your handheld device.

Decontamination for suspected or known mussels or other AIS:

This protocol is to be followed when adult mussels, faucet snails, unidentifiable bumps, or other AIS are detected on the watercraft. This decontamination is the most comprehensive and ensures that the watercraft has been completely decontaminated inside and out. This will involve rinsing and spraying the hull, as well as a residual water and motor flush. Perform a hot-water rinse for aquatic plants that cannot be removed by hand.

Decontamination for suspected water:

This protocol is performed to kill and flush veligers or other microscopic AIS in water that can't be fully drained from the watercraft/equipment. This decontamination applies to interior compartments that contain water or have equipment that come in contact with the water body. The interior compartments include, but are not limited to: live wells, bait wells, bilge areas, and ballast tanks. Residual water decontamination also includes flushing the outboard motor, inboard/outboard engine, or inboard engine of watercraft.

Residual water decontamination is **mandatory** if:

- The watercraft is from a zebra mussel, spiny waterflea, or other unverifiable water;
- There is residual water after draining;
- Ballast tanks have water or unverifiable water in them; or
- The watercraft is unable to be fully drained and the water can't be sponged, towed, or pumped out.

The residual water decontamination requires that ballast/bilge pump temperature ratings be taken into account when flushing or rinsing a compartment for residual water. Some, but not all, marine pumps are rated to withstand temperatures about 140 °F. If the pump is rated below that temperature and is flushed with water that hot, damage could occur. For this reason, the protocol requires turning the temperature down to 120 °F for all residual water flushes and interior decontamination.

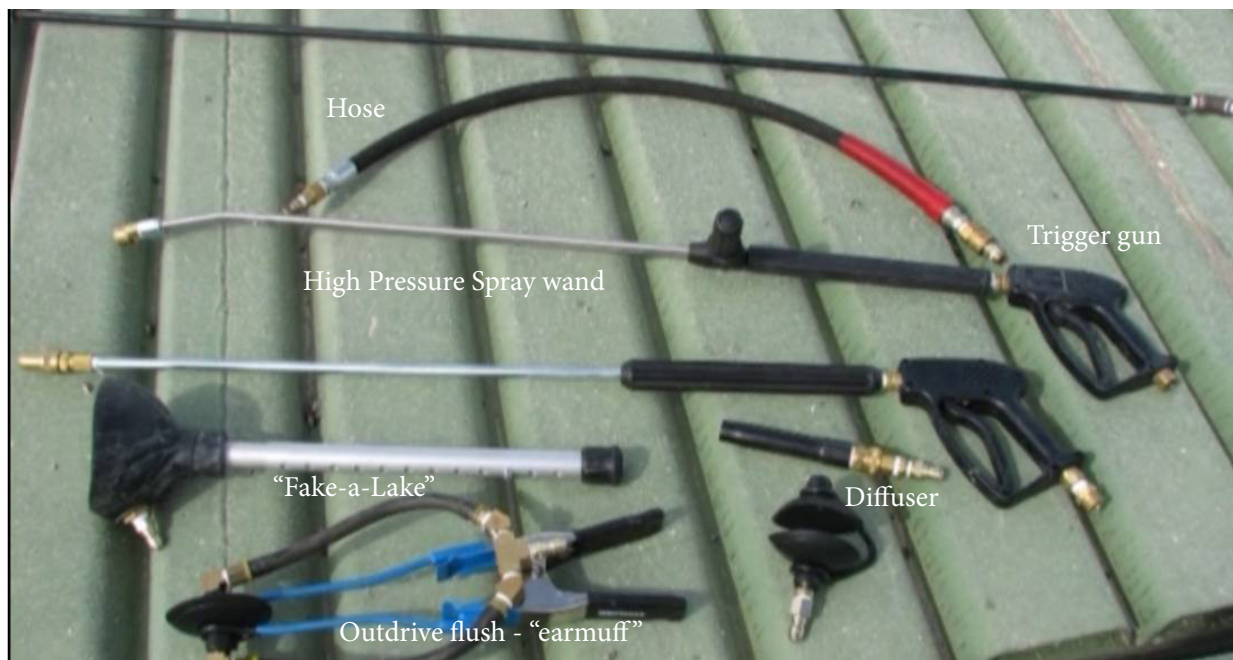
Decontamination for stuck plants:

This decontamination is performed whenever aquatic plants cannot be removed from the watercraft or trailer by hand. It is localized and only requires low pressure, 140°-160°F hot water along bunks or other areas where the plant material is located.

Decontamination for anchor or specific equipment:

Equipment that has been in the water and has attached mud, zebra mussels, other AIS, or plants should be decontaminated by rinsing with hot water and pressure spraying to remove mud and attached AIS. The equipment includes but is not limited to: anchor, mooring and anchor lines, inflatables, downriggers, planning boards, water skis, wakeboards, ropes, fishing gear, bait buckets, and stringers.

Watercraft Decontamination Process



Internal Watercraft Decontamination

The inside compartments, ballast tanks, holding areas, and accessories should be decontaminated first. This will allow all fluids, and potentially AIS, to flow to the exterior where they will be removed during exterior decontamination. The photo above shows the attachments that will be used in the decontamination process.

The areas inside a watercraft will require low-pressure, high-temperature (120° F) water flush for decontamination. The attachment used for this procedure is called a “diffuser”. The diffuser attaches to the downstream quick connect of “trigger gun” that is attached to high-pressure hose. High-pressure water is present upstream to the trigger gun, but released to low pressure downstream when the trigger is pulled.

Once inside the watercraft, with the trigger gun, flush hose, and diffuser connected, the decontaminator can begin the flushing of all compartments, holding areas and rinsing the water-related equipment that has been in contact with the water (right). Note that all compartment drains must be open during the flushing process to allow all water to drain to the exterior. Likewise, any interior pumps must be operated when flushed with hot water. The boater is responsible for operating the pumps.

The flushing procedure is performed by aiming the diffuser assembly into a compartment and pulling trigger on the trigger gun.



Photo: Deborah Rose

Note that it is very important that hot water flowing is up to the operating temperature of 140 °F or 120 °F with a contact time of at least 10 seconds.

Rinse all bait wells, livewells, bilge and other water holding compartments with hot water for at least ten seconds to ensure complete and effective coverage. The exposure time should be longer if the temperature falls below 140 degrees. If any adult mussels are observed, they should be physically removed after hot water kill. Be certain all drain lines are treated to kill all life stages of mussels or waterfleas. Take enough time to ensure that all compartments and potential water holding areas are hot water rinsed and flushed sufficiently for a thorough kill. Optional items, such as air conditioners and generators that pull water from the waterbody and return water to the same water body should also be flushed. Plumbing for these items has potential for harboring mussels, especially veligers. Sea strainers for generator systems must be removed to gain flow access to lines. Since there are so many fixture variations employed, there is no clear method or attachment for everything at this time. The decontaminator must make an assessment of the attachment requirements using the diffuser and flush hose, make an appropriate connection to perform task effectively.

Once all areas of the inside have been decontaminated, decontaminators should confirm that all drains removed have been replaced, compartment doors closed, and everything returned to its proper place. The boater should still be on board, or observing, and can confirm this is complete. Decontaminator and boater can exit watercraft and prepare for exterior decontamination once a final check of all interior flush operations is made. Remind the boater that they must leave the plug out, ballast tanks open, and live/bait wells open when transporting the boat.

Interior Decontamination - Ballast Tanks

The process to rinse ballast tanks of sailboats and wakeboard style boats is a bit different from rinsing the other internal water holding areas. The opening for a sailboat ballast area is usually located on the transom of the boat (see photo right) and can be raised and lowered to allow water into the ballast area and to drain from it. Because of this location, it is not possible to fill the ballast area and let the hot water sit in it. The best option is to insert the high pressure wand into the opening and spray hot water into the ballast area, using caution



because the hot water will begin to drain back out of the opening. Flushing the ballast tanks on wakeboard style boats should be done by using a narrow-hose difusser. This hose should be inserted into the active thru hull port where water is pumped out of the ballast tanks. These are located on the sides of the hull (see photo left). Hot water should be placed into each of the ballast tanks and allowed to sit in the tank for a few minutes. The boater should then be asked to turn on the ballast pumps and expell the water as much water as possible from the tanks. **Caution: Do not stand near the thru hull ports when this occurs.**



Photo: Deborah Rose

Exterior Watercraft Decontamination

The diffuser is used for the first portion of the exterior decontamination. During the self inspection and formal inspection process, any aquatic plants or other loose foreign matter should have been removed. Throughout the decontamination effort on the exterior, confirm this was accomplished.

Decon unit decontaminators should systematically work their way around the watercraft, rinsing each section of the hull for at least ten seconds (see photo left). Also, rinse the thru hull fittings, outdrive, gimbal area, trim tabs, and any other exterior fixture or form that

may have been exposed to the water during normal operation. The flat exterior surfaces will be high-pressure washed, but the areas outlined need to have a thorough high-temperature flush first.

The aft of any boat can have numerous features that need high-temperature flush. This can include transducers, trim tabs, ladders, pumps, swim deck, etc. The outdrive gimbal area is protected and a likely location for mussels due to its shielded location on the boat transom.

Decontaminators must take ample time and make certain that all exterior boat devices are thoroughly and effectively rinsed to ensure no species will survive. The diffuser hose can be inserted in the gimble area and moved around to ensure thorough coverage and kill. It must be understood that effective decontamination takes time and dedication to ensure every possible location that could possibly harbor life stages of mussels is rinsed with water at 140°F. Exposure to the hot water will be effective so don't rush the rinse, do it right.

Outdrive/Outboards

The next step for exterior decontamination should be the engine drive unit. The exterior of outdrive and gimbal joint should have already been rinsed, but the engine and outdrive cooling system must be flushed. Personal Watercraft, V-Drives and Jet Drives will be covered separately below.

Inboard/outboard and outboard motors have a water intake on the lower unit of the outdrive (right). Water from the lake is pumped into the cooling system of the engine



and returned normally to the exhaust port located at the prop center. The engine must run long enough during this process to allow the thermostat to open for a thorough flush. Monitor fluid discharge temperature if possible to ensure 120-degrees minimum is reached for at least two minutes.

For this procedure, use the outdrive flush attachment, or earmuff attachment (see left), that is spring loaded and designed to fit most all standard outdrives.



It should supply water to both sides of the lower unit, which covers all water pickup, or intake, types.

When you begin this process, clear everyone from the motor area. Have the boater lower the outdrive and start the engine. Position the cups of the attachment over the screened water pickup location on both sides of the lower unit. Connect either a 36" hose or the 72" hose to the earmuff attachment for an extension. Next, connect the trigger gun to the hose. Each time the trigger is activated, hot water will be expelled out the cups of the earmuff attachment. Ensure the boater doesn't lower it until it hits the ground. Before starting the engine, instruction must be given to



the boater to ensure the outdrive transmission is kept in the neutral gear (not prop drive position). Activate the trigger gun to apply water to the lower unit intake, then instruct the boater to start the engine. Continue squeezing trigger gun and allow engine to warm up. Monitor water temperature coming out the exhaust until water is up to operating temperature and water is sufficiently hot to ensure a kill of any adults inside water system of engine. This flush procedure may take 3-10 minutes to complete.

Engines normally run at temperatures lower than 140°F. This means that the high temperature flush will actually open the thermostat rather than heat

generated by the engine. Note also that some engines are electronically monitored and may actually shut engine down when temperatures are that high. By the time this would happen the engine has been flushed adequately, so automatic engine shutdown should not be a concern.

Once sufficient time has passed on the engine flush the engine can be turned off, the trigger of the gun released and the flush assembly removed. Leave outdrive lower unit down for further procedures discussed later.

Inboards / V-Drives

V-Drives, often referred to as inboards, have a straight shaft from engine through hull (see right). Water pickup for these type drives will be located at the bottom of hull and/or lower transom of the vessel, and there may be multiple water intake points on the craft hull. Water flow discharge will normally be at the engine exhaust and located at the transom. The engine water system will require high temperature flush to perform an effective decontamination. Again, water will be circulated through system until confirmed temperature at exhaust is achieved.



Locate all through hull water intake points and exhaust points.

Attachments for this task will be the inboard motor flush attachment, or fake-a-lake (see right), and an extension flush hose as used previously. The flush hose will attach to the trigger gun and the other end to the fake-a-lake attachment.



Before starting the engine, instruct boater to maintain a neutral drive position of the transmission. Also instruct boater to watch engine temperature gauge to prevent engine from overheating.

Position the fake-a-lake attachment, which looks like a plunger, against the hull at a water intake point. Activate the trigger gun to flow hot water. Confirm water flow and then have the boater start the engine.

With engine running and hot water flowing, engine water system will fill and soon begin to exhaust water. Monitor temperature of expelled water until confirmed sufficiently hot. Stop engine once adequate temperature for kill of 120°F is reached.

As stated, there may be multiple water intake points on V-Drive watercraft. Locate additional intake points and repeat flush procedures. Do not confuse other through hull drains or ports with water intake points for the engine. Decontaminators may need to take time to climb aboard watercraft once again to identify thru hull fittings purpose and location.

Again, the objective is to ensure engine cooling system all thru hull lines are clear and sufficiently flushed to kill any possible attachment or deposit of mussels.

High-Pressure Exterior Rinse

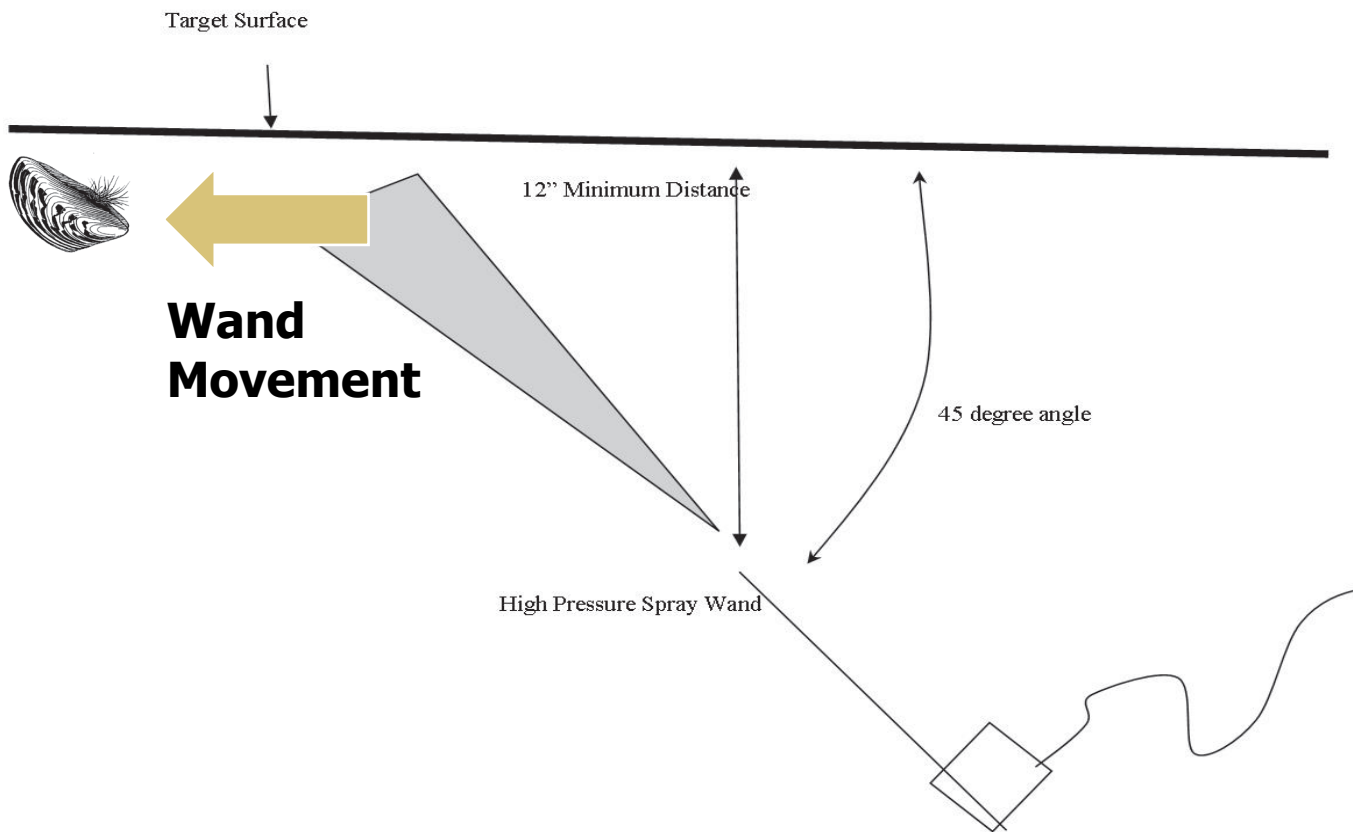
The high-pressure procedures do not depend upon high-temperature water for decontamination. Rather, these procedures use water pressure to remove any organism or contaminants that may be attached to a surface. While the high-pressure water spray is hot as it releases from a nozzle, the temperature drops almost instantaneously as it leaves the nozzle. Effective coverage of exterior surface areas for attached plants, mussels, snails, and mud is very important to a complete decontamination process.

For watercraft and trailer exterior surfaces that are exposed to infested water, attach the high-pressure wand (wand) to the trigger gun using the quick connect fittings. At the end of the wand, attach the **white** quick connect spray nozzle. This is a 40-degree flat fan spray nozzle.

In some cases, for difficult to remove mussels, you may need to use the green 25-degree nozzle with more concentrated pressure. **Caution: when using the green nozzle, be careful to avoid damage to the boat.**



The desired distance the high-pressure spray attachment to the surface being sprayed is 12 to 16 inches. The direction of spray should be at an angle of 45 degrees to the boat surface(see diagram and photo on next page). Do not spray directly at the boat surface.



Caution: When using this high-pressure spray wand, always maintain a minimum 12" distance from any surface. That is, DO NOT hold wand so the nozzle is any closer than 12". Doing so can easily remove decals and damage equipment.

The high-pressure wand incorporates a variable pressure adjustment valve located about mid-shaft. The trigger gun is held with the right hand and the pressure adjustment post with the left hand.

When the trigger is activated, rotation of the adjustable pressure post will divert flow from the high-pressure nozzle to the low-pressure bypass nozzle. Decontaminators need to familiarize themselves with the operation of this wand. When rinsing in a sensitive area, pressure can be reduced to prevent damage. Again, never hold nozzle any closer than 12" from any surface.



To perform high-pressure decontamination of exterior surfaces, hold wand as outlined and with flat fan spray vertical, move horizontally, systematically covering all hull areas on watercraft that were exposed to lake or river water. Start near the top of the side 6" above the waterline and work down. Move around the watercraft making sure all surface areas are treated. Decontaminators must be very careful to ensure that high-pressure nozzle is used safely. **Caution:** *Never point the wand at another individual (treat it as you should with a firearm) and be careful of graphics or other sensitive areas on the watercraft and trailer.*

Another attachment used to clean under boats is the turbo nozzle (see right). It has a concentrated pressure that rotates, and is not a fan like the white nozzle. The turbo nozzle end of this assembly is designed to slide on the wash pad. The wand end nearest the trigger gun has

an insulated hand grip for stability and guidance of nozzle. Each time the trigger is activated, a high-pressure spray will be produced at the turbo nozzle. This spray will have a tendency to push the nozzle skid in the opposite direction so decontaminators should have a grasp of the insulated grip to guide movement. **Caution: Never use the turbo nozzle on a wooden boat. It can cut into the wood.**

Decontaminators should get familiar with movement of nozzle for operation. To perform the rinse process, assembly should be moved back and forth under boat hull making sure all surface areas on underside are covered repeatedly by spray. Keep spray under hull or trailer area to prevent overspray as much as possible. Take sufficient time to cover the entire underside of hull and along the underside of trailers. In addition, the high-pressure spray can damage electrical wiring or other fixtures.

