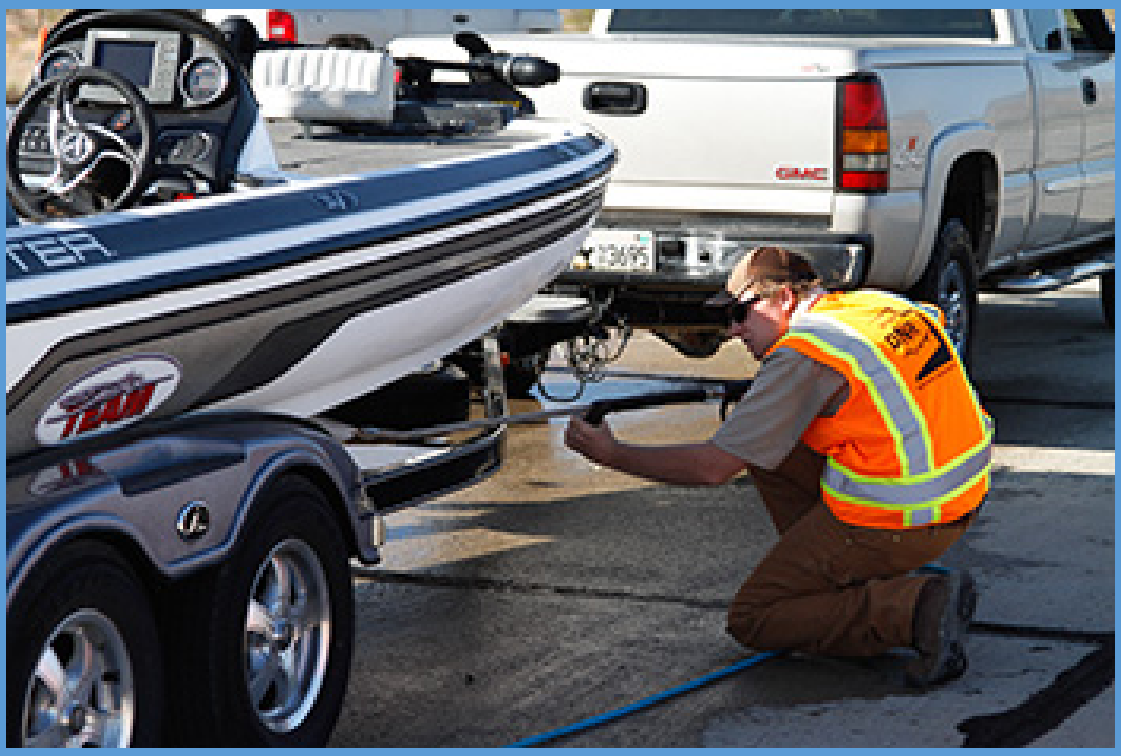
UNIVERSITY OF WISCONSIN OSHKOSH
Environmental Research and Innovation Center

STOP AQUATIC HITCHHIKERS!™

Vilas COUNTY WISCONSIN LAND & WATER CONSERVATION

AQUATIC INVASIVE SPECIES (AIS) WATERCRAFT DECONTAMINATION HANDBOOK



2018

UW OSHKOSH ENVIRONMENTAL RESEARCH AND INNOVATION CENTER

Images: http://stopaquatichitchhikers.org/; https://wildlife.utah.gov/wildlife-news/1858-stop-or-risk-a-ticket.html

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What is watercraft decontamination?

The purpose of watercraft (or boat) decontamination is to adequately remove aquatic invasive species (AIS) from boats and their trailers. Aquatic invasive species such as spiny water flea, zebra mussels, and several invasive aquatic plants have the ability to attach to boats and travel long distances while still being viable. Many perish after 5-7 days out of water, however some can survive up to 30 days out of water. AIS are a problem when they invade waterbodies because they may outcompete native species, reduce water quality and clarity, and are a nuisance to people.

Boat decontamination using a heated pressure washer has been found to be the most efficient way to remove and kill AIS. When used to remove AIS from boats, motors, trailers, personal gear, and equipment, it is a tool to help prevent the spread of populations. No chemicals, bleaches, or soaps are necessary when using a heated pressure washer. The hot water and high pressure are sufficient in killing targeted AIS. Killing AIS will help prevent new established populations when boats are transferred to other waterbodies.

Wisconsin Administrative Code NR 40, the invasive species rule, makes it illegal to possess or transport certain AIS in Wisconsin. Citation penalty amounts for transporting AIS in Wisconsin ranges from $200-$2,500, and therefore is an important matter for lake users to follow. While decontamination is not required of the public under WI statues, use of boat decontamination ensures compliance with this rule.

About the decontamination unit

The decontamination unit is a heated pressure washer manufactured by Power Line USA. This unit was purchased using grant funding from Lumberjack RC&D, a multi-county nonprofit that covers several northern Wisconsin counties. This organization is a resource conservation and development council that funds projects that would be beneficial for enhancing and preserving northern Wisconsin natural resources. The Vilas County Land and Water Conservation Department has partnered with UW Oshkosh for this program. They have applied for grant funding in 2018 that will be used for intern's time operating the decontamination unit at several boat landings and other locations.

The decontamination unit is a single-axle trailered heated pressure washer with an 18 HP engine. It has capabilities to heat water to over 200 degrees F, however is used to remove AIS at temperatures between 120-140 degrees F (household hot water heaters are typically between 120-130 degrees F). The water pressure from this unit is capable of reaching 3,500 PSI/5 gpm and above, however will be used at much lower pressure for boat decontamination.

There is a 200 gallon water tank attached to the unit. The tank includes baffles, which are liquid surge protectors. This prevents the water from "sloshing" around when you are driving the trailer around with a full tank of water. There are several attachments available for washing different areas of the boats.

Personal protection equipment

In order to safely operate our heated pressure washer (boat decontamination unit) there are necessary personal protection equipment (PPE) to be used. The high pressure is capable of doing considerable damage to the skin and extremities. You may take off PPE when the decontamination unit is not in use and you are waiting for another boat. However, when operating the unit, the following items are REQUIRED when the decontamination unit is running and in use.

Required PPE when operating unit:

1. Goggles OR face shield
2. Rubber boots (you will supply your own)
3. Heat resistant gloves
4. Long sleeve shirt
5. Long pants (no skin showing)
6. Ear plugs
7. Heavy duty rain jacket
8. Heavy duty rain pants
9. Knee pads (provided for comfort – but not required to wear)

Truck and trailer training

Because the decontamination unit is attached to a single axle trailer, each person who will be operating and driving with the unit must pass a trailer training course and quiz. In addition, any person driving the University vehicle or driving their personal vehicle on behalf of the University must fill out a “Driver Authorization” online form to in order to be eligible to drive. If determined to be ineligible, you will not be able to drive therefore will not be able to use the decontamination unit. It is an expectation that all vehicle and decontamination unit users are respectful and careful when operating.

Before each use, users must inspect both the trailer and truck using the Trailer and Vehicle Inspection Checklist. A thorough inspection is important in order to ensure your safety and that all equipment is cared for properly. The handbook, “Towing a Trailer” is also a required document for you to review prior to your training.

Make sure you alert your supervisor immediately if there are any changes to the truck or trailer operational condition.

Pre-operation steps

Prior to starting the unit, ensure you follow the steps below.

1) Check pump for any cracks or leaks
2) Clean water filters
3) Check engine and pump oil and add any oil if needed
4) Check that you have keys for unit
5) Clean nozzles
6) Check that all safety equipment and PPE are on board
7) Check that there are no loose items that may fall off trailer during transport

How to operate the unit – start up procedures

1) Fill the water tank at designated location
2) Check fluid levels of pressure washer
    a. Gas
    b. Diesel
    c. Engine Oil
    d. Pump Oil
3) Open water tank valve
4) Close antifreeze tank valve (should remain closed during the summer season)
5) Connect trigger assembly and high pressure wand to pressure hose – **ensure safety on trigger is ON**
6) Take nozzle out of spray gun
7) Choke the machine – turn key on – start engine (start machine with trigger pulled)
8) Push the choke back in
9) Warm the engine up (about 2 minutes) – while pulling the trigger (safety off) without nozzle in
10) Put safety back on and attach desired nozzle
11) Turn heater switch on and turn up temperature gauge
12) Spray the water away from people/equipment to test the water temperature and pressure.
    a. Use the Infrared Temperature Gun and point at water to ensure temperature is at correct temperature for the area you will start spraying
    b. Check the pressure gauge and ensure pressure does not go over 2,500 PSI
13) Start cleaning surfaces

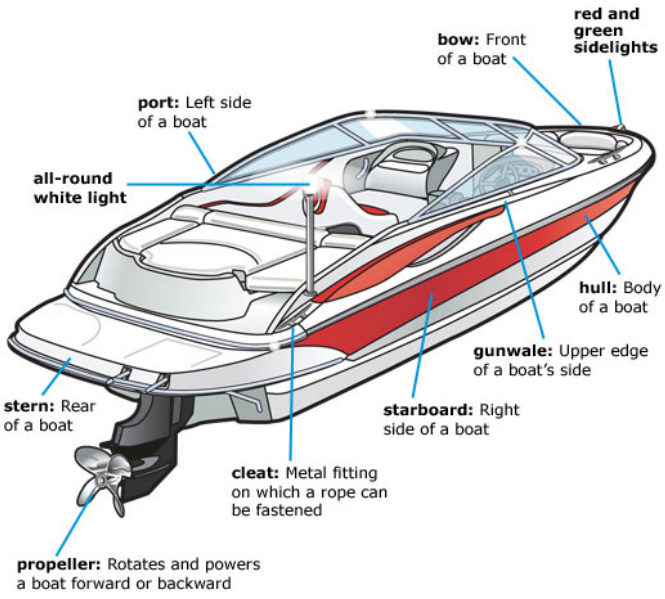
How to operate the unit – shut down procedures

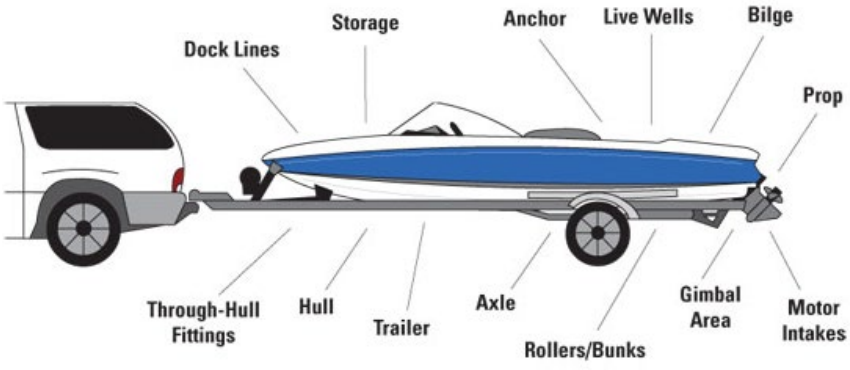
1) Turn off heater and turn the thermostat to 0°
2) Run the machine (point and pull trigger away from any people or equipment) for 2 minutes to cool the heater down

3) Turn off engine
4) Pull the trigger to release any excess pressure – be sure to point it away in a safe location
5) Once per week place the unit in a trickle type battery charger overnight

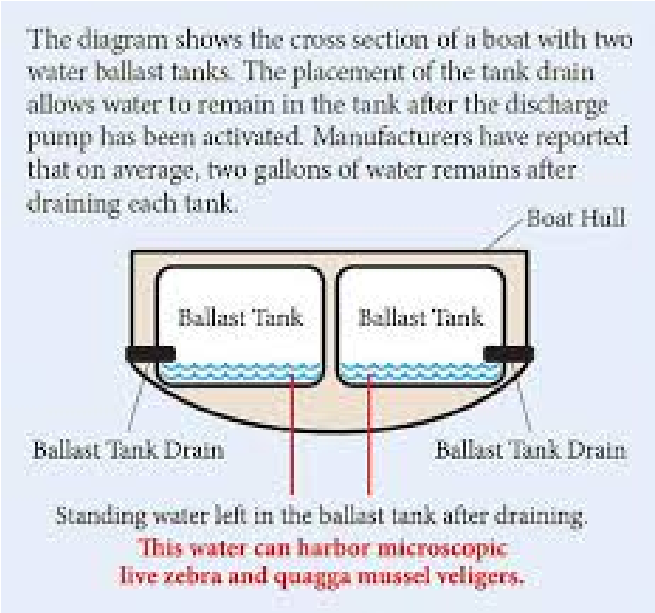
Parts of a boat

1. General parts





Images from [www.boat-ed.com, oregan.gov]



https://nwhanew.memberclicks.net/assets/AnnualConference/2018/(1)Stephen%20Phillips-%20NWHA%202018.pdf

2. Types of engines and drives

a. Outboard engines

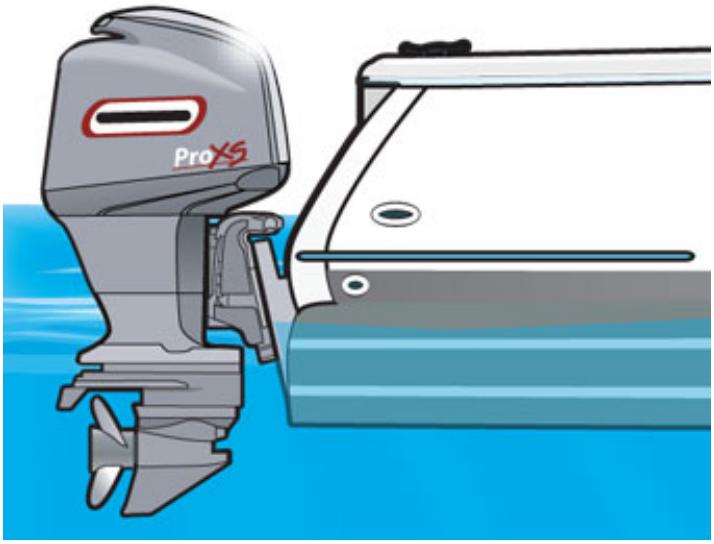


Image from www.boat-ed.com

b. Inboard engines

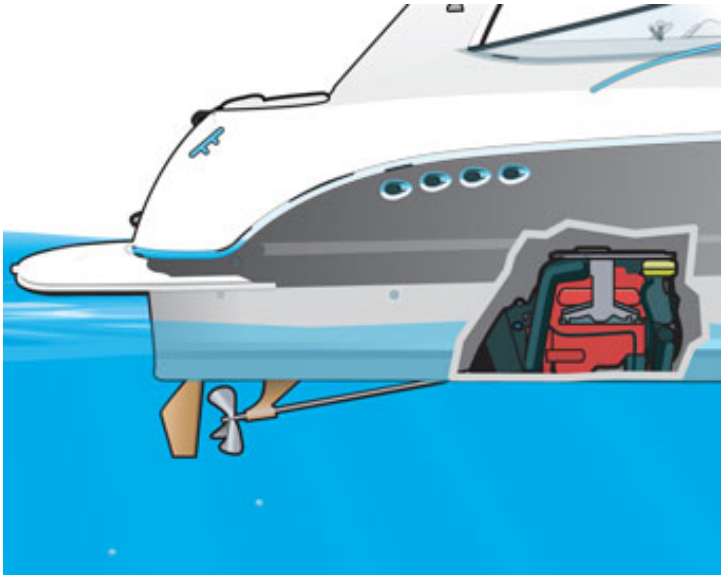


Image from www.boat-ed.com

c. Jet drives

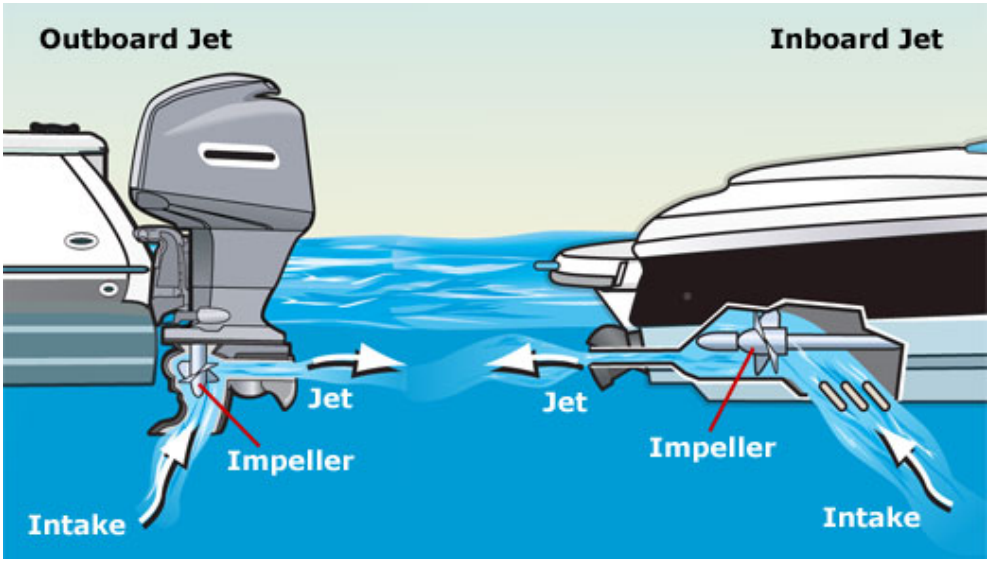


Image from www.boat-ed.com

Attachments

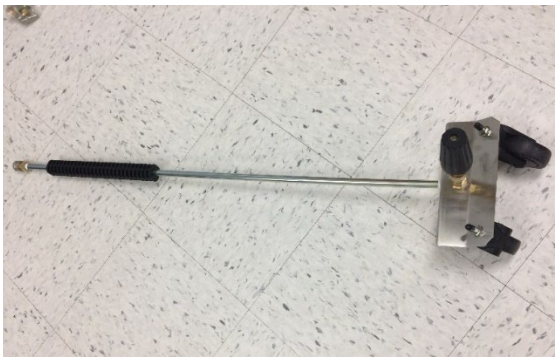
Trigger assembly – attached directly to the high-pressure hose. Used to start and stop the flow of water. The red portion of the trigger is the safety switch.

High pressure spray wand with trigger assembly. This wand is used to spray pressurized water onto the boat's hull and trailer frame.

The ballast hose attaches using the extension use. It is used to fill some ballast tanks by inserting the hose into the through-hull fitting that connects to the ballast tank.

The extension hose connects to the trigger assembly and is used to connect several of the accessory tools.

The low flow diffuser is used for low-flow decontamination. It is used to decontaminate sensitive equipment/surfaces and internal compartments.



The undercarriage sprayer is used to high-pressure spray bottoms of hulls, pontoon boats, under trailers, etc.

Motor muffs are used to decontaminate inboard-outboard and outboard engines by providing clean water to the intake. There are two different sizes (see photos to left) depending on the size of the intake.

The fake-a-lake is used to flush water through inboard engines or to fill ballast tanks while the watercraft is out of the water.

The infrared temperature gun is used to confirm water temperatures during decontamination.

Boat decontamination process

The first step to the boat decontamination process is to follow the general Clean Boats Clean Waters inspection – this includes inspecting the boat and trailer of any visible removable AIS and removing by hand as well as draining all interior compartments such as live wells.

Next, unwind the entire length of the high-pressure hose so that you may maneuver around the entire watercraft easily. Lay the hose away from any traffic areas and lay out safety cones in the area you will be working. Connect the trigger to the high-pressure hose, then attach the high pressure spray wand and ensure all attachments you will be using are easily accessible. Lastly, start the unit and as stated in the start-up procedures section (page 5), test the water temperature using the infrared temperature gun to ensure you are meeting the right temperatures.

IMPORTANT BEFORE STARTING:

- Set out safety cones around the area you are working
- Wear all PPE
- Do not allow any members of the public to operate the unit

- Do not point the attachments at any vehicles or people
- Always ensure trigger safety is on when not in use
- Do not put your hand in front of the water stream
- Do not touch the engine/burner during or after use

1. Exterior watercraft

Start by rinsing each section of the hull using the diffuser hose for at least 10 seconds using 140 degree F water. In addition, rinse all hull fittings, outdrive, gimbal area, trim tabs, and any other exterior parts that have been exposed to lake water for at least 10 seconds.

There are some areas of the boat that will need a high-temperature soak such as transducers, trim tabs, outdrive gimbal area, ladders, swim deck, etc. The diffuser hose can be inserted into the gimbal area and moved around to completely cover the area.

The high-pressure spray step uses the high-pressure spray wand to remove anything that may be attached to the surface of the hull or trailer. At the end of the spray wand, the white quick connect spray nozzle (40 degree flat fan spray nozzle) should be attached. To perform the high-pressure decontamination, hold the wand tip 12-16 inches away from the surface you are spraying**. Never hold it closer than 12 inches**. Hold the wand at a 45-degree angle from the surface you are spraying and move the wand horizontally, away from your body (see image below for an overview). Start at the top (near the waterline) and work your way down. If you need to adjust the pressure, rotate the pressure post located on the wand. You should feel a difference in the pressure as well as see the pressure decrease on the pressure gauge.

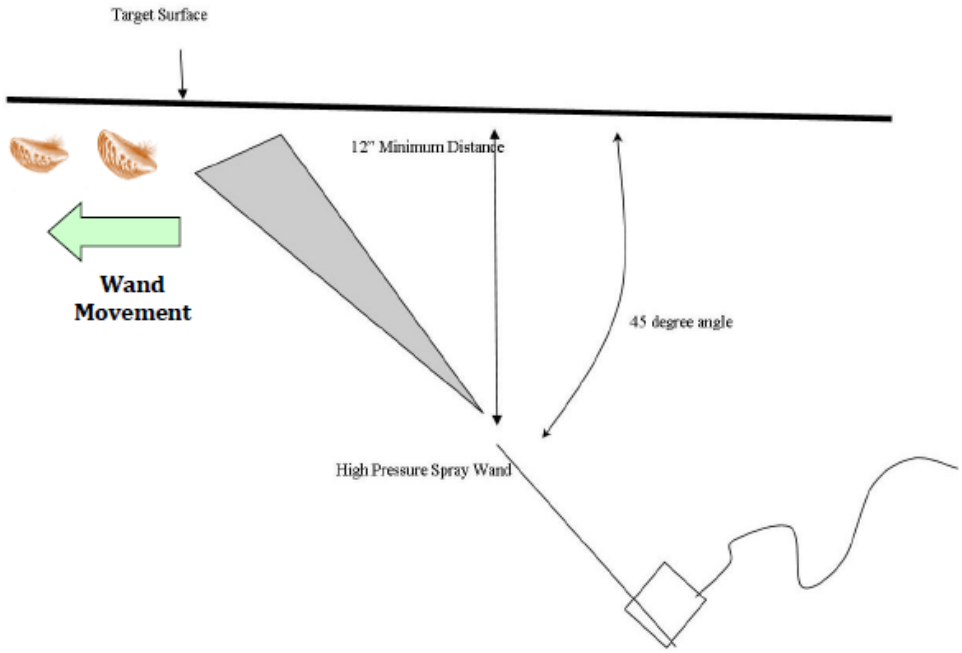


Image derived from the MN Decontamination Inspection Manual

In order to clean the underside of boats, use the undercarriage sprayer with the 40-degree white nozzle. Make sure to take sufficient time to cover the entire underside of the boat hull and trailers. **Also, make sure you avoid any electrical wiring or fixtures when doing so, as they can easily be damaged.**

2. Interior compartments

Due to microscopic AIS that can get into interior compartments in boats, washing the compartments is necessary to ensure a thorough cleaning. These include: live wells, bait wells, bilge areas, and ballast tanks. The outboard motor, inboard/outboard engine, and inboard engines must also be flushed. Ballast and bilge pump temperature ratings can vary based on boat model. Because of this, **the temperature should be turned down to 120 degrees F and pressure turned down as low as you can** for all interior compartments. The diffuser attachment should be used for all interior decontamination.

If possible, perform all interior compartment decontamination from the outside of the boat. If necessary to enter the boat, ask the boat owner/operator for permission to enter the boat. Set up the diffuser attachment using a trigger assembly, accessory hose, and diffuser connection. Ask the boater to open all drains and turn on any interior pumps in order to flush interior compartments. To flush compartments, aim the diffuser into the compartment and pull the trigger. **Ensure a temperature of 120 degrees F is being met, but <u>not exceeded</u>.** Flush each compartment that is exposed to lake water for

2 minutes. Remove any visible remaining AIS by hand after interior decontamination is complete. Make sure all drain lines and compartments are flushed.

If the watercraft has a ballast tank, verify with boater whether they are soft bags or hard tanks (solid-colored). To flush solid-colored ballast tanks (wakeboard style boats – see image below for location), ask boater to turn on drains to confirm which thru-hull fitting leads to each tank.

Image derived from the MN Decontamination Inspection Manual

Then insert the ballast tank diffuser hose into the active thru-hull fitting (see photo below). Fill each tank with the 120° F water and let sit for 5 minutes. After 5 minutes, ask boater to turn on the ballast pumps to remove as much water as possible (be sure not to stand in front of thru-hull fittings during this time). While water is draining, verify the temperature is at 120 degrees – if lower, adjust the temperature as necessary and add more water and allow to sit for another 5 minutes.

Image derived from the MN Decontamination Inspection Manual

If ballast tank drains are inaccessible (covered by trailer frame, check valve located in the thru-hull fitting, etc), use the fake-a-lake attachment to pump water into each ballast tank by positioning the attachment so that the opening inside is closest to the thru-hull fitting. Then start running the water by squeezing the trigger – once water is flowing, ask the operator to start the ballast tank fill pump so water is drawn into the tank. Fill for two minutes then turn off the pump and allow the water to sit for 5 minutes in each tank before pumping water out.

Image derived from the MN Decontamination Inspection Manual

If there are ballast bags (image below), remove the bags from the watercraft and ensure they are empty – if not, drain the bag on a permeable surface (gravel, grass, etc). Then use the ballast diffuser hose to fill the bag with water (ensure water is at 120 degrees) and allow to sit for 5 minutes and drain.

Image derived from the MN Decontamination Inspection Manual

If decontaminating a sailboat, look for the ballast openings near the transom of the boat. Insert the low flow hose or ballast tank hose into the opening and fill with 120 degree water. Be careful, as the water will drain back out of the opening.

3. Engines

There are three different major types of engines you will encounter: outboard, inboard/outboard, and inboard. Inboard/outboard and outboard motors have a water intake on the lower unit where water is pumped into the cooling system and returned to the exhaust port located at the prop center. In order to flush these types of motors, the engine must be running long enough for the thermostat to open. Monitor the fluid discharge temperature if possible to ensure 100 degrees F minimum is reached for at least 2 minutes (use the infrared temperature gun to confirm). Ensure you are using a lower temperature for flushing motors – never go over 140 degrees F. Some engines are electronically monitored and may shut off if the temperature is too high. If this happens, turn the temperature down and flush the motor at a lower temperature.

Inboard/Outboard & Outboard

For inboard/outboard or outboard motor decontamination, you will start by attaching the motor muff attachment to the supply water to the lower unit. Make sure no one is near the motor area when you start flushing. Have the operator lower the motor, but ensure it does not hit the ground. Do not start the motor. Position the muffs over the water intake on both sides (see image below). Before starting the engine have the operator switch it in neutral, then activate the trigger assembly to start water flow, then have the operator start the engine – if water does not exit through the exhaust, then shut the engine off and adjust the muffs and try again. Once water is flowing through the exhaust, continue flushing the motor with water until the water is up to 100 degrees F and allow engine to run for two minutes. Make sure the temperature does not exceed 140 degrees F by using the infrared temperature gun. After two minutes, the engine can be shut off and trigger released, and then turn the trigger safety on and remove the motor muffs.

Image derived from the MN Decontamination Inspection Manual

Inboard

Inboard motors have a straight drive shaft from the engine through the hull, where water intakes are located at the bottom or the hull or lower transom. The hull may have multiple water intakes. The water discharge will typically be at the engine exhaust and located at the transom. Water will be circulated through the system until the confirmed temperature of 100 degrees F is met. After locating all water intake and exhaust points, use the fake-a-lake and attach against the hull at a water intake point (see image below). Again, before starting the engine, ensure it is set in neutral and instruct the operator to watch the water temperature gauge in the boat to prevent it from heating over 140 degrees F. Turn the trigger on and instruct the operator to start the engine, and watch for water to exit the exhaust. If water does not exit the exhaust, turn the motor off and adjust/restart as necessary. After water is flowing out of exhaust, keep the trigger squeezed and monitor the water temperature until water is up to 100 degrees F, then allow the engine to run for 2 minutes. Again, ensure the temperature does not exceed 140 degrees F. After 2 minutes, turn the engine off and release the trigger. Engage the safety on the trigger and remove the fake-a-lake. If there are multiple water intake locations, repeat the above steps.

Image derived from the MN Decontamination Inspection Manual

Emergency Procedures

Boat decontamination using a heated pressure washer can be dangerous. With this in mind, do not hesitate to contact UW Oshkosh or the Vilas County Land and Water Conservation Department with any questions or concerns regarding safety or damage to equipment. If you damage any equipment or have any safety issues to report, please call Carmen from UW Oshkosh at (920) 424-0182 (office) or (920) 420-0584 (work cell) OR Greg Kleinheinz at (920) 424-1100 (office) or (920) 420-4821 (cell). If it is of immediate concern, contact Cathy Higley of Vilas County at (715) 479-3738.