Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Marine Headquarters - Boating Division

PO Box 280, 333 Ferry Road • Old Lyme, CT 06371 Affirmative Action/Equal Opportunity Employer

Best Management Practices for Vessel Decontamination

Zebra mussels are present in the Twin Lakes, Lake Zoar, Lake Lillinonah and Lake Housatonic. If you are retrieving vessels for the season from any of these lakes, please follow DEEP's BMPs for Zebra Mussel Decontamination.

The objective of decontamination is to KILL and REMOVE, to the extent practical, all visible mussels and prevent them from entering any nearby water bodies. Killing prevents establishment of new populations in new areas.

Any boat, trailer, tank, equipment, machinery, gear, or net removed from a water body known to be infested should be decontaminated using one of the treatments in Table 1. **If you are servicing a boat and need to test it in uninfested waters, be sure to decontaminate it prior to the open water test.**

BEST MANAGEMENT PRACTICES/PROTOCOLS FOR DECONTAMINATION:

1) **Location of decontamination area**

   a) Locate the area so that is away from the water so that the run-off and solids from the cleaning process can be discharged into the ground to be absorbed or contained and will not enter any waterbody. Be mindful of storm drains, as these drains can be conduits back to your lake or to another body of water.

2) Factors for effective power washing

   a) Use water that is 140 degree Fahrenheit (**at the point of contact**) to kill mussels and veligers. Veligers are the microscopic larval forms of the mussels that can settle and then grow into adult mussels.

      Note: *Allow* ***at least*** *10 seconds to elapse from the leading edge of the spray to the tailing edge when moving the wand across the surface to maintain sufficient "lethal" contact time. Larger mussels may require more time to remove from the surface.*

   b) Use a power wash unit capable of spraying at least 4 gallons/minute with a nozzle pressure of 3,000 psi or greater (not to exceed 3,500 psi) to **remove a**ttached visible mussels from all exposed surfaces of the watercraft, piece of equipment, trailer and engine.
   c) A brush may also be used in conjunction with flushing to remove mussels from hard to access areas.
   d) Maintaining a contact time of 60 seconds for hard to reach and sensitive areas will assure the mussels are killed.
   e) Cleaning the boat hull should be done in a systematic fashion and all solids removed from the vessel need to be disposed of in a proper fashion. An educational video called, "Don't Move a Mussel" can be watched or ordered from the 100th Meridian website (http://www.100thmeridian.org/videolibrary.asp).
   f) Using the appropriate attachment connected to the power wash unit or other hot water source, start the vessel's engine and run for 1-2 minutes to kill mussels in the engine cooling system.

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3) Pressure washing wastewater discharge options:

a) **Discharge onto the ground:**

DEEP's-Water Permitting and Enforcement Division may use permitting and enforcement discretion to allow inland marinas without a sanitary sewer and following the power washing practice described in BMP #2 to **discharge power washing wastewater from boats onto the ground**. The discharge may be acceptable if the volume can be absorbed into the soil (activity level similar to an individual boater). If the volume is too large then hauling to a sewage treatment facility would be necessary (permit required, please see below).

b) **Collection of wastewater:**

Low cost containment systems exist for this purpose. Contained wastewater should be directed to a sewage treatment facility either directly by an available municipal sewer service connection or by transportation to an approved sewage treatment facility by an appropriately licensed hazardous waste hauler.

> ***Note:*** *Discharge of wastewater to a* ***sewage treatment facility*** *requires a discharge permit from the DEEP (Miscellaneous Discharges of Sewer Compatible Wastewater (MISC) General Permit). The MISC General Permit would authorize wash wastewater discharges to a sewage treatment facility or a licensed waste hauler.*

If there is bottom paint on the vessel, extra pre-cautions must be taken. Additional information regarding these management options can be found on the DEEP's website at: http://www.ct.gov/deep/cleanmarina and at the link under the heading, "Important Information for Facilities Conducting Vessel Bottom Pressure Washing".

For questions regarding pressure washing discharge and permits, please contact Edward Finger at edward.finger@ct.gov or 860-424-3817.

4) Other decontamination options (if power washing isn't available)

If power washing with hot water isn't available at your facility, utilizing a disinfecting method BMP from Table 1 will remove and kill zebra mussels on a vessel and equipment. After disinfectant is used and prior to the next launch, all visible zebra mussels should be removed.

a) **Organizing Air Drying Activities**

i) **Quarantine** a vessel or piece of equipment by providing a safe and secure holding area where it can be "parked" for the amount of time required (see "Air Drying" on Table 1) to kill all mussels on-board.

ii) **Band** (make a secure connection between the vessel and trailer) the vessel or equipment to the trailer and label with a minimum drying end date (see "Air Drying", as listed in Table 1 for required timeframe). The vessel/equipment should not be used on any freshwater area until the date indicated on either the "band" or an accompanying paper certificate.

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b) **Decontaminating ballasts or other internal water storage tanks**
Watercraft with ballast or other internal water storage tanks that cannot be completely drained should be treated differently. After draining every water storage tank as much as possible and using water disposal protocols, the following options will provide lethal results to zebra mussels:

i) Treat with Potassium Chloride

(a) Run hot water (120-130°F) through the water tank for a minimum of 2 minutes.
Note: *Some ballast system manufactures have indicated that their pumps and/or other system components are designed for temperatures of no more than 130° F.*

(b) Add a 200 ppm solution of Potassium Chloride and allow it to remain there for a minimum of 12 hours. The mixing directions can be found in Table 2. When making the solution, keep in mind the amount of existing water in the ballast.
Note: *Despite the fact that it will kill mussels, this solution is harmless to humans and to the environment. It also has extremely low corrosion characteristics. A chloride concentration of 250 ppm is allowable for drinking water and the solution is below that level.*

ii) Treat with non-toxic propylene glycol anti-freeze and store over the winter.

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Table 1. Zebra Mussel Disinfectants and Usage Guidelines for Boats and Equipment

Disinfectant	Concentration	Contact Time	Usage Guidelines, Safety Precautions, Drawbacks
Vinegar	100%	20 min Dip/Bath	Dipping equipment into 100% vinegar for 20 minutes will kill harmful aquatic hitchhiker species. MUST Ensure that solution does not run-off directly into waterways.
Chlorine	200 ppm	10 min	Use appropriate PPE and caution. Stay up-wind of the spray. Is corrosive to metal and rubber and toxic to fish at this concentration, so neutralize with 800 ppm sodium thiosulfate and rinse thoroughly with tap water or water from a non-infested lake or river. MUST Ensure that solution does not run-off directly into waterways.
Power wash with hot water	>104° F or higher (120° F -140° F is the preferred range) Use hottest water available	10-15 seconds per location	Use appropriate PPE and *caution when using hot water due to possibility of burns/scalding at 120° F to 140° F.* Temperature and contact times are crucial, as efficiency is weather dependent. Most effective when used in conjunction with air drying (see below). Power wash with hot water, including thoroughly flushing lower motor unit.
Freezing	<32° F	72hrs	Boats, gear, and equipment should be thoroughly frozen. Ambient air temperature should remain below freezing for the entire contact time. No safety precautions.
Air Drying	N/A	April, November: 29 days May, October: 19 days June, July, August: 7 days September: 12 days	Must dry completely to be effective. Most effective when used in conjunction with hot water (see above). To be used for small nets, gear, pumps, etc., *ONLY AFTER* power washing with hottest water (>104° F) for appropriate contact time.
Salt Bath (NaCl)	1%	24 hrs Dip/Bath	Due to the long contact time, may only be used as a bath solution and not sprayed. To be used only for pieces of equipment, gear, and nets that can be completely immersed in the solution.
Potassium Chloride (KCl)	200 ppm	12 hour bath	This is an effective ballast cleaner. The solution must be kept in the water storage area for a minimum of 12 hours to ensure lethal results.

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To make your cleaning solution effective, use Table 2 to determine the proper concentration to dissolve in water.

Table 2:Disinfectant Amounts to Make Needed Concentrations

	Amount of Water needed				
Disinfectant	**1 gal**	**2 gal**	**5 gal**	**20 gal**	**100 gal**
100% Vinegar	1 gal	2 gal	5 gal	20 gal	100 gal
200 ppm Chlorine (household bleach, 5.25% Chlorine)	0.5 ounce (15 ml)	1.0 ounce (30 ml)	2.5 ounces (75 ml)	11.0 ounces (300 ml)	6 1/3 cups (1.5 L)
200 ppm Chlorine (HTH granular)	0.04 ounce (1.2 g)	0.08 ounce (2.4 g)	0.2 ounce (6 g)	0.8 ounce (24 g)	4.2 ounces (120 g)
800 ppm Sodium Thiosulfate	0.1 ounce (3 g)	0.2 ounce (6 g)	0.5 ounce (15 g)	2.1 ounces (60 g)	10.6 ounces (300 g)
1% Salt Bath (as NaCl)	1/8 cup	¼ cup	2/3 cup	2 2/3 cups	13 1/3 cups
Potassium Chloride (dry salt crystals)	½ teaspoon	1 teaspoon	2 ½ teaspoons	10 teaspoons	50 teaspoons

Amount of disinfectant

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Boater Education/Prevention

Through boater education, the spread of invasive species can be stopped. We encourage boaters to Clean, Drain, Dry. This will empower the boaters throughout the state to help prevent the spread. Encourage the boaters at your marina to:

CLEAN-Thoroughly inspect boats (hulls, drive units, trim plates, transducers), trailers and components (rollers, bunk boards, axles, etc.), equipment (i.e., water pumps, hatchery equipment, siphons, nets, ropes, traps, etc.), and machinery (tractors, bulldozers, etc.) for adult zebra mussels. Pay close attention to nooks, crannies and other inconspicuous places (i.e., around the motor housing, trim tabs, and water intake screens, or pump fittings). All trash, mud, vegetation, and suspected zebra mussels should be removed and properly disposed of in the trash.

DRAIN- whenever possible, areas that hold water should be drained so there is no standing water. This includes live wells, bilges, cargo areas, pipes, water pumps, etc.

DRY –To help eradicate zebra mussels from the inside of the vessel, encourage boaters to dry all areas of their vessel that may have gotten wet. Drying boats, gear and equipment will help to minimize risk of contamination. See Table 1 for monthly drying times. These drying days were calculated by the 100th Meridian Initiative website.

If you are interested in the DEEP-Boating Division coming to your marina to discuss Clean and Safe Boating, or for "Stop Aquatic Hitchhiker" brochures, please contact Gwendolynn Flynn at gwendolynn.flynn@ct.gov or 860-447-4339.

Cleaning the boat hull should be done in a systematic fashion and all solids removed from the vessel need to be disposed of in a proper fashion. An educational video called "Don't Move a Mussel" can be watched or ordered from the 100th Meridian website (http://www.100thmeridian.org/videolibrary.asp).

References

"Candlewood Lake Zebra Mussel Task Force Interim Report", dated October 31, 2011.

"Recommended Uniform Minimum Protocols and Standards for Watercraft Interception Programs for Dreissenid Mussels in the Western United States," Version September 2009.

100th Meridian Initiative website: www.100thmeridian.org