

NEBRASKA AQUATIC INVASIVE SPECIES PREVENTION PROTOCOL: WATERCRAFT DECONTAMINATION



Adapted for Nebraska from the Wyoming Game and Fish Department “State of Wyoming Aquatic Invasive Species (AIS) Watercraft Inspection and Decontamination Manual” and Colorado Department of Natural Resources “Aquatic Nuisance Species (ANS) Watercraft Inspection Handbook”. Used with permission by the Wyoming Game and Fish Department and the Colorado Division of Wildlife.

For questions about this manual or questions concerning aquatic invasive species in Nebraska:

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What is the purpose of this Aquatic Invasive Species (AIS) prevention manual?

This manual outlines standard watercraft inspection and decontamination procedures to prevent the spread of AIS into and within Nebraska. While this manual emphasizes two of the most threatening AIS to Nebraska, zebra and quagga mussels, the procedures apply to all AIS. The procedures in this manual apply to watercraft of any and all kinds. It includes their motors, trailers, compartments and any other associated equipment or containers that routinely come in contact with water.

While all watercraft and floating devices (including their content, motors, anchors, wells, trailers, and other associated equipment) have the potential to transport AIS, watercraft moored at marinas pose the highest risk, especially commercially hauled watercraft. In addition, watercraft that visit multiple waterbodies in a week represent a high risk of transporting AIS. Hand-launch watercraft have low biological risk. Pets and personal equipment such as waders, fishing gear, and decoys can transport mussels, but usually pose a low biological risk for mussels. However, there is still a high possibility pets and equipment will transport other AIS, such as New Zealand mudsnails. Frequency of use also determines risk. Watercraft used frequently (at least once a week) represent a higher risk, while watercraft used less frequently (at least a week between uses), represent a lower risk, as long as the equipment is allowed to dry thoroughly between uses.

This manual provides the recommended method for preventing the spread of AIS. It provides the procedures for inspecting and decontaminating watercraft between uses, reporting procedures to follow if zebra/quagga mussels (or other AIS) are found, and options for when a decontamination unit is not available. Also included are answers to frequently asked questions about aquatic invasive species.

The primary focus for preventing the spread of AIS is to prevent the transport of water (in a livewell, bait bucket, bilge, etc) from one waterbody to another. While AIS can be transported by attaching to boats and equipment, these are generally easier to see and remove. Unwanted aquatic weeds, fish pathogens, and larvae of zebra/quagga mussels can all be transported in the water contained in livewells, bait buckets, bilge areas, and others, and thus this protocol focuses on the national campaign of Clean-Drain-Dry.

Standard watercraft inspection protocol

To ensure that zebra/quagga mussels and other AIS are not transported between waterbodies, all watercraft should be inspected prior to leaving a waterbody. Inspections **must** include:

Identify the risk factors

1. Has the watercraft has been **in a state with known infested waters in the last 30 days**?
2. Has the watercraft been in **infested waters** in last 30 days? (list provided online)?
3. Is the watercraft **dirty, crusty, or slimy below the waterline**?
4. Is watercraft big or complex?
5. Look for water on board. Is there **standing water** (in tanks/wells/bait wells)?

Answering ‘Yes’ to any of these questions may indicate that the watercraft is a high risk for potentially introducing/spreading AIS. A very thorough inspection is recommended and possible decontamination needed.

Recommended practices before leaving a waterbody (every time)

Clean- Rapid Exterior Inspection

1. Feel the hull ridges, seams, and recessed bolts of the craft. The young mussels may feel like bumps or sandpaper on the craft.
2. Carefully check the rear of the watercraft, including intakes, upper and lower motor areas, and the propeller.
3. Trailers can pose as high a risk as watercraft, so carefully check trailer rails, lights and electrical wires, as well as the license plate and trailer pads.
4. If any AIS are found, decontaminate before transporting



Ensure the Watercraft is Drained

1. **Remove the bilge plug** (and other plugs if needed) drain the watercraft.
2. **Activate the bilge pump** to show the watercraft contains little or no water.
3. Check **all bait wells, live wells, and ballast tanks**. If the watercraft has standing water in any container, drain (an wipe out if necessary) before transporting,

✓ CLEAN ✓ DRAIN ✓ DRY

What if a watercraft contains standing water?

You must pay careful attention to all trailered watercraft that cannot be completely drained and therefore, may contain standing water. Zebra and quagga mussel larvae or veligers are microscopic and can be transported in water. Usually, the larvae are much less hardy than shelled adults and die more quickly and easily. It is difficult to pinpoint the exact amount of standing water necessary for larvae to survive - more research is needed in this area. You will have to use a degree of common sense and knowledge of the zebra mussel biology to evaluate the risk.

Experts believe small amounts of standing water present lower risk if:

- Water temperature is over 90°F.
- Water is oily.
- Compartments with small amounts of water have been closed up and have little or no airflow or oxygen.

If watercraft have been drained to the fullest extent possible and still contain standing water in the bilge, ballast tanks or engines, then you will need to use these facts as a guideline to assess the risks associated with different amounts of remaining standing water.

If the watercraft has been in infested waters in the last 30 days AND has any standing water, the watercraft should be decontaminated. Even in cases where watercraft have a lower unit or an engine or a ballast tank that cannot be drained completely, the watercraft should be decontaminated and thoroughly flush those compartments with hot water for a minimum of 3–5 minutes.



If the watercraft has been in a state with known infested waters and contains 5 gallons or more of standing water, then you should decontaminate the watercraft, even if there is NO evidence that the watercraft has been in infested waters.

If the watercraft has small amounts of standing water (less than 5 gallons) and the watercraft has NOT been in infested waters or any water of a state with known infested waters, you must determine the risk and appropriate course of action. If you believe the risk associated with the small amount of water on the watercraft to be very low, drain the watercraft as best you can before launching. You should have a small bilge pump and hose available to assist with draining of watercraft that have ballast or bilge areas that were not designed to drain fully.

If you believe the standing water is likely to harbor live organisms and presents a higher risk, then err on the side of caution and send the watercraft to decontamination.

Standard watercraft decontamination protocol

If you find evidence of zebra/quagga mussels or other AIS or have reasonable belief the watercraft may have AIS, the watercraft should be decontaminated.

Hot water or drying is the recommended decontamination method in Nebraska. Decontamination units (hot water pressure washers) are recommended to carry out this protocol. **BE SURE TO TAKE THE NECESSARY SAFETY PRECAUTIONS WHEN WORKING WITH HOT WATER.** Adult zebra/quagga mussels are killed upon contact with hot water (140°F) in about 10 seconds. Larvae (veligers) are killed at much lower temps (around 90°F - 100°F).

Decontamination measures should be taken prior to moving watercraft and other gear from one waterbody to another. Generally, they are not needed daily when visiting the same waterbody. However, it is good practice to **always** CLEAN-DRAIN-DRY before leaving any waterbody.

Decontamination of watercraft occurs in two parts:

1. A gentle, full rinse with hot water to **KILL** zebra/quagga mussels and other AIS
2. High pressure water to **REMOVE** the AIS

To ensure that zebra/quagga mussels and other AIS are removed and destroyed, all watercraft decontamination protocols **must** include:

1. Remove all visible mud, plants, and organisms from the exterior of the watercraft.
2. Thoroughly rinse (not spray) the exterior and flush the interior water compartments of the watercraft with hot water (minimum 140°F).
3. After rinsing the exterior and interior of the watercraft, use the high-pressure water to remove any remaining AIS.
 - a. Take care not to use extensive pressure on or near boat decals, chipped paint, or other sensitive areas.
 - b. **DO NOT** use the high-pressure water on the gimble area of the watercraft! This will damage it!
4. After decontamination, the watercraft should be inspected again to ensure a successful decontamination

****Decontaminations should be conducted “high and dry”—away from the water at a semi-permeable dirt or gravel site.**



What if a watercraft decontamination unit is not available?

- Hot water or drying is the recommended decontamination method in Nebraska.
- Chemicals, such as bleach, have not been proven to be effective in disinfecting all AIS and may damage your watercraft and equipment, so caution should be taken.
- Vinegar can be an effective method to decontaminate areas that do not drain completely. Dipping equipment into 100% vinegar for 20 minutes will help to kill harmful aquatic hitchhiker species. Over extended periods of time, vinegar may be corrosive to metal and is toxic to fish at this concentration, so thoroughly rinse with tap water. *****Ensure that the solution does not run-off directly into waterways.**
- Also, a 1 % table salt solution for 24 hours can replace the vinegar dip. This table provides correct mixtures for the 1 % salt solution in water:

Gallons of Water	Cups of Salt
5	2/3
10	1 ¼
25	3
50	6 1/4
100	12 /3

****If hot water is not available, spray equipment such as boats, motors, trailers, anchors, decoys, floats, nets, with high-pressure water, and always allow enough time to DRY Equipment. Be sure to spray in an area that will not run off into a sewer or into a water body.**

What is recommended if watercraft will be used again in less than five days from previous use and I don't have access to a hot water pressure washer?

Follow Day Use Decontamination Procedures:

1. Before leaving the vicinity of the water, remove any clinging material such as plants, animals and mud from anchor, boat, motor, and trailer.
2. Before leaving the vicinity of the water, remove the plug (if applicable) and drain the water from the bilge, live-well and any other compartments that could hold water. Drain water from engine and engine cooling system(s).
3. Ensure watercraft, vehicle, equipment, or conveyance are allowed to dry completely (wipe down if needed).
AND, if necessary
4. Replace bilge drain plug and disinfect the bilge by pouring in not less than one gallon of vinegar; the vinegar can be drained from the bilge upon arrival at home (vinegar can be reused several times).



What if zebra/quagga mussels or other AIS are found?

If you find zebra or quagga mussels or other possible aquatic invasive species, PLEASE **Report your findings and do not launch watercraft until it has been decontaminated.**

Report

Use one of the following options to report your suspected AIS discovery.

The Nebraska Invasive Species Project:

1—Telephone: 1-402-472-3133

2—Online: <http://snr.unl.edu/invasives>; email: invasives@unl.edu

Your report should include the following essential information:

- Date/Time
- Location (Both Current Location of Watercraft and Waters Recently Visited)
- Suspected species of AIS
- Name of Reporter and Contact info (email and/or phone number)
- Photo (if possible). Take a close-up photo - place a common object such as a pencil or penny next to the specimen and photograph the combination to demonstrate the relative size of the specimen.
- Collect specimen (if possible) – do not store in tap water - trace amounts of chlorine from tap water, or “de-chlorinated” tap water can completely destroy sample DNA over a few weeks.



Frequently Asked Questions:

What are Aquatic Invasive Species (AIS)?

“A species that is: 1.) non-native (or alien) to the ecosystem under consideration and 2.) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.”[Executive Order 13112 signed by President William Clinton on February 3, 1999 (“Invasive Species Act”)]

Aquatic invasive species (AIS) and aquatic nuisance species (ANS) can be plants, animals, or pathogens. Invasive aquatic plants are introduced plants that have adapted to living in, on, or next to water, and that can grow either submerged or partially submerged in water. Invasive aquatic animals require a watery habitat, but do not necessarily have to live entirely in water.

AIS threaten native species and interfere with municipal, commercial, and agricultural water supply and distribution, and recreational activities. In their native environments, AIS populations are typically held in check and controlled by predators, parasites, pathogens, or competitors. However, when they are transported to a new environment, the natural checks are usually left behind. This gives invasive plants and animals an advantage over native species and makes them very difficult to control. Invasive aquatic pathogens impact native since they have not built up a resistance to them.

What are zebra and quagga mussels?

Zebra and quagga mussels are freshwater bivalve mollusks (animals with two shells). They are relatives of clams and oysters. It is very difficult to tell the two species apart in the field. The shell color of both mussels alternates between a yellowish and darker brown, often forming stripes. Larvae are microscopic whereas adults can reach up to two inches long. The zebra mussel is nearly triangular in shape and the quagga mussel is more rounded. Unlike native North American freshwater mussels, which burrow in soft sediment, adult zebra and quagga mussels can attach via small byssal threads to hard surfaces.

Both zebra and quagga mussels can survive cold waters, but cannot tolerate freezing. They can endure temperatures between 1°–30°C (33°–86°F). Zebra mussels need waters above 10°C (50°F) to reproduce while quagga mussels can reproduce in waters as cold as 9°C (48°F). The embryos are microscopic. The larvae, called veligers, are planktonic and free-floating. The veligers float in the water column or are carried in the current for about four to eight weeks. The larvae develop shells and settle onto any solid surface, including the skin or shells of native aquatic species. Zebra mussels are native to the Black and Caspian Seas. Zebra mussels were discovered in the Great Lakes in 1988. Quagga mussels are native to the Dnieper River Drainage in the Ukraine, and were first found in the Great Lakes in 1989. Both species have since spread to more than 25 states.

How did the mussels get to North America?

Many AIS, including zebra and quagga mussels, were introduced into the Great Lakes in the discharged ballast water of ocean-going ships. Once in North American waters and wetlands, aquatic invasive species often hitch rides to other bodies of water on boats, trailers, and equipment that people transport from place to place.



Boaters and anglers can inadvertently transport AIS on waders and in bait buckets and live wells.

Zebra and quagga mussels likely made their way to the western United States on trailered watercraft. Invasive mussels are now currently found in western states such as Colorado, Utah, Nebraska, California, Arizona, and Nevada. The U.S. Geological Survey (USGS) updates a sightings map for both species daily at <http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/>.

Why should we be concerned about zebra and quagga mussels?

Zebra and quagga mussels pose a great ecological and economic threat to the state. The invasion of these mussels can affect every Nebraska citizen in some way. The impacts could be devastating.

They grow and reproduce quickly.

Zebra and quagga mussels reproduce *exponentially*. They can spawn year-round if conditions are favorable. A single female mussel can produce up to one million eggs a year. Even if only ten percent of the offspring survive, there would be 10 septillion mussels in the waterway at the end of five years! As the mussel population explodes, they cover the bottom and sides of the waterway.

They clog water infrastructure, impacting water supply and quality.

Zebra and quagga mussels can attach via byssal threads to hard surfaces. They attach to most underwater structures and can form dense clusters that impair facilities and impede the flow of water. They clog intake pipes and trash screens, canals, aqueducts, and dams—disrupting water supply to homes, farms, factories, and power plants. Zebra and quagga mussels also degrade water quality and can alter the taste and smell of drinking water.

They have significant ecological impact.

Invasive species have the ability to change aquatic ecosystems, native plant, and animal communities. The amount of food the mussels eat and the waste they produce has life-altering effects on the ecosystem and can harm fisheries. As filter feeders, these species remove large amounts of microscopic plants and animals that form the base of the food chain, leaving little or nothing for native aquatic species. Zebra mussels attach to and encrust native organisms, essentially smothering them and removing more animals from the food chain.

They have recreational impacts.

These mussels encrust docks and boats. Attached mussels increase drag on boats. Small mussels can get into engine cooling systems causing overheating and damage. Increased hull and motor fouling will result in increased maintenance costs on watercraft moored for long periods of time. The weight of attached mussels can sink navigational buoys. Zebra and quagga mussels also impact fish populations and reduce sport-fishing opportunities. Their sharp shells can cut the feet of unsuspecting swimmers and beach goers.

They have significant economic impacts.

As maintenance costs for power plants, water treatment facilities and water delivery infrastructures increase, so does the cost of food and utilities. In the Great Lakes area, maintenance costs in water treatment plants, power plant intakes and dams have been in the billions of dollars. The destruction of native fisheries also has a wider economic impact in terms of tourism and recreation dollars not spent. Estimated annual costs for mussel control in western states are \$1 million per large hydropower facility and \$40,000 per municipal water supply system.

They are very difficult to eliminate.

In only one instance have managers been able to eradicate zebra mussels and that was an isolated 12-acre quarry in Virginia. A large volume of chemical was used to treat the water to kill the adults and larvae. Eradicating or treating zebra or quagga mussels in large water bodies and/or connected waterways may not be possible, so prevention is very important.

If watercraft are cleaned, drained and dried in between waters, any mussels or other AIS will be killed.

They spread quickly to other water bodies.

Mussels can spread to other bodies of water by attaching to watercraft hulls, anchors, trailers, and fishing equipment. Larvae can be transported in bilge water, ballast water, and live bait wells. Mussel larvae also disperse naturally and can be carried by water currents to other lakes and reservoirs, downstream, or through water diversions.

What can we do?**Educating the public is the most important task.**

Many lakes and reservoirs in the state will not have inspections, therefore it is essential that we:

- 1—Show boaters how to inspect their watercraft themselves.
- 2—Explain why inspection is critical to find mussels and other AIS.
- 3—Impress upon boaters how zebra and quagga mussels damage boats, ruin fishing opportunities, harm the environment and impair water infrastructure.

The primary education message to **CLEAN-DRAIN-DRY** and explain why boaters need to do it *each time* they use their watercraft. Many AIS are spread when water (in a livewell, bait bucket, etc) is transferred from one water body to another. The Clean, Drain, Dry protocol will help prevent the spread of all AIS.

Clean – Remove all plants, mud, and debris from boats and equipment

Drain – Drain all the water from the boat; ballast, bilge, livewell, motor, bait bucket, etc.

Dry – Dry all equipment before launching in a new water body.

What is a watercraft inspection?

A watercraft inspection is meant to determine the risk your watercraft poses of transporting AIS. If, after asking a few questions the watercraft is deemed low risk, the watercraft owner will be provided informational materials and allowed to launch. A watercraft deemed high risk will need to undergo a more thorough inspection. High risk watercraft may include those that last operated their watercraft in a state with waters known to have invasive mussels, or watercraft with a large amount of standing water which could harbor larval mussels.

How long will an inspection take?

A standard inspection will take 2-3 minutes. A high-risk inspection is more thorough and may take 10-30 minutes depending on the type and size of watercraft.

Why are the inspections not conducted at all water bodies?

Rather than spend millions of dollars by inspecting at all water bodies, we are targeting efforts at lakes that are considered high-risk. In addition, inspections will be available at other water bodies on a rotating basis. The AIS program is focused on public education rather than enforcement as other states have done. Participation by the public is critical, thus educating everyone rather than enforcement will benefit Nebraskan's long-term.

Is it mandatory to get my watercraft inspected?

At this point, it is not mandatory to get your watercraft inspected. We are hoping that everyone will be willing to participate fully to ensure that zebra/quagga mussels and other aquatic invasive species don't get into other water bodies. There is legislation being considered which would allow for mandatory inspections of high-risk watercraft.

Are watercraft inspections required in other states?

Yes. Many states have now begun watercraft inspections. Colorado, Wyoming, Kansas, Iowa, and many states in the west have implemented this program at various water bodies. The Nebraska program has been developed based on programs at the regional level so that the process is similar across neighboring states.

What happens if my watercraft needs to be decontaminated?

An authorized inspector will thoroughly spray the exterior and flush the interior compartments with scalding (140°F) water to remove and kill any AIS that may be on the watercraft. After decontamination, the watercraft will be inspected again to ensure the decontamination was successful. Watercraft that are heavily infested with AIS may require a quarantine to kill any AIS that may not have been killed during a decontamination.

What other AIS is Nebraska concerned about?

The state is concerned about numerous AIS that may pose a significant threat to the aquatic resources or water infrastructure of the state, including, but not limited to:



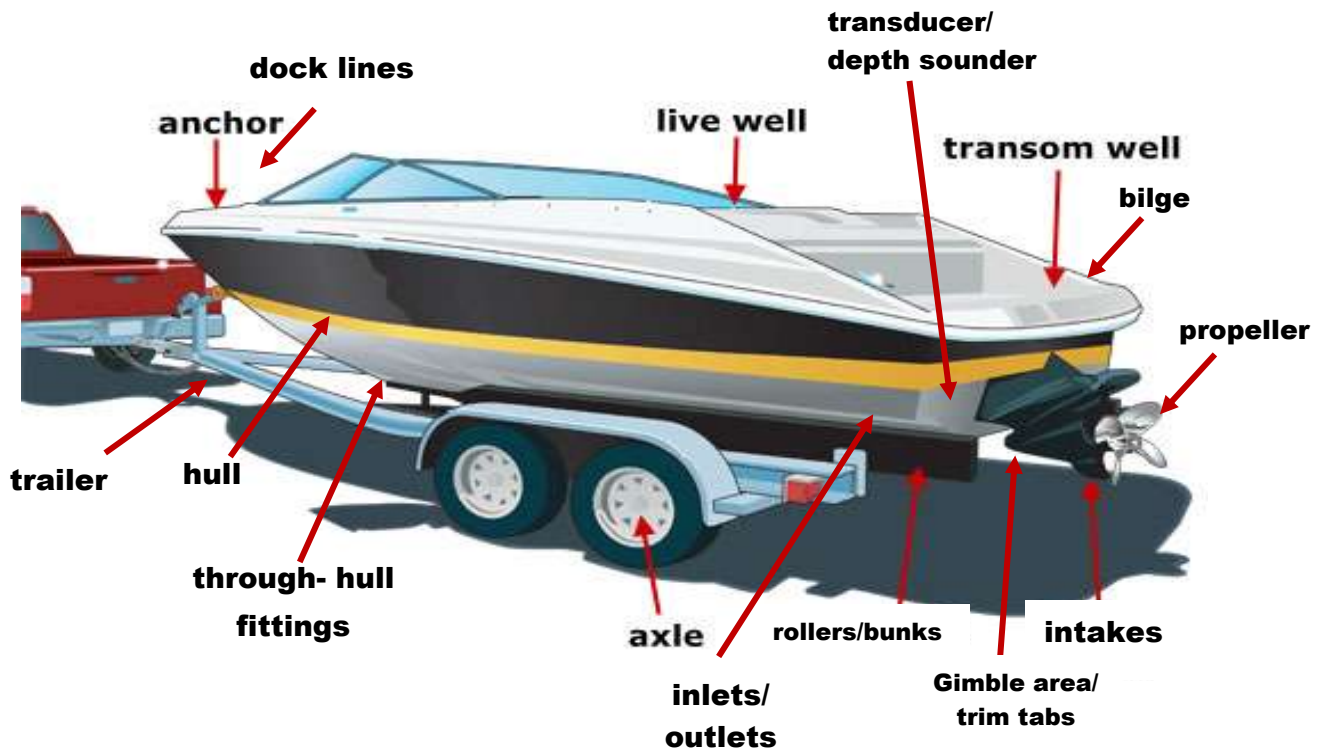
Photo by Karie Decker

Common Name	Scientific Name
Animals	
Zebra mussel	<i>Dreissena polymorpha</i>
Quagga mussel	<i>Dreissena rostriformis</i>
New Zealand mudsnail (not in NE)	<i>Potamopyrgus antipodarum</i>
Asian clam	<i>Corbicula fluminea</i>
Rusty Crayfish	<i>Orconectes rusticus</i>
Asian Carp (silver, bighead, grass, common)	Hypophthalmichthys molitrix, Hypophthalmichthys nobilis, Ctenopharyngodon idella, Mylopharyngodon piceus
White Perch	<i>Morone americana</i>
Rudd	<i>Scardinius erythrophthalmus</i>
Plants	
Hydrilla (not in NE)	<i>Hydrilla verticillata</i>
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Curly pondweed	<i>Potamogeton crispus</i>
Flowering rush	<i>Butomus umbellatus</i>
Yellow floating heart	<i>Nymphoides peltata</i>
Water hyacinth (not in NE)	<i>Eichhornia</i> spp.
Phragmites (Common reed)	<i>Phragmites australis</i>
Pathogens (not in NE)	
VHS	Viral Hemorrhagic Septicemia
Whirling Disease	<i>Myxobolus cerebralis</i>
Chytrid fungus	<i>Batrachochytrium dendrobatidis</i>
Largemouth Bass Virus	
Heterosporosis	

Refer to the Nebraska Aquatic Invasive Species Pocket Guide for details on each of these AIS available at: <http://snr.unl.edu/invasives>



Appendix A: Diagram of standard boat detailing areas to check during watercraft inspection.
Photo modified from Wisconsin DNR



Appendix B: Map of states with waters infested with zebra or quagga mussels, April 2010.
 **Maryland and Massachusetts are also states with infested waters.

