

TECHNICAL REPORT 05-157

DECONTAMINATION PROTOCOL
FOR AQUATIC NUISANCE
SPECIES



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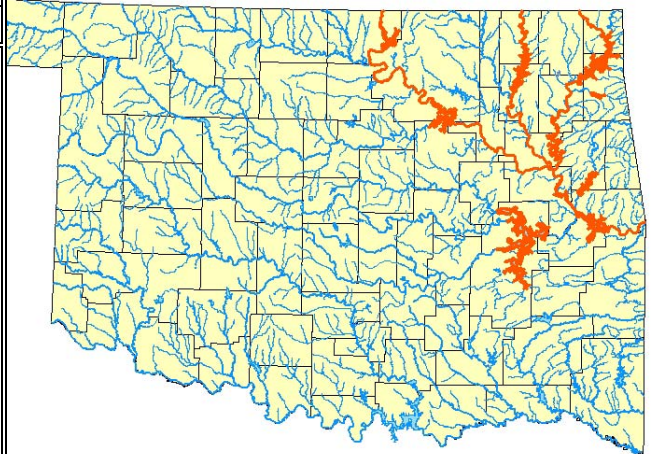
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DECONTAMINATION PROCEDURES FOR AQUATIC NUISANCE SPECIES

The distribution of zebra mussels (*Dreissena polymorpha*) and golden algae (*Prymnesium parvum*) has increased in Oklahoma and threatens to continue. Others, like Eurasian milfoil (*Myriophyllum spicatum*) and the New Zealand mud snail (*Potamopyrgus antipodarum*), are on the horizon and threaten to complicate matters even further. The impact of these invading taxa can be measured in physical, chemical, biological and financial terms. Measures to minimize the spread of and therefore the damage inflicted by these nuisance species have been identified. These measures are to be implemented on all waterbodies known or suspected to contain these or any aquatic nuisance species (ANS). Any waterbody downstream of a known contaminated waterbody is suspect and measures to avoid transfer of these species will be employed. When equipment or vehicles are stored on site of a known contaminated waterbody, strict decontamination methods will be employed. Use this link (<http://nas.er.usgs.gov/taxgroup/mollusks/zebramusel>) for an update of current distribution of zebra mussels within the state or nationwide. Generally, the golden algae distribution is limited to the south and southwest parts of the state. For an update on golden algae distribution call the Oklahoma Department of Wildlife Conservation at 521-3721.

Below is the location and listing of known and suspected zebra mussel infested waterbodies in Oklahoma as of 3/18/05:

WATERBODY	STATUS OF CONTAMINATION
	CONFIRMED/SUSPECTED
Dardanelle (Ark)	C
El Dorado (Kan)	C
Oologah	C
Kaw Res	C
Keystone	S
Ft. Gibson	S
Lynn Lane	C
Chaney Res (Kan)	C
Ark River nav channel	C
Verdigris River	C
Webber's Falls	C
Grand	C
RS Kerr	S
Eucha	S
Spavinaw	S
Eufaula	S



The reader should be aware that the zebra mussel has been used as an example in many locations throughout this document. These same decontamination procedures are believed to be effective for all known invasive species in Oklahoma.

Two levels of decontamination are detailed herein. Level one, a cursory, less intense decontamination, is used when a boat has been used in a waterbody with a known or suspected infestation for a very short period of time (generally <1 hour) or equipment, including boats, is being transferred between sites that have known or suspected infestations. Level two, the more intense decontamination, requires more time and effort to ensure that no juveniles mussels, algal cells or plant parts have attached to equipment or the boat. Level two is used when transferring a boat or piece of sampling gear away from a waterbody with a known or suspected infestation. Level II decontamination is to be used **IN ADDITION TO LEVEL I** every time a piece of equipment or a boat has been exposed to a waterbody that has a confirmed or suspected infestation of an ANS (e.g. zebra mussels, golden algae, Eurasian milfoil) **and** that equipment is to be transferred out of the area of known contamination. This is especially important if the equipment has been deployed for an extended period of time in the infested water. The “Quick Reference” at the end of this document will help you determine when to apply which level. Field teams are encouraged to laminate this and keep it with your boat or in the truck.

These procedures are to be employed at all waters confirmed or suspected to be infested with an aquatic nuisance species and at all times when waters are above 5°C. Waters are to be considered “suspect” if they are downstream of a known infestation even if there is no report of infestation. However, researchers working in 1st and 2nd order streams within the watersheds of known or suspected infestations will only be required to perform a Level I decontamination. These waters will normally undergo such wide swings in environmental conditions that it is unlikely that ANS could become established. Normal cleaning and maintenance should be enough to prevent the distribution of ANS. It is the researchers responsibility to stay up to date with the most current information on distributions.

It is important to note here that the task is not to directly kill the invasive species in question but to ***prevent its transfer to other uninfected waterbodies***. The process of treating the car wash wastewater in the municipal sewage or stormwater treatment system prior to discharge is sufficient to kill almost anything that may have survived the car wash itself. Procedures dealing with high-pressure car washing will be dealt with later.

Various chemicals have been investigated in the on-going attempt to limit the spread of ANS. Approximate concentrations of disinfectants and contact times necessary to kill zebra mussels are presented below. The guidelines presented in the table are believed to be adequate to obtain 100-percent mortality for the veliger (larval) stage and may also be adequate for the other life stages, including juvenile and adult mussels. As can be seen in the table, the effort required to kill zebra mussels is far beyond that which can be reasonably applied on a daily basis. Additionally, many of these methods are considered to be detrimental to many types of equipment used by field staff.

DECONTAMINANT	CONCENTRATION	MIN. CONTACT TIME
iodized salt soln.	saturated	30 minutes
ethanol	50%	2 minutes or multiple flooding rinses
Lysol or other phenol-based product	as sold	2 minutes or multiple flooding rinses
chlorine bleach	10%	1 hour
Desiccation		5-7 days
Vinegar (white only)	as sold (5% acetic acid)	Not clear at this point in time
Grapefruit seed extract solution	2 tbsp per gallon	5 minutes

GENERAL PRECAUTIONARY MEASURES AND PREPARATIONS

There are certain measures that should be employed prior to any sampling trip. These will allow more efficient use of time when actually decontaminating.

- Inspect all boats, motors, trailers and other equipment that is to be deployed to make sure that you are not transporting biological nuisance species.
- Never take wet equipment to the field. All boats, trailers and equipment should be completely air-dried for at least 2 days prior to being redeployed. Even if that equipment hasn't been exposed to infested waters, it should not have been put away wet.
- Never transfer water between sites. Always make sure that bilge areas (or all interior low areas if there is no bilge area) and storage compartments are drained before leaving a site.
- Always keep extra boat plugs handy. Since you will be removing the plug after each site, chances are increased that you will lose it.
- Fill a gallon container with tap water for use in the datalogger storage cups. DO NOT use local water for storage. Use only the tap water you brought with you.
- Fill a spray bottle with a Lysol solution or full-strength vinegar for use on the wet wells, bilge areas and carpeted trailer bunks. The trailer bunks can be treated after unloading the boat at your destination. Keep the disinfectant bottle in the truck so the driver can treat the trailer bunks after deploying the boat.
- Always have a bucket with you to wash/soak anchor ropes and equipment lines in.
- Note the location of car wash operations that can handle the size boat you are using. This information should be recorded on a map or the logbook for future reference. Keep a supply of quarters handy and remember to keep track of how much you spend since this is reimbursable on a travel claim (even without receipts according to Administrative staff).

- Make sure that you are using, when possible, the coolers and churn splitters dedicated for sampling within an area of suspected or confirmed infestation. These coolers and churn splitters should be labeled and referred to as “DIRTY”. If you cannot dedicate equipment to certain waters, Level II decontamination is required after all trips.
- Plan your trips to sample un-infested waters first, then suspect waters and conclude with the waters with confirmed infestations. Refer to the map in the front of this document as a guide for trip planning. Check the various information sources periodically to confirm distributions of zebra mussels, milfoil, and golden algae. Decontaminate when sampling is complete.
- Use the checklist found in the back of this document to help keep track of what has been done to equipment. These sheets should be kept in the lab, completed after each trip for each lake visited (confirmed or suspected infestations only) and filed in the lab for future reference. Look for the expandable folder on the refrigerator marked “DECONTAMINATION HISTORIES”. Each waterbody will have its own folder for you to file the checklist found at the end of this document.

LEVEL I DECONTAMINATION

Level I decontamination is to be used every time a piece of equipment or a boat has been exposed to a waterbody that has a confirmed or suspected infestation of an aquatic nuisance species (e.g. zebra mussels, golden algae, Eurasian milfoil). Even short-duration exposures can be a pathway for the transfer of these invasive organisms. It employs cursory examination and a high-pressure hot water car wash. Field staffs are encouraged to note the locations of local car wash operations in areas you frequently sample that are equipped to handle the size boat you normally employ. These locations should be noted on a map or the logbooks for future reference.

The following constitutes Level I decontamination.

Small equipment (nets, waders, boots, buckets, etc.)

- All field equipment needs to be visually inspected and all visible mussels removed and killed.
- All field equipment (except the dataloggers and other electronics) must be cleaned by soaking, dipping in, or scrubbing with, one of the disinfectant solutions listed. If one of these approaches is not possible, the equipment should be cleaned and rinsed with soapy water (hot and/or high pressure if possible) and allowed to dry completely before next use. This is best accomplished in a car wash setting close to the lake or stream.
- Particular attention must be given to places where the mussels could be accidentally trapped, such as the treads of boots and waders, hinges of benthic grabs, etc.
- Seines can be left rolled for cleaning if at least 3 minutes of high-pressure hot soapy water is used in the cleaning process. Be sure to rinse thoroughly.

- Anchor lines, dock lines and other ropes used to deploy equipment such as Van Dorn bottles or “bomb” samplers can be coiled inside a bucket for cleaning. These should be left to soak for 5 minutes in the hot soapy water.
- Dataloggers (Hydrolab and YSI instruments) should be thoroughly rinsed with D.I. water **after every exposure** to infested water. Use tap water you brought with you to fill storage cups.

NOTE: These preventative measures are not meant to replace normal cleaning and maintenance. “Acid washing” is still necessary for some equipment and is performed in addition to Level I decontamination.

Boat hulls, anchors, and trailers:

- Always drain the bilges of the boat by removing the drain plug. Bilge pumps are not capable of removing all water from those areas. Wet wells, live wells, and any other compartments that could hold water from an infested field collection site should be drained of water at the field site, and if possible, flushed with hot water and allowed to dry before the next use. If appropriate, the field site water may be drained back into the original body of water, as long as conditions and the decontaminant used are such that this would not cause chemical or biological contamination. Otherwise, such water containing disinfectant solutions (vinegar, alcohol, or strong Lysol solution) must be drained into a suitable container for treatment prior to final disposal. Field crews may elect to not drain the bilge area until they return to the storage lot **if they are not going to any other bodies of water until decontamination is completed.**
- If the bilge water is drained and collected, it must be disinfected and then disposed of by suitable means to avoid causing environmental damage or contamination.
- After draining contained water, all compartments that held water should be power washed and left open to completely dry prior to use in the next site.
- All boats, anchors, trailers used in field sampling will be cleaned using a self-service car wash working from fore to aft and gunnels to keel in a thorough manner.
- While using the high-pressure car wash, particular attention should be paid to the cooling water intakes on the lower unit of the motor.
- Particular attention should be paid to the carpeted trailer bunks since they can hold water for extended periods of time. These areas should have already been treated with a disinfectant solution when the boat was unloaded into the lake but should be power washed anyway.
- Lower the motor to drain all water from the lower unit. Replace the motor into the “transom saver” when this is accomplished.

Regardless of which level of decontamination is used for cleaning, visual inspection must follow with *special attention* being paid to: 1) cracks and crevices in which mussels or aquatic macrophyte segments may become trapped, and 2) areas on trailers or propellers that may harbor aquatic macrophytes or juvenile mussels. Particular attention must be paid to trailer pads made of carpet and foam rubber,

which could trap tiny mussels or algal cells. Make sure you always treat trailer bunks with disinfectant on every trip.

LEVEL II DECONTAMINATION

Level II decontamination is to be used IN ADDITION TO LEVEL I every time a piece of equipment or a boat has been exposed to a waterbody that has a confirmed or suspected infestation of an aquatic nuisance species (e.g. zebra mussels, golden algae, Eurasian milfoil) and that equipment is to be transferred out of the area of known contamination. Usually this will mean that a sampling trip is complete and you are returning to the home office to process samples or being planning the next trip. This is especially important for those who leave equipment in the infested waterbody for extended measurements or activities that will require a boat to be deployed in the infested waterbody for several days. If a boat is to be re-deployed into the same water it just came out of, level II decontamination is not necessary until the sampling trip is complete.

The following constitutes Level II decontamination.

Small equipment (nets, waders, boots, buckets, etc.)

- Sampling equipment should be washed in a disinfectant solution previously discussed. Hard surfaces should be scrubbed with a brush to ensure complete removal of any attached veligers and algal cells.
- All equipment should be left in the open to dry completely for at least 2 days.
- If dedicated equipment is being used (e.g. samplers or coolers that are not used anywhere else except in infested waterbodies), be sure that whatever identification is being used to mark this item as dedicated equipment is intact and visible.
- Normal “acid washing” will accomplish the goals of Level II decontamination for that equipment for which it is appropriate.
- Dataloggers (Hydrolab and YSI instruments) should be thoroughly cleaned with a mild soap and water solution using the maintenance brush (soft bristle toothbrush) provided with the instrument. **DO NOT USE THE DISINFECTANT SOLUTION ON THESE INSTRUMENTS.**
- Wading shoes should be washed with normal laundry detergent before being used in another waterbody. Waders can be power washed and allowed to air dry completely.

Large equipment (boats, trailers, etc.)

- After draining the bilges and all other wet areas, use the high-pressure car wash to clean out those areas.
- Use a pre-mixed spray bottle of disinfectant solution to spray the inside surfaces of the bilges and other wet areas.
- Be sure to clean the forward deck of the boat and any other area where water may have pooled or potentially contaminated equipment may have rested.
- Leave all cleaned areas open to the air for at least 2 days.

- **FOR FTE STAFF ONLY:** With all personnel clear of the motor and the motor in the “down” position, use the high-pressure wash wand to flush the lower unit first with hot soapy water and then clean rinse water. While rinsing the lower unit, turn off the “dead man” switch thereby preventing the engine from running and engage the starter for several seconds to flush clean water through the cooling system. Make sure that the rinse water is continually sprayed into the cooling vents while the motor is cranking over. **NEVER RUN THE MOTOR “DRY”**.

Boat hull surfaces, anchors, and trailers:

- When launching the boat, the person backing the tow vehicle should take a spray bottle of disinfectant solution previously discussed and apply a generous coating of disinfectant to the carpeted bunks of the trailer. Do not rinse this off. This is the same disinfectant used to clean out the bilge areas and wet wells.
- After using the high-pressure car wash, use the brush or soap mop at the car wash to scrub all exterior surfaces to ensure complete removal of attached veligers and algal cells. After power-washing, feel along the hull below the water line for a “gritty” or “bumpy” residue. This may indicate settled veligers or juvenile mussels that are attached to the hull and forming shells. If you can feel a gritty texture to the hull, repeat the washing procedure until the grit is gone.
- Pay close attention to the underside of the trailer and fenders when cleaning. Pieces of macrophytes and other hitchhikers can become lodged around axels and springs.

TRIP NAME (LOCATION)		TRIP DATE	
POST TRIP CHECKLIST	LEVEL	DATE	NAME
PULL DRAIN PLUG	I		
DRAIN ALL INTERIOR AREAS	I		
AIR-DRY ALL COMPARTMENTS	I		
VISUAL INSPECTION			
HULL	I		
TRAILER	I		
EQUIPMENT	I		
HAND-WASHING			
HYDROLAB	I		
ROPES	I		
SAMPLERS	I		
WADERS	I		
POWER WASHING			
HULL	II		
TRAILER	II		
INBOARD SURFACES	II		
SEINES AND OTHER NETS	II		
WADERS ETC	II		
CHEMICAL TREATMENT			
INBOARD SURFACES	II		
ROPES	II		
SAMPLERS	II		

DECONTAMINATION QUICK REFERENCE

LEVEL I - for use when moving boats and equipment between waterbodies with confirmed or suspected infestation.

- Rinse Hydrolabs with clean water and refill storage with tap water.
- All seines, ropes, equipment lines, waders, sampling equipment should be washed with hot soapy water (car wash) or a disinfectant solution, then rinsed thoroughly.
- Drain plugs should be removed and all water removed from interior spaces. Leave these areas open to the air till next launch.
- Boat hulls and bunks should be washed with hot soapy water and rinsed thoroughly (car wash).
- Lower motors to completely drain the lower unit.

LEVEL II – for use IN ADDITION TO LEVEL I when moving boats and equipment out of areas with confirmed or suspected infestation.

- Wading shoes should be washed in normal laundry detergent using the manufacturers guidelines.
- All interior surfaces of the boat that may hold water including bilge areas and wet wells should be washed with hot soapy water and rinsed thoroughly (car wash).
- Areas that hold water should also be sprayed with the disinfectant solution and not rinsed.
- Leave all interior spaces open to the air for at least 2 days.
- After draining the lower unit of the motor, disengage the “dead man” switch, direct a constant flow of hot soapy water into the lower unit, engage the starter to push the soapy water through the cooling system, rinse the system thoroughly in the same manner. **DO NOT RUN THE MOTOR OUT OF THE WATER.** After completion of the rinse, return the lower unit to the transom saver.
- Boat hulls should be washed using the brush or soap mop.
- Trailers should be carefully washed including bunks and all underneath surfaces and suspension systems.