Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedures to Minimize the Spread of Invasive Species
Version 2.1

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SIGNATURES ON FILE

Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

SOP Revision History

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Environmental Assessment Program

Standard Operating Procedures to Minimize the Spread of Invasive Species

1.0 Purpose and Scope

1.1 Environmental ethics and Washington law prohibit the transportation of all aquatic plants, animals, and many noxious weeds.. Specifically, it is a misdemeanor to "transport aquatic plants on any state or public road, including forest roads" or to "knowingly import, move within the state, or export" animals.

1.2 This document is the Environmental Assessment Program (EAP), Standard Operating Procedure (SOP) to minimize the risk of spreading any organisms, especially aquatic invasive species (AIS), within or between waterbodies or other field sites as a result of fieldwork, reconnaissance activities or other operations.

1.3 This SOP combines and implements the prevention and control measures identified in Ecology's Hazard Analysis and Critical Control Point (HACCP) Plans for conducting operations in Areas of Extreme Concern and Areas of Moderate Concern. See Aquatic Invasive Species webpage-- www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html

1.4 This SOP supersedes the Washington Invasive Species Council SOP 'Reducing Accidental Introductions of Invasive Species'. It covers all points considered in that protocol and is more stringent in some areas.

2.0 Applicability

2.1 This SOP covers all field operations.

2.2 These procedures also apply to contractors operating under contract to EAP. They don't apply to other organizations conducting joint field work with EAP.

3.0 Definitions

3.1 AIS – Aquatic Invasive Species: any freshwater or marine species that is not native to an ecosystem and whose introduction does or is likely to cause economic, human health, or environmental harm.

3.2 Areas of Extreme Concern –Areas of the state documented as having established Aquatic Invasive Species (AIS) that are considered to be a particular environmental or economic threat and hard to remove from sampling equipment, such as areas with New Zealand mudsnail (NZMS) populations. Most equipment and sampling gear used in these areas must undergo rigorous inspection and decontamination procedures to prevent accidental introductions to other waters. (Maps of these areas are available at www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html.)

3.3 Areas of Moderate Concern –Areas of the state not documented as having established NZMS or other species of extreme concern. These areas may have other invasive species, including plants, animals, fish, invertebrates, and pathogens that should not be spread.

3.4 Decontamination – a method used to kill invasive species that may be lodged in or on equipment. These include drying, hot water wash, freezing and chemical treatments.

3.5 Ecology – Washington State Department of Ecology.

3.6 EAP – Environmental Assessment Program.

3.7 HACCP – Hazard Analysis and Critical Control Point. This is a systematic analysis tool used to identify the risks and the preventative procedures needed to significantly reduce the spread of aquatic species from our sampling equipment and operations. (HACCPs for areas of both Moderate and Extreme Concern are available at at www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html.)

3.8 Invasive Species – any organism that is not native to an ecosystem and whose introducation does, or is likely to cause, economic, human health, or environmental harm.

3.9 New Zealand mudsnail – This AIS from New Zealand has been spreading across North America since its introduction in the late 1980s. They are very small (<1/8 inch) and just one individual is capable of producing 230 juveniles per year. They are easily transported into uninfected waters by hitchhiking on waders or other aquatic equipment. They are considered an environmental and economic threat to the state (Washington Invasive Species Council, 2008).

3.10 Noxious weed – a plant included on the State Noxious Weed List. They are invasive, non-native plants that are a threat to the natural resources, ecology, and economy of Washington State. The list of noxious weeds and information about the State Noxious Weed Control Board is available at www.nwcb.wa.gov.

3.11 Equipment – This means all equipment that contacts water, sediment, plants, or the ground during site access, reconnaissance, and sample collection. Such equipment includes but is not limited to: wading boots or shoes, samplers, ropes, nets, boats, trailers, vehicles, anchors, chain, water and sediment grab samplers, cables, probes, multi-probes, flow measuring or gaging devices, and others.

3.12 Felt-sole waders – waders with any sort of fibrous surface affixed to the sole. They require decontamination because of their ability to trap and hold mud, vegetation, and moisture.

4.0 Personnel Qualifications/Responsibilities

4.1 Field operations require training specified in EAP's Field Safety Manual (Ecology, 2010) such as First Aid, CPR, and Defensive Driving, as well as training in field gear cleaning methods specified in EAP Procedure #1-15.

5.0 Equipment and Supplies

5.1 The following may be required, depending on the equipment used in sampling and the decontamination method being used:

5.1.1 Clean water supply (free of mud and debris)

5.1.2 Scrub brushes and bucket

5.1.3 Hose adapters for flushing outboard boat motors

5.1.4 Hand tools for attaching hoses or taking apart equipment if necessary

5.1.5 If decontamination is required:

5.1.5.1 Treatment chemicals if that is the decontamination method to be used, along with a backpack sprayer, squirt bottle, tub, buckets, bags or other method to apply, contain, and transport chemicals.

5.1.5.2 Thermometer to monitor temperature of treatment if using hot water for decontamination.

5.1.5.3 Watch to monitor treatment times

5.1.5.4 Adequate supply of hot water if that is the decontamination method used.

6.0 Procedures

Note: a one-page procedure summary is at the end of this document

6.1 Planning - Prior to Conducting Field Work and During Field Work

6.1.1 **Determine if the field activity is located within an Area of Extreme Concern** by checking the current maps at this link: www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html. If so, the extra decontamination step (section 6.2.1.2) will need to be followed for all equipment that contacted aquatic sediment, aquatic vegetation, or fish. (Note: felt sole wading boots must be decontaminated no matter where they are used).

6.1.2 **Use equipment which can be easily inspected and cleaned** to both avoid spreading invasive species and reduce impacts to planned field schedules. If possible, bring extra sets of "back up" field equipment in case cleaning and decontamination (if required) can't be done in the field prior to arrival at a new sampling site. Where feasible, especially when working in areas of extreme concern, dedicate gear to be used only in that waterbody.

6.1.3 *Note: wading gear has been implicated in the spread of New Zealand mudsnails as well as other AIS such as didymo (the diatom Didymosphenia geminata) and fish, amphibian, and plant diseases. Felt soles can be particularly problematic because of their tendency to stay moist for long periods. The laces and eyelets of lace-up wading boots can also be problem spots because they are difficult to clean. To the extent possible, consider using non-felt soles and boot-foot waders.* Because of these risks from felt sole waders, they must go through the decontamination step (section 6.2.1.2) in all parts of the state.

6.1.4 Conduct field activities to **minimize contact between equipment and potential sources of invasive species**, particularly aquatic plants, sediment, and fish. This can include the following:

6.1.4.1 Sample from least to most contaminated areas, for example, sample upstream to downstream or from areas of less weed growth to dense weed growth.

6.1.4.2 Minimize wading and avoid running boats onto sediment.

6.1.4.3 Avoid getting plants, sediment, and fish inside boats or other sampling gear.

6.1.4.4 Use a catch pan underneath dredges, etc., to keep potential AIS off boat decks and out of bilges.

6.1.4.5 Avoid driving or walking through areas of mud and high weed growth

6.2 After Field Work

6.2.1 Inspect, clean and if working in an area of extreme concern, decontaminate equipment – this step is divided into two parts:

6.2.1.1 First – inspect, clean and drain all equipment

6.2.1.1.1 **Inspect and clean** all equipment that contacted (terrestrial or aquatic) soil, vegetation, or water. Remove any visible vertebrates, invertebrates, plants, algae or sediment. If necessary, use a scrub brush, and rinse with clean water either from the site or brought for that purpose. Continue this process until the equipment is clean. **Drain** all water in bilges, samplers or other equipment that could hold water from the site. Flush areas that can't be seen with clean water until the rinse water is clean. Information on cleaning boats and motors is in Attachment B.

6.2.1.1.2 Do the initial treatment (scrubbing and rinsing) before leaving the sampling site (if possible). If cleaning after leaving the field site, ensure that no debris will leave the equipment and potentially spread invasive species during transit or cleaning. Acceptable interim sites for cleaning include: Ecology OC or Regional Offices, commercial car wash businesses, or other facilities (e.g. WADOT shops), provided drains do not lead to surface waters. A table with commercial car wash locations is available to Ecology employees http://aww.ecology/programs/eap/InvasiveSpecies/index.html

6.2.1.2 ***Second – decontaminatefelt sole waders and, in areas of extreme concern, equipment that contacted aquatic sediment, aquatic vegetation, or fish.***

6.2.1.2.1 **Wipe smooth surfaced sampling equipment that can be easily and fully wiped down until dry**. The equipment must be smooth enough so there are no cracks or crevices that could harbor a sand-grain-sized juvenile New Zealand mudsnail while being wiped dry.

6.2.1.2.2 **Use one of the decontamination treatments from Attachment A for all other equipment**. For additional information on cleaning boats and motors, see Attachment B.

6.2.1.2.3 Decontamination treatments should take place where the procedure can be carried out effectively and safely. Keep in mind that wash and rinse water must not drain to surface water, and all chemicals must be disposed of to a sanitary sewer.

6.3 Relaxing Requirements

6.3.1 Equipment should be cleaned whenever leaving a field site, however, decontamination procedures as described in this SOP need not be followed under the following circumstances.

6.3.2 Documented exceptions:

6.3.2.1 If procedures in this SOP are not workable for a particular project, exceptions may be documented and approved following QAPP guidance.

6.3.3 Moving short distances:

6.3.3.1 If moving by foot within the same watershed, equipment may be used without following procedures in this SOP. Keep in mind to work from upstream to down whenever possible. Procedures laid out in this SOP must be followed when leaving the area.

6.3.4 Sampling by boat:

6.3.4.1 When transiting by boat to different sites within a waterbody, procedures detailed in this SOP may not be necessary. However, when boating from site to site, don't move water, sediment, organisms, nor vegetation on sampling gear, boat props, etc. Leaving the waterbody requires implementing this SOP.

6.3.5 Float Planes

6.3.5.1 In marine systems, the pontoons of float planes should not represent a problem and special cleaning should not be required unless motoring through weedy areas, in which case they should be visually inspected before taking off. Amphibious planes (with wheels) should be avoided because they are more likely to catch and transport material. The use of float planes and helicopters in freshwater is not covered in this SOP and should be explicitly addressed in the project QAPP; however, float planes should not be used between waterbodies with invasive plant species.

7.0 Equipment storage

7.1 When moving between field sites, and upon returning from the field, **store gear in a manner to facilitate drying**. For example, boots and waders should be stored on a drying rack until dry, not left in a gear bag; open hatches and leave out drain plugs on boats.

8.0 Special Considerations for Construction and Restoration Projects

8.1 Avoid moving weed infested gravel, rock, and other fill material to relatively weed-free locations. Gravel and fill should come from weed-free sources. Inspect gravel pits and fill sources to identify weed-free sources.

8.2 Identify and remove existing noxious weeds in areas of construction to avoid contaminating construction equipment

8.3 Minimize ground-disturbing activities

8.4 Use only certified weed-free straw and mulch for erosion control

9.0 Quality Control and Quality Assurance Section

9.1 Follow the procedures of this SOP.

10.0 Safety

10.1 Follow all EA Program Safety Manual procedures. Take precautions if using hot water for decontamination to avoid burns.

11.0 References and Related Documents

11.1 Ecology, 2010. Environmental Assessment Program Safety Manual. Olympia, WA. 168 pp.

11.2 Ecology, 2006. Chemical hygiene plan and hazardous material handling plan. Olympia, WA.

11.3 Washington Invasive Species Council. Invaders at the Gate: Washington Invasive Species Council 2008 Strategic Plan. www.invasivespecies.wa.gov/documents/InvasiveSpeciesStrategicPlan.pdf

11.4 10.4 Reducing Accidental Introductions of Invasive Species: State Agency Field Work Protocols

www.invasivespecies.wa.gov/documents/invasive%20species%20prevention%20protocol.pdf

11.5 Environmental Assessment Program Policy on Minimizing the Spread of Aquatic Organisms. EAP Procedure 1-15. *(Requires all EAP field work to follow approved procedures for minimizing the spread of aquatic organisms.*)

11.6 Invasive Species Internet page.

(www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html) *(Includes maps, SOPs, and supporting documentation, a section on alternatives to*

felt-soled waders, a list of car washes and other hot water sources, contacts, and links to more information.)

11.7 RCW 77.15.290: Unlawful transportation of fish or wildlife — Unlawful transport of aquatic plants — Penalty.

11.8 Washington Weed Laws: links to three laws pertaining to noxious weed and quarantine laws www.nwcb.wa.gov/ab_weedlaws.htm

Attachment A – Decontamination treatment options

Decontamination employs chemicals, freezing, drying, or hot water. While chemical treatments can be used, they are not generally recommended for most equipment, boats, and trailers. The effects of chemical treatments on some equipment have yet to be researched. Several of the chemicals contain ammonia compounds that could contaminate ammonia samples. Also, chemical treatments need to address safe and environmentally sound storage, handling, and disposal of the chemicals.

The treatment options listed in Table A-1 utilize temperature (heat or cold) or chemicals to ensure that contaminants such as New Zealand mudsnails that may have been missed during the initial treatment will be killed. At this time, hot water or drying are the recommended treatments for large equipment such as boats and boat trailers. Additional information about hot water sources and treatment methods is provided in Figure A-1.

Table A-1. Options for decontaminating equipment that has contacted sediment, aquatic vegetation or fish in areas of extreme concern.

Treatment	Concentration or temperature	Exposure Time	comments
hot water wash or soak (**see Figure A-1**)	60° C (140° F)	5 min for felt-soled boots and nets; 10 sec for all other equipment	Ensure all parts of the equipment reach temperature for the full exposure time
	49° C (120° F)	10 min for felt-sole boots and nets; 5 min for other equipment	Ensure all parts of the equipment reach temperature for the full exposure time
cold	-4° C	4 hours minimum	Time starts after the equipment reaches -4 °C
drying	low humidity, in sunlight is best	48 hours	Time starts after the equipment is thoroughly dry
Formula 409 Antibacterial All-Purpose Cleaner[1]	100% (full strength)	10 min	Follow proper procedures for storage and handling.
Green Solutions High Dilution 256[2]	3.1% or higher	10 min	Follow proper procedures for storage and handling.
Quat 128	4.60%	10 min	Follow proper procedures for

			storage and handling.
Hydrogen peroxide[3]	30,000 ppm (3%)	15 min	Spray on until soaked, then keep damp for contact time (cover or place gear in a dry bag)
Virkon Aquatic®	2%	20 min	Must soak (not spray on) Follow proper procedures for storage and handling[4]

[1] Must be antibacterial (make sure it has quaternary ammonia, otherwise it is ineffective)
[2] corrosive; read the MSDS and use with caution (replaced Sparquat 256).
[3] May be corrosive; read the MSDS and follow safety precautions
[4] Rinse gear after soak to prolong life. Solution degrades, lasts up to 7 days, best if mixed fresh

Note: additional options, details of the exposure times necessary to kill various organisms, and references are provided in a spreadsheet on EAP's website at www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html.

Note: All chemicals must be disposed of to a sanitary sewer.

MSDS forms for all chemicals are available at the following websites:
Formula 409® Antibacterial All Purpose Cleaner
https://www.thecloroxcompany.com/downloads/msds/409products/formula409antibacterialall-purposecleanerjw2014-08-10.pdf

Green Solutions High Dilution Disinfectant 256
http://cmcss.net/documents/safety/msds/greensolutionsdisinfectant.pdf

Buckeye Sanicare Quat-128
www.buckeyeinternational.com/media/SanicareQuat-1285087.pdf

Hydrogen peroxide 3%
www.sciencelab.com/msds.php?msdsId=9924298

Virkon aquatic solution
http://cygnetenterprises.com/files/msds/VirkonsolutionMsds.pdf

Figure A-1 Sources and methods for treating equipment with hot water

Hot Water Sources

- Hot tap water is available at EAP's OC in the Skookum Bay. (Note: Tap water at the Spills Program washdown bay by the HQ loading dock can be used for rinsing, but it is not hot enough to meet decontamination requirements.)
- A hot water pressure washer is available at EAP's OC (special training required).
- Other facilities may have hot water, such as Ecology's regional offices, WA DOT shops, and local government maintenance facilities.
- A portable hot water heater is available at the OC. The system uses propane to power an on-demand heater. It may be difficult to maintain 60° C with this equipment in the field. It is recommended to use the wask/soak times for 49° C (Table A-1) to ensure proper decontamination when using the portable hot water heater.
- Car washes can be used for rinsing and cleaning, but are not an option for decontamination: the water is not hot enough to kill aquatic organisms.

Treating Equipment with Hot Water

- Wear appropriate personal protection equipment to prevent burns to self and others.
- Avoid or protect parts of equipment that might be damaged by hot water.
- Ensure that the water is at least 60° C at the discharge side of whatever's being treated.
- Flush for at least 10 sec. for all equipment except felt soles and nets; 5 min for felt-soled boots and nets at 60° C (10 min at 49°C)
- After treatment, ensure equipment drains and dries before re-stowing equipment.

Attachment B – Additional Cleaning Information

Use one of the decontamination options in Table A1 if needed.
HOT WATER is preferred for decontaminating boating equipment at this time.

Felt Sole Waders

Felt soles can trap aquatic organisms and hold moisture that can sustain them for long periods.

1. First, rinse and brush soles to remove visible mud and debris.
2. Then use one of the treatment options in Table A-1.
3. Hot water, freezing or drying are recommended because they are effective against the widest variety of species and don't involve chemicals.
4. If hot water, freezing, or drying are not possible, choose a different option from Table A-1. Hydrogen peroxide is inexpensive, readily available, and relatively innocuous to humans and the environment; however, its effectiveness at killing organisms besides New Zealand mudsnails is not clear. Or see other options in the "treatment options" chart on www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html.

Hydrolabs

Cleaning recommendations for Hydrolabs that are deployed in areas of Extreme Concern and contact aquatic sediment or vegetation

1. Follow procedures in section 6.2.1.2.1 (wipe smooth surfaces until clean and dry). Decontaminate any parts of the hydrolab that can't be wiped clean of sand grain-sized particles using one of the methods listed in Table A-1
2. Parts of the hydrolab that can not withstand those methods (the probes) should be soaked in the low pH buffer solution (pH 4) overnight. (PH 4 buffer is the recommended storage solution.)

Boat Trailers

1. Flush all interior and exterior surfaces of trailers, wheels, and tires until clean. Interior surfaces are the inside of the trailer's metal tube framing.

Boat Hulls: Exterior and Interior

1. Remove gear as needed (e.g. deck mat, dip nets, net anchors, boat anchor and line, ropes) to provide access to all areas of the boat to allow for effective cleaning.
2. Wash down the boat working from bow to stern, and top to bottom. Flush all nooks and crannies to get at all areas where aquatic species may have gotten into. Wash all boat-related gear.
3. Wash all bilge areas where accessible using hot water, working from bow to stern. However, do not flush the bilge of the jet sled with hot water because of the fuel tank located there.

4. Raise bow of boat for effective draining of water and muck that gets into bilge. Work all of the bilge water, sediment, and muck out of drain on transom.
5. Flush all interior and exterior thru-hull pipes and screens. These may be located on the bottom of the hull, on the transom, or inside the hull (e.g. Skookum's strainers for washdown pumps and engine cooling system). Try backflushing bilge pumps by introducing water into the bilge pump discharge port (on transom or hull exterior) and check to see if water flows through the bilge pump and into the bilge.
6. If using hot water or chemicals on inflatable boats, ensure that such treatments won't damage the boat's material or adhesives

Boat Engines: Propeller and Jet Pump

Boat engines pump ambient water through them for cooling and can pick up and harbor unwanted material – which may be transported to another waterbody. While most boat engines have fine-mesh screens (~2 mm) that can prevent debris from getting into the engine, sand and mud particles may pass through. Jet-pump engines operating in shallow waters often move sediment and fine debris through the cooling passages, so more effort is needed to clean jet-pump engines. The external parts of engines can also collect weeds or other debris, especially propellers and other parts submerged in the water. Clean external parts of engines to remove all visible debris. Clean internal parts of engines by flushing with water as described below.

- Some engines have an adaptor that accepts garden hoses (electrofisher, jet sled, and Whaler #2). Connect hose or adaptor and run water through the engine. Check to ensure that water is reaching and running from the cooling water pump intake areas.
- Some engines need the "ear muff" type flushing adaptor (many smaller engines): Connect hose to adaptor and attach adaptor to the engine. Turn on water. Start engine and let run at idle speed.
- Some engines have no flushing adaptor (some smaller engines): Mount the engine so that the lower unit can be submerged in a large container (e.g. 18 gallon tote) filled with water. Start engine and let run at idle speed.

NOTE that all engines can be run while being flushed with cold water. However, running some engines while flushing with hot water could damage the engine, so DO NOT run engines while flushing with hot water. The exception to this is the electrofishing boat's outboard engine and generator – these may be run while flushing with hot water (monitor temperature for possible overheating condition). Many engines can be flushed with hot water as long as the engine is not run at the same time.

Table B-1 at the end of this section shows all of EAP's boat engines, their location, and the method needed for flushing each engine (electric motors excluded).

Electrofishing Boat: Fish Tank, Outboard, Generator, Pumps, and Plumbing Systems

Fish Holding Tank (Live Well)

1. Remove all standpipes and screens to get at trapped muck.
2. Wash interior thoroughly using scrub brush, and hot water (60° C; 140° F).
3. Soak and scrub all standpipes, and screens with hot water.
4. Let wash water and muck drain out of tank through transom.
5. Flush the fish tank fill pump and its plumbing with hot water for five minutes. To do this, remove access cover located inside live well on starboard side aft. Place hose through access and into tall stand pipe. Hot water will flush through the fish tank fill plumbing and pump, and out through the hull intake. While flushing, turn on fish tank fill pump for five seconds to stir out any debris. Do not run fish tank fill pump for extended period of time because this could burn up pump.
6. Decontaminating the recirculation pump can be skipped. The recirculation pump has been decommissioned and no longer in use. If the recirculation system becomes operational in the future follow these procedures: once fish tank and fish tank pump are thoroughly cleaned, fill fish tank with 4" of hot water and operate the recirculation pump for five minutes to help flush system of debris. If needed, remove and clean aerator (sprinkler) heads located in upper corners of live well.

Outboard Engine

1. Use 13mm socket and ratchet to unscrew and remove water intake bolt located on the lower jet unit, near jet pump bearing zerk fitting (see pictures 2A-2C below). Next, hand screw outboard flushing adapter to lower jet unit. Do not over tighten adapter to lower jet unit, finger tight is okay. Attach water hose to outboard flushing adapter.
2. Turn on water supply with the outboard engine off. Water will begin to spill out lower jet unit, and seams.
3. Turn on "Outboard Cranking Battery" selector located on stern (ensure water is on and spilling out of jet unit).
4. Turn outboard engine on, and run at idle speed. Outboard ignition key is located on throttle control box, port side of diver's console. Note: Do not run the outboard above idle speed. Throttle controller should be in neutral position. Ensure idle lever is all the way down, do not increase RPMs.
5. With the outboard engine on, water will discharge from the lower jet unit, seams, and indicator pilot hole located on starboard side of engine. At this point, water is flushing through entire cooling system.
6. Once flushing is complete, turn off outboard engine. Next, turn off "Outboard Cranking Battery" selector located on stern.
7. Turn off water and disconnect hose and adapter from lower jet unit.

8. Replace water intake bolt on lower jet unit.
9. **Note**: If flushing the outboard engine with hot water, you may notice grease seeping out from "Excess-Grease Exit Hose" (see picture 2A), this is normal. If grease seeps out, apply an adequate amount of grease using electrofishing boat grease gun. Pump enough grease to just fill the exit hose.

Generator

1. Unscrew "Generator Raw Water Strainer" located on the port side of dirver's console (see picture 3A below). Remove mesh strainer from strainer cup. Rinse out debris from strainer and strainer cup. Ensure not to lose strainer cup o-ring during rinsing. After rinsing is complete, replace mesh strainer back into strainer cup, and attach strainer cup to port side of driver's console – do not bend edges of mesh strainer while attaching to driver's console.
2. Next, use 11/16" open end wrench to unscrew "Generator Test Water" fitting pipe plug located on the base of generator cover, port side aft (see pictures 3B-3C). Next, hand screw generator flushing adapter into "Generator Test Water" fitting. Do not over tighten, finger tight is okay. Attach water hose to the generator flushing adapter.
3. Turn on water supply with the generator off (do not run generator at this point). Water will back flush plumbing through generator strainer, and out through hull intake. Flush for several minutes.
4. Once the plumbing from the hull intake through generator strainer has been flushed, the generator can now be started. Turn the main battery selector located on port side of driver's console to battery 1 or 2 (see picture 3A). Ensure water is spilling out of hull intake before starting generator. Turn on generator ignition key located on driver's console. Once the generator is started, water will flush the cooling system from the raw water pump, through the heat exchanger, and out the exhaust located on the transom. Continue flushing system for several minutes.
5. Once flushing is complete, turn off the generator. Leave the adapter and hose attached to the "Generator Test Water" fitting, with the water on. Proceed to flush washdown pump.

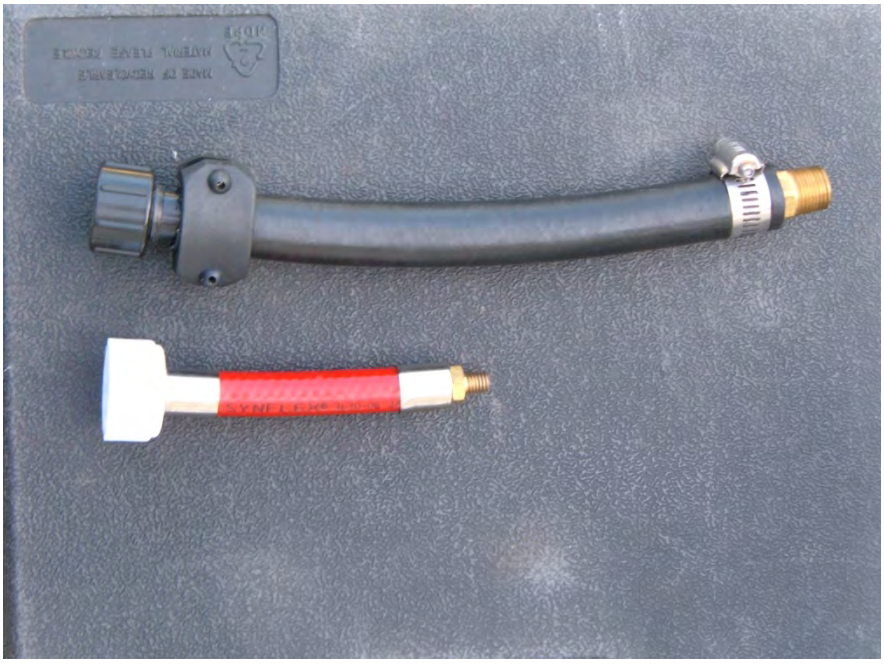
Washdown Pump

1. Follow steps 1 – 4 from generator section above. As the water back-flushes through generator strainer and out hull intake, it's also priming the wash down pump.
2. Turn main battery selector to either battery 1 or 2 (see picture 3A). Next, turn generator ignition key to the accessories position. Turn on the washdown pump switch located on driver's console. Remove washdown hose/spray nozzle from access port located on the starboard side of driver's console.
3. Spray washdown hose to flush washdown pump and internal plumbing.
4. Once flushing is complete, turn off washdown pump switch. Next, turn generator ignition key off. Turn off main battery selector.
5. Turn off water supply, disconnect hose and adaptor from "Generator Test Water" fitting.

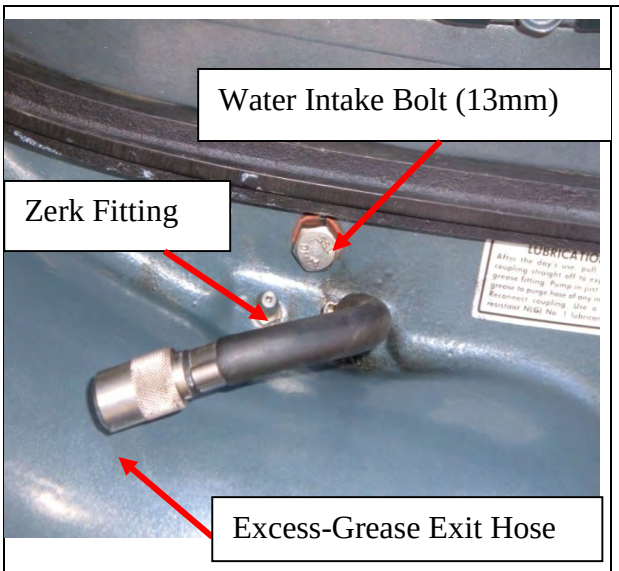
6. Replace pipe plug in the “Generator Test Water” fitting located at the base of generator cover, port side aft. Finger tighten pipe plug, then ¾ turn with 11/16” open end wrench to snug down. Do not over tighten the brass pipe plug because it is prone to stripped threads.

Nets and Related Gear

1. Clean weeds off the net and attached gear while retrieving in order to reduce loading the boat with weed fragments.
2. When ashore at the boat launch, find a way to hang nets and manually pick off all weeds from mesh, lead line, and float line. For gillnets, hang 30-50 foot sections of net at a time between the truck and boat and gather the cleaned section into a clean tub. Repeat for the rest of the net.
3. Clean other nets and gear (e.g. beach seines, fyke net, dip nets, and trawl nets) similarly to gill nets.
4. Ensure that floats, anchors, and anchor line are cleaned of all visible foreign material.
5. After adequately hand-picking and cleaning nets and related gear, one of the treatments in Table A-1 is required. Preferably a hot water soak.
6. If unable to clean while in the field, nets and gear can be cleaned upon return to the OC - provided they are not being used in another waterbody
7. NOTE: chemical treatments may damage nets so testing should be done before using chemicals.



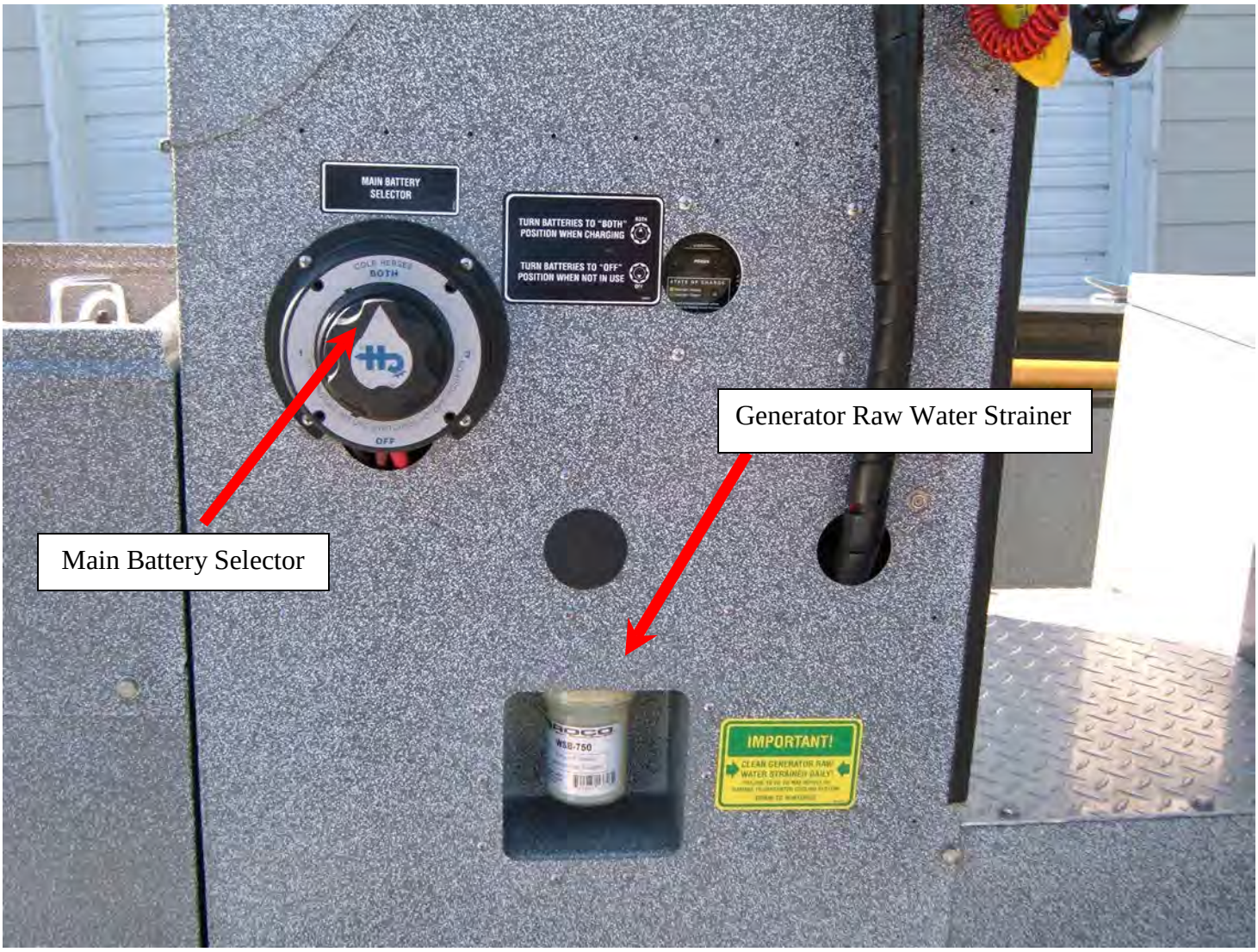
1A. Large black hose adapter for flushing electrofishing boat generator. Small red hose adapter for flushing electrofishing boat outboard engine.



2A. Outboard excess-grease exit hose, zerk fitting and water intake bolt. Located on port side of jet unit.

2B. Water intake bolt has been removed, and outboard flushing adapter has been attached.

2C. Outboard flushing adapter attached to lower jet unit. Ready to turn on water supply and flush outboard system.



3A. Generator raw water strainer and main battery selector are located on port side of diver's console.

3B. Generator raw water flushing connection (i.e. Generator Test Water Fitting). Located on the base of generator cover, port side aft.

3C. Pipe plug has been removed, and generator flushing adapter has been attached.

3D. Generator flushing adapter is attached. Ready to turn on water supply and flush generator and washdown pump systems.

Table B-1. Boat Engine Information for Cleaning to Minimize Spread of Aquatic Species. (1/28/10).

Boat Name and Type	Engine Information	Location	Flushing Method
Skookum Almar "Sounder" 26'x8.5'	Volvo-Penta 200HP Diesel Model AD 41/DP 2002	OC main engine on boat	Ear Muffs
Large Whaler 20' "Outrage" Boston Whaler	Evinrude 150 HP 2-cycle Model E150FPXEE Serial # G04651401 Tag # E120972 (12/98)	ERO main engine on boat	Ear Muffs
Large Whaler 20' "Outrage" Boston Whaler	Evinrude 5 HP 4-cycle Model E15FRLED Serial # G04070374 Tag# E117261	ERO spare engine on boat	Ear Muffs
Electro-Fisher Smith-Root SR-18 18'	Yamaha 115 HP 4-cycle Model F115TJRC Serial #68VL1070897J Tag # E133353 2007	OC main engine on boat	Hose connection and adaptor Generator also uses hose connection and adaptor
Whaler #1 ("old") 17' "Montauk" Boston Whaler	Evinrude 70 HP 2-cycle Model E70TLED Serial # G03842907 Tag # E116488 Feb-95	OC main engine on boat	Ear Muffs
Whaler #1 ("old") 17' "Montauk" Boston Whaler	No motor on boat as of 1/12/09	OC	n/a
Whaler #2 ("new") 17' "Montauk" Boston Whaler	Evinrude 90 HP 2-cycle Model E-TEC Serial # 05227247 Tag # new 2008	OC main engine on boat	Hose connection
Jet Sled Wooldridge 16 Xtra Plus (16.5')	Evinrude 115/80 HP 2-cycle Model E-TEC Serial # 05250809 Tag # E135285 2008	OC main engine on boat	Hose connection and adaptor

Table B-1 (continued). Boat Engine Information for Cleaning to Minimize Spread of Aquatic Species.

Boat Name and Type	Engine Information	Location	Flushing Method
McKee Craft 16'	Honda 90 HP 4-cycle Model Serial # BEB…a7…1007464 ? Tag # E135305	CRO main engine on boat	Hose connection
Jon Boat Valco P-14'	OMC 8HP 2-cycle #1 (in red lettering) Model E8REV Serial # G04323535 Tag # E118561 1997	OC on floor caddy	Flushing Tub
Little Jon Grumman Model 1237	Evinrude 6HP 2-cycle #3 (in white ? lettering) Model E6RETB Serial # BO8967546 Tag # E121292	OC on floor caddy	Flushing Tub
AVON 1 Roll-Up inflatable 2.85 9'x4'9"	Honda 5 HP 4-cycle Model ?? Serial # Tag # 2005	CRO location?	Hose connection
AVON 2 Roll-Up inflatable 2.85 9'x4'9"	Evinrude 6 HP 2-cycle #2 (in white lettering) Model E6RERE Serial # B09048443 Tag #E115547 Jun-94	**location unknown**	Flushing Tub
No Boat Assigned	Evinrude 6 HP 2-cycle #1 (in white lettering) Model E6R…? Serial # B8984343 Tag # E114122	OC on floor caddy	Flushing Tub
No Boat Assigned	OMC 8HP 4-cycle #2 (in red lettering) Model E8REVR Serial # H09363061 Tag # E119579 1997	OC on upright stand	Ear Muffs

Appendix

Summary of Field Gear Cleaning and Decontamination Procedure

Prior to field work:

- Check if the sampling will take place in an area of extreme concern – maps at this link: www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html.
- Plan field activities to minimize contact between equipment and potential sources of invasive species, particularly aquatic plants and sediment.

After conducting field work:

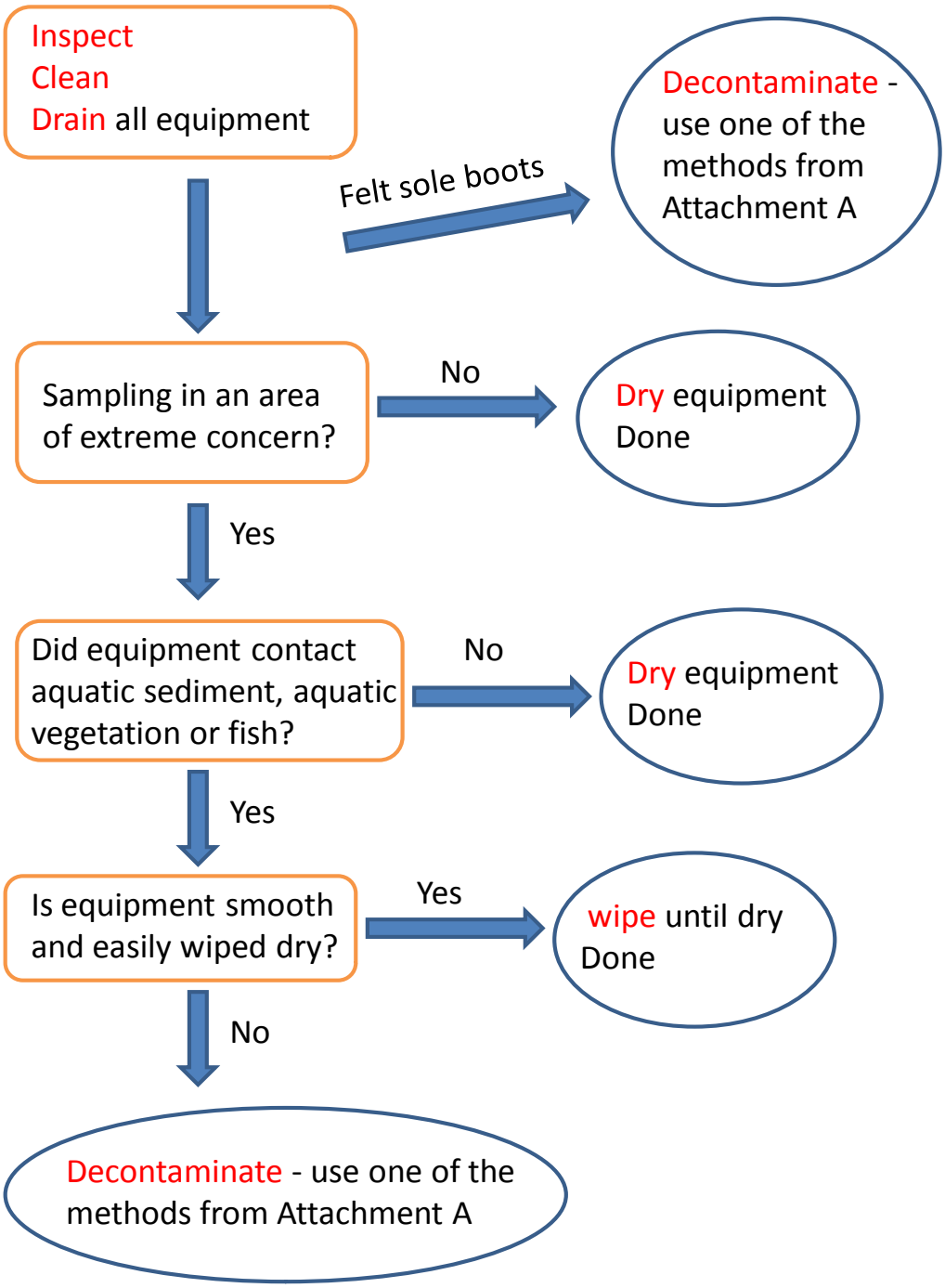
- **Inspect and clean** all equipment. Remove any visible soil, vegetation, vertebrates, invertebrates, aquatic plants, algae or sediment. If necessary, use a scrub brush and rinse with clean water either from the site or brought for that purpose. Continue this process until the equipment is clean. **Drain** all water in bilges, samplers or other equipment that could harbor water from the site. This step should take place before leaving the sampling site or at an interim site. If cleaning after leaving the sampling site, ensure that no debris will leave the equipment and potentially spread invasive species during transit or cleaning.
- **Additional Requirements for felt sole waders used anywhere in the state and equipment that contacted sediment, aquatic vegetation or fish in areas of extreme concern**:
    - **Smooth surfaced sampling equipment that can be easily and fully wiped down – wipe until dry**. The equipment must be smooth enough so there are no cracks or crevices that could harbor a sand-grain-sized juvenile New Zealand mudsnail while being wiped dry.
    - **For all other equipment, use one of the decontamination treatments found in the table below**. Conduct decontamination where the procedure can be carried out effectively and safely. Wash and rinse water must not drain to surface water, and all chemicals must be disposed of to a sanitary sewer.

Equipment Storage:

- **Dry** – Between field sites and upon returning from the field, when cleaning and decontamination requirements are complete store gear to facilitate drying.

Table. Decontamination Options

Treatment	Concentration or temperature	Exposure Time	Comments
hot water wash or soak	60° C (140° F)	5 min for felt-soled boots and nets; 10 sec for all other equipment	Ensure all parts of the equipment reach temperature for the full exposure time
	49° C (120° F)	10 min for felt-sole boots and nets; 5 min for other equipment	Ensure all parts of the equipment reach temperature for the full exposure time
cold	-4° C	4 hours minimum	Time starts after the equipment reaches -4 °C
drying	low humidity, in sunlight is best	48 hours	Time starts after the equipment is thoroughly dry
Formula 409 All-Purpose Cleaner[1]	100% (full strength)	10 min	Follow proper procedures for storage and handling.
Green Solutions High Dilution 256[2]	3.1% or higher	10 min	Follow proper procedures for storage and handling.
Quat 128	4.60%	10 min	Follow proper procedures for storage and handling.
Hydrogen peroxide[3]	30,000 ppm (3%)	15 min	Spray on until soaked, then keep damp for contact time (cover or place gear in a dry bag)
Virkon Aquatic®	2%	20 min	Must soak (not spray on) Follow proper procedures for storage and handling[4]

[1] Must be antibacterial (make sure it has quaternary ammonia, otherwise it is ineffective)
[2] Corrosive; read the MSDS and use with caution (replaced Sparquat 256).
[3] May be corrosive; read the MSDS and follow safety precautions
[4] Rinse gear after soak to prolong life. Solution degrades, lasts up to 7 days, best if mixed fresh

Summary Flow Chart