

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

# Invasive Species Management Protocols

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Version 1 - July 2011

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## **INTRODUCTION**

**Policy Background** – Policy 5310, Managing Invasive Species, commits the Department to “adopt and actively maintain science-based protocols for minimizing the risk that field and property management activities will contribute to the spread of invasive species”. The accompanying Procedure established the Invasive Species Management Committee (ISMC), with responsibility for developing and updating these protocols, monitoring their implementation and ensuring that training needs are met.

**Adaptive Management** - The ISMC relied upon best available science in developing these decontamination protocols. However, the science regarding effectiveness of decontamination protocols (either chemicals or procedures) on the entire suite of undesirable or invasive aquatic organisms remains incomplete. In particular, protocols known to be effective on selected undesirable organisms remain untested or poorly understood on others. Ultimately, science can adaptively fill these gaps. However, where effectiveness of a protocol on a specific undesirable organism is unknown and alternatives for control are lacking, protocol application must be viewed as exploratory and experimental, and control is not guaranteed. The ISMC will keep abreast of scientific developments, as well as monitoring implementation issues, and will adaptively modify these protocols as necessary to ensure they remain science-based, effective and safe.

**Phase In and Funding Constraints** – Policy 5310 stipulated that “Fiscal impacts may be phased in based on available revenue.” Full implementation of these protocols, in terms of purchase of materials and establishing proper decontamination stations, may take several years. However, all staff are expected to comply with these protocols to the extent feasible, within existing budget and staff constraints. Basic techniques of Inspect, Clean, Drain and Dry can be followed at little or no additional cost to the agency and should be implemented immediately. Much of this is already required by existing statutes concerning transport of aquatic plants, noxious weeds or prohibited species.

## **PART I. PROTOCOLS FOR FIELD WORK IN TERRESTRIAL AREAS**

1. When any acquisition, habitat enhancement/restoration, or construction projects are proposed, the Regional Director will be notified to disseminate the information to ensure that staff can review for invasive species management issues.
2. Before conducting field work, determine whether activities will be in an area of concern, and ensure that work plan allows for suitable decontamination and that appropriate decontamination equipment is available.
3. On Department lands, follow the requirements of the local Weed Management Plan located in the Wildlife Area Management Plan specific to that site. Consult with the Wildlife Area Manager or Access Site Manager prior to conducting of field work.
4. On other public lands, determine whether there are any local requirements and comply with those rules.
5. Employ basic weed-free precautions prior to entering the field by ensuring vehicles and clothing are free of invasives. Regularly check clothing and boots for attached weed seeds, remove them immediately to avoid distributing to new areas. Before exiting the field, visually inspect clothing and vehicles for plant hitchhikers and remove. Carry zip lock bags for this purpose, and dispose of them where they will not get reintroduced into the environment. Thoroughly wash vehicles in a contained area before moving to a new site, paying special attention to the undercarriage, grill and wheel wells.
6. Ensure that any wildlife translocation or relocation efforts comply with pathogen/disease screening criteria<sup>1</sup>.
7. Observe special precautions for field work at bat roosts/caves (white nose fungus) and other special circumstances<sup>2</sup>.

### **Protocols for Purchasing Hay**

Hay purchased for wildlife feeding must meet certain nutritional requirements and be available in bale sizes that are compatible with agency feeding equipment. To reduce the risk of introducing weeds through hay, the following procedure should be followed:

1. Feed certified weed-free hay when available with a target of using 50% weed-free hay for wildlife feeding operations by 2017.

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<sup>1</sup> Contact Kristin Mansfield (WDFW Veterinarian) 509-892-1001 Ext 326, [Kristin.Mansfield@dfw.wa.gov](mailto:Kristin.Mansfield@dfw.wa.gov).

<sup>2</sup> Decontamination protocols for white nose syndrome available at: <http://www.fws.gov/WhiteNoseSyndrome/Research.html>

2. Hay that is not certified weed-free must include bid and contract language addressing noxious weeds/unwanted plants. Bales, or hay fields that do not meet the standards will be cause for terminating the contract and rejecting the hay.
3. Feeding of wildlife with uncertified hay will occur in designated areas to reduce the potential spread of weeds to wild lands. These designated areas will be surveyed and treated annually for new weeds.

### **Protocols for Purchasing Seeds and Rootstock for Revegetation**

The agency purchases seeds and rootstock to implement restoration/enhancement, plant forage crops, and as an element of construction projects. Eliminating noxious weeds seeds and propagules in vegetation purchased by the agency will help reduce the potential for infestations on agency land. Revegetation plantings will be consistent with ecological integrity goals and objectives identified for the site. To accomplish this, the following procedure should be followed:

1. Purchase native plant seeds and rootstock adapted to the project area, when appropriate.
2. Ensure that the bid and contract language for seeds and rootstock meet quality standards for noxious weeds/unwanted plants; pathogens; or disease. Request appropriate certification documentation when applicable.
3. Restoration/enhancement and agricultural fields must be revisited and treated for weeds.
4. Refer to the *WDFW Restoration Manual* (currently being written), *Landscaping for Wildlife in the Pacific Northwest*, and *PNW Weed Management Handbook* for information regarding planting and weed control.

## **PART II. PROTOCOLS FOR FIELD WORK ON ALL WATERS**

### **Freshwater Ecosystems (WRIA Based)**

Level I precautions are required whenever moving from one waterbody to another, regardless if in the same Watershed Resource Inventory Area (WRIA).

Level II decontamination is required whenever:

- moving across WRIA boundaries, or
- when leaving known infested waters, or
- before entering protected or highly sensitive sites, or
- when moving between still water habitats (lakes, marshes or ponds) that have no surface water connection to streams or other aquatic habitats.

Each region is responsible for reviewing the WRIA boundaries, and determining whether additional delineation to the sub-basin level is necessary: either to contain known infestations or to protect vulnerable ecosystems or native populations. Maps delineating WRIA boundaries are available on the WDFW website image gallery<sup>3</sup> or on the SalmonScape web site<sup>4</sup>. Sub-basin boundaries will be available on maps on the agency intranet.

### **Marine and Estuarine Ecosystems**

Level I decontamination is required whenever moving from one waterbody to another, regardless if in the same WDFW marine area. Level II decontamination is required whenever equipment or vessels are transported between:

- major oceanographic basins (Outer coast and Strait of Juan de Fuca, Georgia/Haro Strait, Hood Canal, South Puget Sound, and North/Central Puget Sound), or
- when moving from known infested waters (eg., marinas with invasive tunicate populations), or
- before entering protected or highly sensitive areas.

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<sup>3</sup> <http://wdfw.wa.gov/gallery/index.php/Maps/album28>

<sup>4</sup> <http://fortress.wa.gov/dfw/gispublic/apps/salmonscape/default.htm>

## A. Decontamination Protocols – Basic Precautions

All staff are encouraged to apply basic precautionary principles to control of invasive species. These include:

- Perform some level of decontamination whenever leaving the water, even if all field work is conducted within a sub-basin, and even if no known areas of concern exist in the sampling area, as decontamination offers the best defense against the spread of invasives, particularly seeds, spores and diseases that may be present but unrecognized. Get in the habit of regularly inspecting and cleaning gear while working.
- Consider dedicating equipment, such as waders, nets, data loggers, to a watershed or waterbody to reduce the frequency and costs of decontamination, whenever feasible.
- Arrange sampling plans to progress from the least to the most likely to be contaminated areas within a waterbody. For example, sample from upstream to downstream in a watershed, or from areas of less weed growth to dense weed growth.
- Minimize wading and avoid running boats into sediment. For instance, consider using bank sampling poles instead of wading.
- Reduce the amount of plants, sediment, or organisms that are removed from the water into boats or sampling gear.
- Consider purchase of wading gear and boots with the fewest places for organisms and debris to become attached. Best are one-piece systems with full rubber material and open cleat soles. Riskiest are the multi-piece wading systems with fabrics, detachable boots and felt soles. Mud/rock guards are recommended for all stocking-foot wades to minimize contamination on inside surfaces.

## B. Level I (Basic) Decontamination Protocol

The basic steps in decontamination for all types of gear and equipment in all situations are Clean and Drain. Immediately upon leaving a water body, clean off any attached sediment, organisms or debris from surface areas that were in contact with the water, the bottom or the wetted perimeter. You can use local water source to help remove heavy deposits. Drain any water back into the water body from which it came. Rinse all

surface areas with potable water. Equipment that comes into contact with a water body must also be decontaminated including stadia rods, measuring tapes, backpack shockers, temperature loggers, etc.

The basic cleaning equipment is a sturdy bristle brush and rinse water. Keep a 3-5 gallon water tank in your field vehicle for potable rinse water (eg., pressurized tank sprayer; solar shower). After exiting the water, debris should always be removed from waders/boots and raingear. Mud/rock guards are recommended for all stocking-foot waders, to minimize the need for cleaning internal surfaces. Clean thoroughly, especially the often complex gripping soles that tend to gather material. When decontaminating multi-piece gear, it is critical to remove attachments and boots to allow for full coverage in both Level 1 and Level 2 protocols.

If the Level I procedures cannot be done in the field, gear must be placed in a plastic bag or tote for transportation to a proper decontamination facility.

**Note on Scrub Brush:** Once you have completed a Level I decontamination on field gear, clean and rinse the brush as well. If conducting a Level II decontamination, make sure you include the brush at the end.

### **C. Level II (High Risk Situations) Decontamination Protocol**

Level I decontamination protocols must be conducted prior to starting Level II protocols, to ensure the effectiveness of the Level II treatments. The use of physical and chemical agents for Level II decontamination is based on best available science and best professional judgment. Protocols for each agent are footnoted to identify the scientific literature the method follows or is based on and the species of organisms for which it was tested. Criteria for each agent are applicable to all gear or equipment types unless otherwise noted in this or other sections.

Field gear must be decontaminated every day (excluding gear used solely in one stream or sub-basin, which is a recommended approach for minimizing risk of transmission). When decontaminating multi-piece gear, it is critical to remove attachments and boots to allow for full coverage.

Chemical agents or physical treatments must be applied to the entire surface to be effective. Safety glasses and waterproof gloves are required for all treatments except freezing.

- **Agency Preferred Method:** Virkon® Aquatic solution<sup>5</sup> – Expose (spray or soak) gear thoroughly with 1% solution so that it is completely saturated for a minimum of 10 minutes, and allow to dry, if possible. Virkon® Aquatic is an on contact solution, rinsing is not required. Virkon® Aquatic solutions last up to 7 days and will need to be checked regularly. Test strips can be purchased to test your solution. Not known to damage gear or equipment materials. Wear protective gear, eye protection and gloves, when using.
- Hot water<sup>6</sup> – Expose gear to a minimum of 140°F (60°C) for minimum five minutes or a minimum of 120°F for a minimum of 30 minutes. If whirling disease is a possibility, you must use a minimum of 167°F (75°C) for minimum five minutes. CAUTION: These temperatures can cause burns to exposed skin. Do not use this method for Gortex or other materials that may not hold up to high temperatures. A hot water pressure-washer is currently available at every regional office. Note: these temperatures cannot be achieved using most hot water heaters that are installed for domestic uses, which should be kept at 120°F to avoid burns.
- Freezing<sup>7</sup> - Expose gear to 14°F (-10°C) or colder for a minimum of 8 hours or 15°F to 32°F (-9°C to 0°C) for 24 hours. If gear has been used in marine or estuary situations, rinse thoroughly in freshwater before freezing. Not recommended for whirling disease decontamination.

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<sup>5</sup> Criteria based on Johnson et al. 2003 (Chytrid fungus), VESO 1991, Frerichs 1990, Hellstrom and Johansson 1990, Bennett 1997, and Rainnie 2002 on multiple fish bacteria and viruses.

<sup>6</sup> Maximum temperatures based on Johnson et al. 2003 under laboratory conditions for Chytrid fungus. Supports other decontamination studies for juvenile and adult New Zealand Mudsnaills, zebra and quagga mussels, and Didymo species by Medhurst 2003, Morse 2009, and USFS Fire Guidance 2008 respectively. Whirling disease criteria from Wagner et al. 2003.

<sup>7</sup> Minimum temperatures based on Bergendorf 2004 for adult New Zealand Mudsnaills and Kilroy et al. 2006 for Didymo. Using conservative criteria as literature studies show high variability in effectiveness. Effectiveness of freezing for whirling disease questioned by Hedrick et al. 2008 as may not completely inactivate cells.

- Formula 409® solution<sup>8</sup> – Must use anti-bacterial version. Expose gear thoroughly to 100% solution for a minimum of 10 minutes (may be sprayed on and kept “wet” for time period). Rinse thoroughly in a contained area. Rinse water must be disposed of down a sewage drain, not a storm drain.
- Sparquat 256®<sup>9</sup> - Expose gear to 3.1% solution for a minimum of 10 minutes (may be sprayed on and kept “wet” for time period). Rinse thoroughly in a contained area. Rinse water must be disposed of down a sewage drain, not a storm drain.

**Note on Large Equipment:** Additional or different Level II decontamination steps may be required for boats and other large aquatic equipment. (To be developed)

**Note on Mixing Virkon® Aquatic** - Must be mixed in a well-ventilated area, preferably outdoors. A splash apron, gloves and safety goggles must be used. The powder should be mixed with clean water according to the dilution instructions for a 1% solution. Do not apply the powder directly on the surface you are trying to disinfect. Mix the solution in a clean container of known volume. Measure the correct amount according to the dilution table (1 quart, 1 gallon, 10 gallons or 50 gallons).

One gallon will disinfect 135 sq. ft. Virkon® Aquatic is stable for up to 7 days. Test strips should be used regularly to determine the solution strength. Refer to the Virkon® Aquatic instructions and MSDS sheets for further information. Information can also be obtained by going to:

<http://www.wchemical.com/VIRKON-AQUATIC-P44C11.aspx>

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<sup>8</sup> Criteria based on Schisler et al. 2008 on adult New Zealand Mudsnaills only. No data on effectiveness for other species.

<sup>9</sup> Criteria based on Schisler et al. 2008 for adult New Zealand Mudsnaills and whirling disease spores.

## D. Decontamination Facilities

Level I decontamination that is conducted immediately after leaving the water does not require any further containment. Level II decontamination conducted immediately after leaving the water does not require any further containment EXCEPT when using Formula 409 or Sparquat agents. These require a portable or fixed containment system capable of capturing all solid debris for disposal in an upland facility and chemicals or rinse materials for disposal in a sanitary sewer system. Never place chemicals or rinse water into a stormwater or other drain system for water quality and invasive species spread prevention.

**Portable facility** - A standard portable decontamination station using the spray-on technique consists of the following equipment (Figure 1):

- Min 2ft. x 2ft. plastic tub (e.g., concrete mixing tray)
- Stiff-bristled brush
- Safety glasses
- Waterproof gloves (disposable nitrile, latex, or rubber)
- 1 quart spray bottle or pressurized tank sprayer
- Funnel
- Rinse water (e.g., solar shower system)
- 5 gallon bucket with lid
- Towel

Put on the safety gear and stand in the plastic tub or remove gear and place in the tub to contain the gear and chemicals during decontamination. Use the spray bottle or tank containing the decontamination chemical for application on the gear. Use the brush to work the chemicals into the fabric and irregular surfaces. Use the rinse water to remove the chemicals and the funnel to empty the decontamination tub contents into the 5 gallon bucket for transportation to a proper disposal site. Rinse water can be brought from office/facility (take a couple of gallons in a labeled container along with you for field use) or obtained from a domestic source (restroom at lake etc.). Use the towel to remove most of the rinse water to help in the drying process. Transport the solution back to the office and dispose of down a sewage drain, not a storm drain.



Figure 1. Portable decontamination station equipment.

**Fixed location facility** – WDFW will establish fixed facilities at regional offices, and as many district offices as feasible. A standard fixed location decontamination station using the spray-on technique consists of the following equipment (Figure 2):

- Min 2ft. x 2ft. tub with drain to sewer
- Stiff-bristled brush
- Safety glasses
- Waterproof gloves (disposable nitrile, latex, or rubber)
- 1 quart spray bottle or pressurized tank sprayer
- Rinse water hose/sprayer
- Towel

Use the basic procedure as for the portable station except you do not need to drain the rinse solution into a 5 gallon bucket.



Figure 2. Region 5 Decontamination Room with sewage system drain and supplies.

## E. SPECIAL PROTOCOLS

**Note on Felt Soles** - Many research studies indicate that felt soles contribute to the transference of invasive species. Several state and international environmental agencies have or are in the process of phasing out the use of felt sole boots. Some manufacturing companies are also phasing out felt sole boots from their lines and offering rubber sole/cleat combinations in their place. Felt soles are one of the largest risk factors for transmission of invasives such as Didymo and whirling disease, since they are extremely difficult to decontaminate fully.

In the interest of being proactive and minimizing the risk of transference of invasive species throughout Washington waters, the Department will no longer purchase sole boots by July 1, 2012. WDFW staff will phase out use of felt sole boots by July 1, 2013, although exceptions may be permitted by the Director upon recommendation of the Invasive Species Management Committee.

In the meantime, exercise extra precaution in cleaning felt soles. Use the disinfection protocols for waders/boots above, and take extra care to ensure that solutions, heat or cold penetrate fully before starting minimum exposure time.

**Note on Wading “Wet”** - Any gear or clothing that gets wet from a water body are potential vectors for spreading invasive species. Crew that prefer not to wear regular wading gear must launder their clothing for decontamination.

### Decontamination of Trailerable Boats and Other Large Aquatic Equipment

State law requires that boats and other trailered equipment used in an aquatic environment should be free of aquatic animals and plants whenever removed from the water in order to avoid transport<sup>10</sup>.

When removing or before transporting boats and other large aquatic equipment:

1. Conduct a Level I decontamination. **This is required every time you remove the boat from a body of water. No exceptions.** Thoroughly inspect both the equipment and trailer for attached or loose organisms such as weeds, algae, barnacles, mussels, snails, etc. A hand mirror and flashlight are important tools to help you see into otherwise hard to reach

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<sup>10</sup> RCW 77.15.253 and 77.15.290

areas. Scrape or otherwise remove all organisms and put into a secure trash receptacle for upland disposal.

2. Pull drain plug at the boat ramp. Drain all water in bilges and live wells that could hold water from the site. Reinsert the drain plug unless you have a good system for remembering before re-launching!
3. If Level II precautions are indicated, using a self-service commercial car wash with hand operated pressure wands, pressure wash boat and trailer inside (deck or internal areas that get contaminated with aquatic debris) and out. Make sure you wash out raw water storage areas, get behind and under trim tabs, engine mounts and raw water intake ports. Use the hot water and soap setting. or;
4. Using one of the chemical options listed above, conduct a Level II decontamination. Make sure you wash out/spray raw water storage areas, get behind and under trim tabs, engine mounts, and raw water intake ports. Do not use this method until you have determined the rinse water drains into a sanitary sewer connected to a treatment facility. If that is not available, or you are uncertain, use a commercial car wash.
5. Flush engine cooling system with potable fresh water for minimum 5 minutes – no chemicals. Use of 140<sup>0</sup>F hot water is recommended during the flush.
6. Cross-Rinsing Not Allowed. Taking a boat or equipment from a marine environment into a freshwater environment or from a freshwater to a marine environment without decontaminating is not allowed.

**Moored boats and other typically stationary large aquatic equipment** - Boats and other large aquatic equipment shall not be transported on the water between different WRIAs on larger rivers or lakes, or major oceanographic basins (described above) until a thorough inspection ensures that there are no aquatic organisms attached to the hulls, docks, nets, or other submerged equipment being moved. Boats that travel between different ecological regions frequently must have their hulls, running gear, and other niche areas (water intakes, prop shaft, trim tabs, etc.) cleaned using the protocols above for boat removal on at least a quarterly basis or more often during high growth periods.

As with boots, nets and other gear, leaving boats in the same body of water is a desirable approach, unfortunately also expensive. However, even boats that remain in a single body of water should be checked quarterly as described above to minimize hull fouling.

**Decontamination of Nets** - When possible use water-body specific nets and gear. If this is not possible, nets must be decontaminated before use in a new area.

If possible, before leaving the sampling area, hang or stretch the net, and use a pressure washer and hand-picking to remove excess mud, debris and plant matter.

If field decontamination is not possible or effective, upon return to the office, or before deploying at another sampling location in a different water body, follow the decontamination guidelines for waders/boots above and either hang the nets to allow clear access to all parts, or soak it in a large tub that allows the solution to fully penetrate the material before starting minimum exposure time.

**Decontamination of Vehicles** - Determine which vehicles will be used in bodies of water (i.e., hatchery trucks that have to back down into the water to off load fish). Also determine which vehicles will be moving in between established geographic sampling areas. Follow protocols for trailerable boats, including determination whether a Level I or II decontamination is indicated.

**Disinfecting Fish Tankers** - It is vital that fish transfer tanks be disinfected when used between watersheds. Liquid chlorine bleach, which is available in several concentrations, is the preferred disinfectant for this use. Chlorine in solid form is also an effective disinfectant, but is difficult to dissolve completely and has high human health risks, and therefore is not recommended. To properly disinfect tankers, use the following protocol.

1. Fill the tanker approximately half full with water at the shipping station. Add enough liquid chlorine bleach to achieve a 20-ppm active ingredient solution (30 ppm if water is noticeably dirty or discolored), Table 1.
2. Recirculate this solution for at least 10 minutes in the tanker and fish pump so that all surfaces are wetted.
3. Following recirculation add the appropriate amount of sodium thiosulfate, (Table 1.) to the tanker and circulate another 10 minutes to neutralize the chlorine and make it safe to discharge.
4. As a precaution, prior to discharge, check the water in the tanker with a test kit to make sure the chlorine is COMPLETELY neutralized.
5. Empty the tank where the discharged water will not contact fish.
6. Rinse thoroughly and refill with clean water for fish hauling.

**TABLE 1. CHEMICAL QUANTITIES REQUIRED FOR TANKER DISINFECTION**

<b>TANKER SIZE IN GALLONS</b>	<b>AMOUNT OF WATER</b>	<b>AMOUNT OF 12% BLEACH FOR 20 PPM</b>	<b>AMOUNT OF 12% BLEACH FOR 30 PPM</b>	<b>POUNDS OF SODIUM THIOSULFATE TO NEUTRALIZE 20 PPM<sup>1</sup> / 30 PPM</b>
6000	3000 gal.	1811 ml	2717 ml	3.8 / 5.7
2500	1250 gal.	764 ml	1160 ml	1.6 / 2.4
1800	900 gal.	566 ml	849 ml	1.1 / 1.7
1000	500 gal.	311 ml	481 ml	0.6 / 0.9

<sup>1</sup> 5.6 grams sodium thiosulfate per 10 gallons of 20-ppm chlorine.

**Decontamination of Heavy Equipment when used in water**

To be added later.

**Large Woody Debris and other structures to be placed in water**

To be added later.

**Decontamination of Diving Equipment**

To be added later.