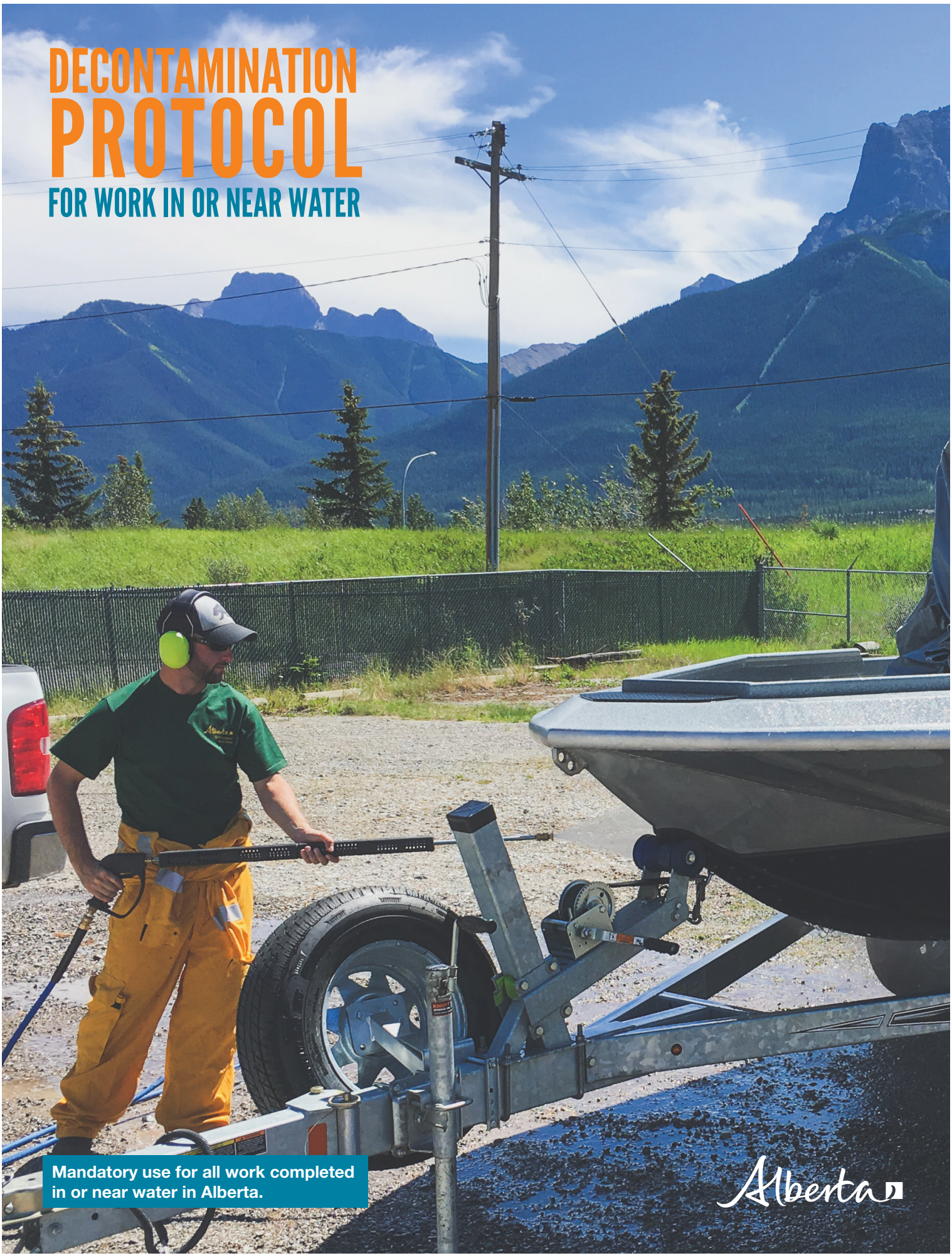
DECONTAMINATION PROTOCOL

FOR WORK IN OR NEAR WATER



Mandatory use for all work completed in or near water in Alberta.

Alberta

Alberta Decontamination Protocol, August 2017,
updated July 2020

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CONTENT

SECTION 1: INTRODUCTION

Aquatic Invasive Species (AIS) and fish disease (including parasites, bacteria and viruses) pose significant risks to the conservation and sustainability of our native species and their habitat. These threats pose both ecological and economic impacts to fisheries (particularly to species at risk), water management infrastructure, tourism, and local communities. Aquatic invasive species such as quagga and zebra mussels, non-native carp, flowering rush, and invasive Phragmites will adversely affect our environment, economy, and society. The introduction and spread of fish diseases has the potential to decimate fish stocks in affected waters. Vigilance on behalf of all Albertan's working with water is required to minimize the chance of introductions and help prevent the spread of AIS and fish disease.

One of the most important aspects of any invasive species or disease detection response is to implement 'Early Detection, Rapid Response' activities to reduce the risk of further spread. This protocol was developed to address the detection of whirling disease in the province, but is also intended to minimize the risk of aquatic invasive species of concern.

In August 2016, whirling disease was detected within Banff National Park; this was the first time the disease had been detected in Canada. Whirling disease is a fish disease that affects salmonids (family of ray-finned fish), including trout and mountain whitefish. The disease is caused by a parasite (*Myxobolus cerebralis*) that has two hosts: a tubifex worm (endemic to Alberta and found in sediment in most waterbodies) and salmonid fish. Once inside a fish, the parasite affects cartilage of the head, spine and/or gills. Whirling disease can cause high levels of mortality to fish populations. The federal Canadian Food Inspection Agency (CFIA) is responsible for reportable diseases in Canada, which includes whirling disease. For this reason, they have issued 'declarations' for infected areas within Alberta. Permits are required from CFIA to move fish or fish parts from the declared zone.

Figure 1: *Whirling Disease Technician cleaning waders between sampling sites.*

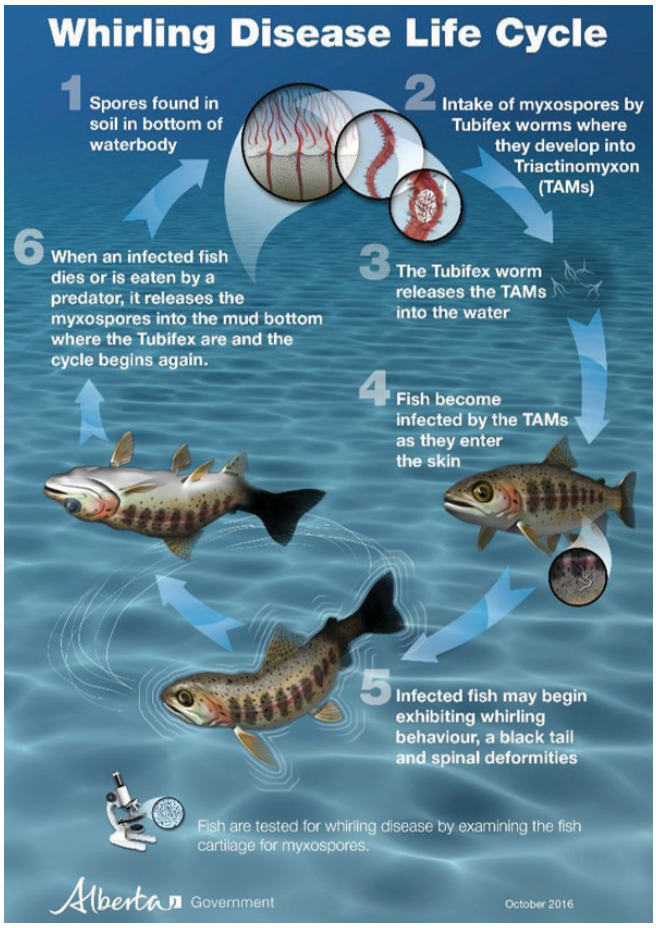


Figure 2: *Whirling Disease Life Cycle*

The CFIA declared infected zones (defined in Appendix A) are different than the decontamination risk map. The Decontamination Risk Map is intended to more accurately portray the specific locations where whirling disease has been detected at watershed level.

It is imperative that all work conducted in, or near water take the necessary measures to ensure that there is not inadvertent spread of AIS and fish disease in any provincial waters.

This protocol is mandatory for all Government of Alberta staff and any activities when conditioned under government issued contracts or approvals (including but not limited to Government of Alberta contractors, Fish Research Licenses, Public Lands Act Approvals, and Water Act Approvals) when working in or near a watercourse or waterbody (defined in Appendix A) across Alberta. Exceptions are provided only to emergency services, which have Best Management Practices instead of a mandatory protocol due to the time sensitivity of their work.

This protocol provides consistent methods for the inspection and cleaning of equipment, vehicles and machinery which will help prevent the spread of fish disease and AIS during all field activities.

The primary targets are equipment inspection and decontamination, if necessary. Preventative actions curb the introduction of pests, fish diseases, and invasive species into uninfected locations.

The general public and those engaging in recreational activities are not required to follow the Decontamination Protocol but are encouraged to use the Clean, Drain, Dry methods that are described in the Level 1 Decontamination section to protect the water resources they use.

SECTION 2: KEY OBJECTIVES OF THE DECONTAMINATION PROTOCOL

1. To provide decontamination requirements for work being completed in or near water, using best available technologies, information and feedback from field staff and other jurisdictions.
2. To provide techniques that can be safely, effectively and efficiently administered in the field or dedicated location, which is effective against whirling disease and AIS.
3. To provide decontamination techniques that minimizes harm to the aquatic environment as a direct, or indirect result of implementation of the protocol.
4. To provide a decontamination process which is economically viable, sustainable, and practical. This will include both the immediate short-term application of the protocol, as well as future use.

5. To minimize the deleterious effects on equipment thereby reducing the necessity of replacing assets and reducing the potential for equipment failures.
6. To update as needed based on user feedback or as new research and decontamination methods become available or to address new aquatic threats.
7. To provide techniques that recognize that different activities carry different risks of AIS and fish disease transfer, and, as such may have different treatment requirements.

SECTION 3: TRAINING, QUALITY ASSURANCE AND TRACKING

- All individuals involved in work in or near water must understand and be able to implement the application of the mandatory protocols before initiating work.
- Training may be provided through formal training workshops lead by designated decontamination staff. Alternately, staff who have been trained can familiarize staff new to the protocol. In these cases, a trained staff member should be clearly identified as the decontamination field lead, who is responsible for ensuring all decontamination protocols are implemented appropriately and effectively.
- All individuals completing the decontamination of equipment, vehicles and machinery must be familiar with and be able to demonstrate proper use of prescribed personal protective equipment (PPE) to complete the decontamination.

Figure 3: *Decontamination workshop held in Lethbridge for GOA staff*

- Decontamination efforts should be documented and tracked. A "Decontamination Record" template is available in Appendix I and on the Stop the Spread website.
- A "Decontamination Record" may be requested as part of a Contract, Approval or License.

SECTION 4: DECONTAMINATION RISK ZONE MAP

> **NOTE:** Only Whirling Disease is reflected in the Decontamination Risk Zone Map. However other aquatic invasive species can be added to risk zone map as required to prevent introduction or spread in the future. If other AIS are detected in the province, alternate disinfection methods may be required and the protocol will be modified to reflect mitigation measures. Other AIS of concern, present in Alberta, are currently all prevented through compliance to Clean, Drain, Dry (Level 1) recommendations.

A 'Whirling Disease Risk Map' has been developed to ensure the correct decontamination effort is used while working in the field based on the level of risk. This map is not included in this protocol as it is subject to change depending on whirling disease monitoring results. The current protocol and Decontamination Risk Zone Map can be found at the AEP Stop the Spread website at: https://www.alberta.ca/stop-whirling-disease.aspx

The map reflects the current status of whirling disease in Alberta. All workers should have access to detailed maps in both digital and print forms to ensure compliance.

The definitions of terms in the Decontamination Protocol can be found in: Appendix A: “Definition of Terms”.

The three risk zones in the province are as follows:

1. **Red Zone** – zone tested positive for whirling disease;
2. **Yellow Zone** – zone that represents high risk waters for introduction/spread of whirling disease due to one or more of the following criteria: susceptible species present, high use and access to water;
3. **White Zone** – zone that has a low population of whirling disease susceptible species, has no confirmed case of whirling disease and represents lower risk due to less activity/use.

The Decontamination Protocol requirements are directly tied to the Decontamination Risk Zone Map, which may include recent detections of ‘suspect positives’ from monitoring efforts not yet confirmed by the Canadian Food Inspection Agency (CFIA).

Given the intent of this Decontamination Protocol, Hydrologic Unit Code (HUC – Defined in Appendix A) watersheds were determined to be the most appropriate mapping system for developing the Risk Map. HUC Watersheds of Alberta define hydrologic units that form a standardized baseline across Alberta. HUCs represent a collection of nested hierarchically structured drainage basins and consist of successively smaller hydrologic units that nest within larger hydrologic units. The risk map is defined by a HUC 6 in Yellow and White Risk Zones and a detailed HUC 10 in the Red Risk Zone.

SECTION 5: OVERVIEW OF THE DECONTAMINATION PROTOCOL

GENERAL PRINCIPLES

- Level 1 Decontamination: “Clean, Drain, and Dry” applies to all zones, regardless of activity or movement.
- It is recommended to use dedicated equipment and gear in the Red Zone whenever possible to avoid decontamination issues and/or concerns especially when working with sensitive equipment or gear. Red Zone dedicated equipment or gear requires a Level 2 decontamination when being moved between HUC or is moving from a downstream location to an upstream location. A Level 3 decontamination is not necessary if equipment is dedicated to the Red Zone.
- When working in a particular zone, please refer to that zone’s decontamination instructions for a detailed description on how to proceed (as summarized in Table 1). Note that different decontamination instructions and/or level of decontamination by risk zone apply for Wildfire, Water Pumping and Industrial and Construction Operations (found in the appendices B, C and D).
- Items that cannot be decontaminated should not be used or should be dedicated for use in particular zones or HUCs.
- Items, or parts of items, that were not contaminated by water, sediment, organics or vegetation do not need to be decontaminated. Isolating small contaminated items in a large container will reduce the amount of decontamination necessary.
- Workers should avoid using leather, felt, wood, Styrofoam, Velcro or rope, as they cannot be easily decontaminated.
- Review equipment before heading into the field and remove any equipment or gear from vehicles, machinery or watercraft that is not required for the work or for decontamination. Any equipment that is exposed to

potentially contaminated water, sediment or vegetation must be decontaminated. Do not take what will not be needed.

- Equipment that cannot or will not be decontaminated must be handled and disposed of in a bio secure manner (Appendix F: Disposal of Disinfectant Solutions and Single-use Products).
- Any essential non-disposable equipment that cannot be decontaminated without compromising its functionality should be protected from contamination (i.e., covered with disposable material, such as a zippered bag).
- Vehicles or equipment not required for the work should be located on high, dry ground whenever possible prior to unloading equipment in order to limit exposure to water or soil.

Table 1: Summary of decontamination levels by risk zone for activities other than wildfire, water pumping, and industrial and construction operations*

WHITE ZONE**	YELLOW ZONE**	RED ZONE**
Level 1: Clean, Drain, Dry Location: On site	**Level 1: Clean, Drain, Dry** Location: On site	**Level 1: Clean, Drain, Dry** Location: On site
	Level 2: Disinfection Treatment Location: On site or at dedicated location	**Level 2: Disinfection Treatment** Location: On site or at dedicated location
		Level 3: Temperature Treatment Location: Decontamination Hub

* Decontamination levels and procedures for Wildfire, Water Pumping and Industrial and Construction Operations are found in the appendices B, C and D
** See associated 'Decontamination Risk Zone Map' as outlined in previous section of this document to determine Zone

> **Note:** At time of publication (2020) approved disinfectants are Quaternary Ammonium Compounds (QAC's) or Bleach. QAC's are common cleaning agents used in homes and hospitals and are safe for MOST equipment, vehicles and machinery when used at the recommended concentrations and followed by a thorough rinse (See Appendix E: Disinfection Treatments). The label and MSDS of any chemical product must be followed at all times.

SECTION 6: LEVELS OF DECONTAMINATION

This section outlines the methods to complete a Level 1, Level 2 or Level 3 decontamination. Levels of decontamination required are dependent upon activity type and zone. Use Table 1 and Section 7 in this document to determine the level of decontamination required in each zone.

SECTION 6.1: LEVEL 1 - CLEAN, DRAIN, DRY!

While on land, but before leaving any body of water, properly follow these instructions every time equipment, vehicles or machinery is used in or near water, regardless of the zone. It is not only mandatory, but critical in prevention efforts. Clean, Drain, and Dry all equipment, vehicles and machinery that came in contact with water. This is a 'Level 1' decontamination.

CLEAN

- Visibly inspect equipment, vehicles and gear after each use. Remove any visible plant fragments, as well as mud and other organic debris. Aquatic plants and mud routinely contain AIS and/or fish disease. Check in and around all the items, including tires as well as items on or inside a vehicle or machine that might have been exposed to water, sediment or vegetation.
- Take extra care to look in tight dark places, or where there are angles or edges for plants or mud to get caught.
- Do not forget to check off-highway vehicles, trailers and towing vehicles.
- Gear must be cleaned and rinsed with on-site water from the waterbody or by using clean water brought to site. For small items, a small nylon bristle-scrub brush (no wood), can be used to aid in the removal of organic debris or fish slime. All small items that were in contact with stream or lake water, that can be immersed, must be thoroughly cleaned by hand washing on-site. Large equipment vehicles and machinery must be cleaned with a long handled nylon scrub brush or pressurized water system on site to prevent transfer.

Figure 4: *Cleaning waders by manually removing organic debris*

DRAIN

- Drain all spaces or items that can hold water. At the conclusion of your work, drain all containers or depressions in equipment that were filled with water from a waterbody. Water should be drained on-site.
- WATERCRAFT: Follow factory guidelines for eliminating water from engines. All engines hold water, but jet drives on personal watercraft and other specialized boats can hold extra water. Lower the motor prior to leaving the body of water to properly ensure all water is drained after each use. Remove the drain plug from boats (the fine for not removing the drain plug while in transport is $172 as of June 2018). Empty water out of kayaks, canoes, rafts, buckets, tanks, etc. and towel dry or use a wet/dry vacuum if necessary.

DRY

- Whenever possible, allow everything to completely dry before working in another body of water. A minimum of 24 hours is recommended, but the longer the dry time, the better between each use. Drying time can be reduced by using towels, wet/dry vacuums, pressurized air, mechanical drying or drying during transport.

SECTION 6.2: LEVEL 2 – DISINFECTION TREATMENT

- After thorough cleaning, a three-step treatment procedure must be used to disinfect wetable items. Items do not need to be dry when moving from Level 1 to Level 2. Ideally a Level 2 decontamination will occur before leaving the field site, however if this is not feasible items can be transported to a decontamination hub, or alternate location provided they are contained and do not contaminate clean items or transport vehicle.

Figure 5: *Disinfecting submersible items in a QAC bath for a Level 2 Decon.*

FIRST TREATMENT (QAC OR ALTERNATIVE):

Prior to working with any disinfectant, refer to the MSDS sheet and use appropriate Personal Protective Equipment (PPE). The disinfectants approved and the appropriate concentrations can be found in Table 2: Disinfectant Treatments.

Submersible Items

- Use a rigid plastic tub/tote (or if field work does not allow, an alternative product that serves the same purpose effectively, such as a dry bag) to make a disinfection solution in which items can be submerged. Care should be taken to locate this container on high ground.

  > **Note:** The concentration of the disinfection solution is dependent on the type being use. Please refer to Table 2: Disinfectant Treatments and Appendix B: Disinfectant Concentration and Dilution.

- Submersible items must be immersed such that all surfaces which were in contact with potentially contaminated water, mud, or fish, are submerged for 10 minutes (quantity of equipment in the treatment is discretionary as it is concentration based). Care must be taken to ensure that any porous materials which may have absorbed potentially contaminated water are thoroughly soaked and physically agitated while submerged. Save this solution for later use on larger equipment (and check concentration level for efficacy).

Non–Submersible Items

- Non-submersible items, sensitive, non-waterproof or large equipment. Personal floatation device's, floater jackets and life jackets that were not submerged in the waterbody should be thoroughly wiped or sprayed rather than submerged in disinfectant to reduce drying time. Surface disinfection can be accomplished by

Figure 6: *QAC application using a pump-up style sprayer.*

wiping wetted surfaces with a heavy-duty type shop towel which has been soaked in a disinfectant or by spraying the surfaces with a disinfectant that is double concentrated to ensure effective coverage of the surfaces.

- Surfaces must be kept damp with disinfectant for 10 minutes. Any disposable items (i.e., shop towels, disposable gloves) used for this purpose must be bagged until able to dispose of these materials in a safe location (i.e., garbage cans with lids) away from water.
- The disinfectant solution can be applied using garden variety pump-up style sprayers which are labelled specifically for use with chlorine or other disinfectants. The disinfectant solution from the submersible tub/tote can be used for this purpose. The solution should be liberally sprayed on both the outside and the inside of the equipment, vehicles or machinery, keeping surfaces moist for 10 minutes. Avoid letting the disinfectant to dry on items as it is harder to rinse off once dry. Care should be taken to avoid electronic components that are not water resistant.

> **Note:** When using watercraft, it is important to target the trailer “bunks” to ensure they are cleaned of organics and then thoroughly wetted with a disinfectant. Workers should consider upgrading bunks to polyethylene plastic from the traditional wooden/carpeted options.

> **Note:** Small quantities of disinfectant [i.e., residual volume from a containment mat (defined in Appendix A) or both] can be reused but should be monitored using testing strips for effective concentration. They can be disposed through a sanitary sewer but should be diluted with an equal volume of water (See Appendix F: Disposal of Disinfectant Solutions and Single-use Products). Local authorities responsible for operating municipal wastewater treatment facilities should be consulted before disposing of larger volumes of disinfectant down sanitary sewers.

Table 2: Disinfectant Treatments

	CONCENTRATION	EXPOSURE TIME	PROS	CONS	EFFECTIVE AGAINST
Chlorine Bleach	▪ Soaking = 5000 ppm ▪ Wiping and spraying = 5000 ppm	15 minutes	▪ Can be neutralized by adding sodium thiosulphate prior to disposal	▪ Can cause corrosion to fabrics, plastics, rubber and metal	▪ Multiple fish viruses and diseases including whirling disease ▪ Quagga and zebra mussels ▪ Didymo ▪ Spiny water flea
Quaternary Ammonium Compounds (QAC's) including: **QUAT Plus**	▪ Soaking = 1500 ppm ▪ Wiping and spraying = 3000 ppm	10 minutes	▪ Common cleaning agent used in home, restaurant and hospital settings ▪ Immobile in soil	▪ Can cause corrosion on aluminum	▪ Whirling disease
Virkon (not approved for decontamination for Whirling Disease at time of publication)	▪ Soaking = 2:100 ▪ Wiping and spraying = 2:100	20 minutes			▪ Many fish viruses and diseases but only the TAM stage of whirling disease ▪ Didymo, ▪ New Zealand mud snail ▪ Quagga mussels ▪ Asian clam ▪ Spiny water flea

Second Treatment: Rinse

- For rinse, use a clean hard plastic tub/tote to contain "clean" water (Defined in Appendix A); this is typically obtained off-site prior to sampling or from a potable water source on-site if available. It must not be water from the waterbody. Small disinfected items, following the 10 minute submersion, should be rinsed in this tub/tote. Make sure to thoroughly rinse the items to prevent the build up of disinfectant residue. In some cases, the addition of a soap (such as Simple Green) helps prevent the disinfectant build-up. Large or sensitive equipment, vehicles or machinery that were wiped or sprayed with disinfectant should be wiped down with clean water to remove any residue.

> **Note:** If "clean" rinse water is not available, disinfected items should be secured in a designated container (i.e., hard tub/totes preferred, dry bags, etc.) for transport back to a location with clean water.

Third Treatment: Dry

- Once treatment and rinse is completed, allow items to dry as long as possible (24 hours minimum recommended). Items that require a Level 3 decontamination do not need to be dry prior. If there is not enough time to allow items to dry before next use, ensure they were thoroughly rinsed prior to next use.

Figure 7: *Rinsing and drying field gear using potable water that was brought to the worksite.*

SECTION 6.3: LEVEL 3 – TEMPERATURE TREATMENT

All equipment, vehicles and machinery leaving a Red Zone HUC requires Level 3 decontamination in addition to Levels 1 and 2. Once Level 2 decontamination has been completed, equipment and gear can be transported to a designated location (decontamination hub) for a final Level 3 decontamination. This three-step treatment process must be completed before items go back into the field for use at another work site unless it is staying in the same Red Zone HUC. Items do not need to be dry when moving from Level 2 to Level 3. If equipment, vehicles and machinery are able to be contained or transported without contaminating other items a Level 2 decontamination can be skipped if going directly to a decontamination hub.

FIRST TREATMENT: TEMPERATURE TREATMENT

- Care must be taken to ensure that any items inside a vehicle, watercraft or equipment that were contaminated with water, sediment or organics are removed, and decontaminated separately. Some equipment, vehicles or machinery, particularly watercraft may have compartments that are not easily accessible. Refer and follow the user manual to gain access to these compartments for decontamination.
- Items to be decontaminated should be evaluated for tolerance to hot and cold temperatures, by contacting the distributor or manufacturer prior to treatment. Inflatable items should not be subjected to more than warm water to ensure that heat and glue welded seams on the pontoons do not rupture.

Temperature Tolerant Items:

- The temperature treatment can be completed using hot or cold temperatures.

Table 3: Level 3 Treatments

TREATMENT	TEMPERATURE	EXPOSURE TIME	PROS	CONS
Hot water or steam applied using: ▪ pressure washer with heat and/or steam capabilities ▪ hot water soaking tub	▪ 90 °C ▪ 60 °C for engine flush	10 minutes of continuous contact	▪ Effective decontamination of all AIS and fish disease, including whirling disease	▪ Failing to understand temperature tolerance of items could cause damage ▪ Cannot be used on items with glued seals or sensitive electronics

Cold temperatures by: ▪ Using freezer units ▪ Leaving items outside during winter months	▪ -20 °C	7 continuous days	▪ Does not produce waste ▪ Passive method of decontamination during winter months	▪ Difficult to maintain the continuous temperature ▪ May be difficult to achieve during summer
Drying time: Items need to be dried to descant any organisms		Out of water for 1 year	▪ Passive method of decontamination	▪ Limits use of equipment due to length of time
Disinfectants – **double** Disinfectant Treatment: ▪ Use should be limited to items that are sensitive or cannot tolerate 90 °C or -20 °C temperatures	See Table 2: Disinfectant Treatments for concentration	See Table 2: Disinfectant Treatments for exposure time	▪ Can be used on items that cannot tolerate high heat or cold temperatures	▪ Is not as effective at killing all AIS and fish diseases as extreme heat

SECOND TREATMENT: DISINFECTANT

- Following temperature treatment, all equipment, vehicles and machinery must receive a secondary decontamination using a disinfectant treatment, see Table 2: Disinfectant Treatments. This is particularly important where temperatures have not been maintained at 90°C because of manufacturer's recommendations or where there is no assurance that internal or difficult to reach areas were subjected to the hot water decontamination. Ensure all items are thoroughly rinsed following the disinfectant treatment.

THIRD TREATMENT: DRY

- Once treatment and rinse are completed, allow items to dry as long as possible (24 hours minimum recommended). Drying time can be reduced by using towels, wet/dry vacuums, pressurized air, mechanical drying or drying during transport.

Figure 8: *Level 3 Temperature Treatment using Steam*

Figure 9: *Drying out recently decontaminated field gear*

GUIDELINES FOR DECONTAMINATION HUBS

A Level 3 decontamination hub can be established subject to meeting the following criteria:

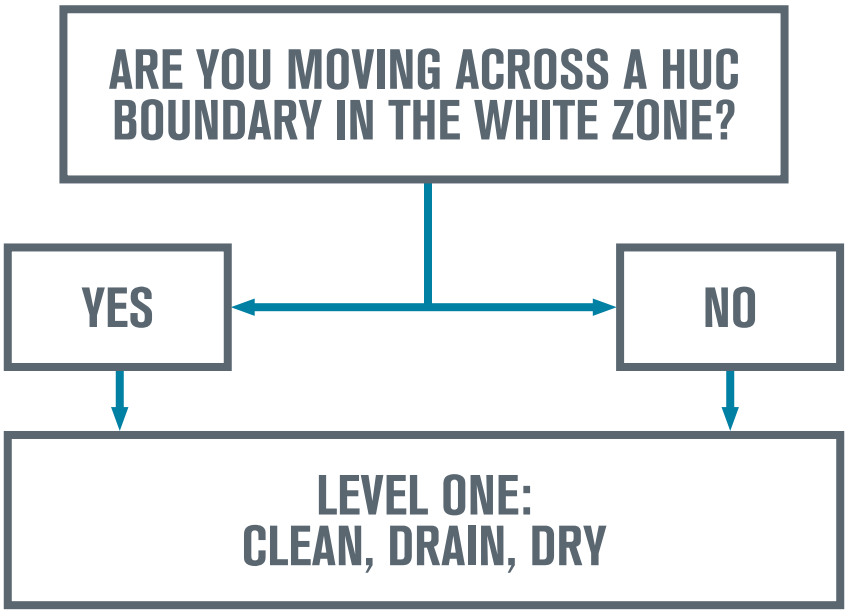
- Enough space to safely turn around necessary equipment, and preferably with exposure to natural sunlight. Asphalt or concrete surfaces are preferred, as water will evaporate following decontamination of equipment due to direct or reflected sunlight.
- Vegetated or graveled areas that allow for filtration are sufficient as well. Dirt surfaces should be avoided for decontamination hubs as they are prone to collecting water or becoming muddy.
- No conveyed drainage to surface waterbodies, wetlands, or adjacent flowing water can be permitted; similarly, no potential for overland drainage to surface waterbodies in the event of large rain events is permissible.
- Controlled, secure access to the site (i.e., no access to vehicles other than those dedicated to the decontamination protocol) is highly desirable. Multi-purpose sites should only be used when other suitable isolated locations cannot be found. If site does not meet all requirements, containment mats must be used.
- If using containment mats, contained water must be treated as required to ensure safe disposal (See Appendix F: Disposal of Disinfectant Solutions and Single-use Products). In the event of contaminated water, consider allowing dumping of water in a safe location (i.e., vegetated area, on gravel, etc. as it allows for slow percolation and/or evaporation of wastewater).

SECTION 7: GENERAL PRINCIPLES FOR DETERMINING LEVEL OF DECONTAMINATION WITHIN EACH ZONE

This section outlines how to determine when a Level 1, Level 2 or Level 3 decontamination is required. Note that this section applies to all activities other than Wildfire, Water Pumping and Industrial and Construction Operation. To determine when a Level 1, Level 2, or Level 3 decontamination is required for Wildfire, Water Pumping and Industrial and Construction Operation, reference the appendices B, C and D.

SECTION 7.1: WHITE ZONE – GENERAL PRINCIPLES

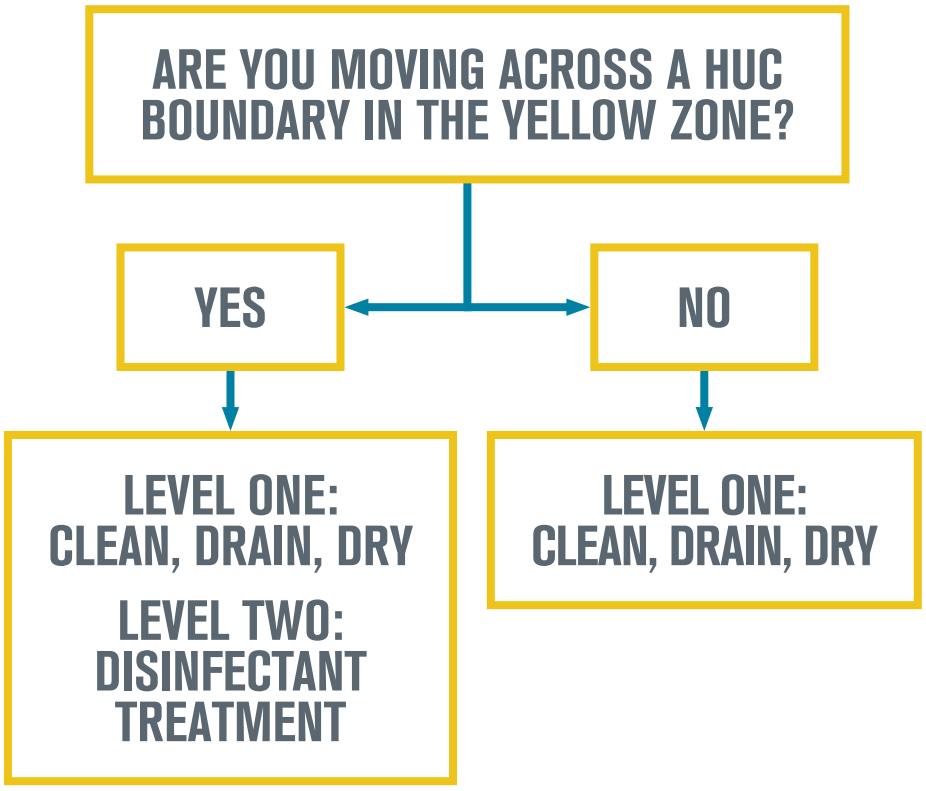
WHITE ZONE = REDUCED RISK OF INTRODUCTION: ZONE THAT DOES NOT HAVE WHIRLING DISEASE SUSCEPTIBLE SPECIES.



- Level 1 (Clean, Drain, Dry instructions) are to be followed when leaving a field site, whether or not you are crossing a HUC boundary.

SECTION 7.2: YELLOW ZONE – GENERAL PRINCIPLES

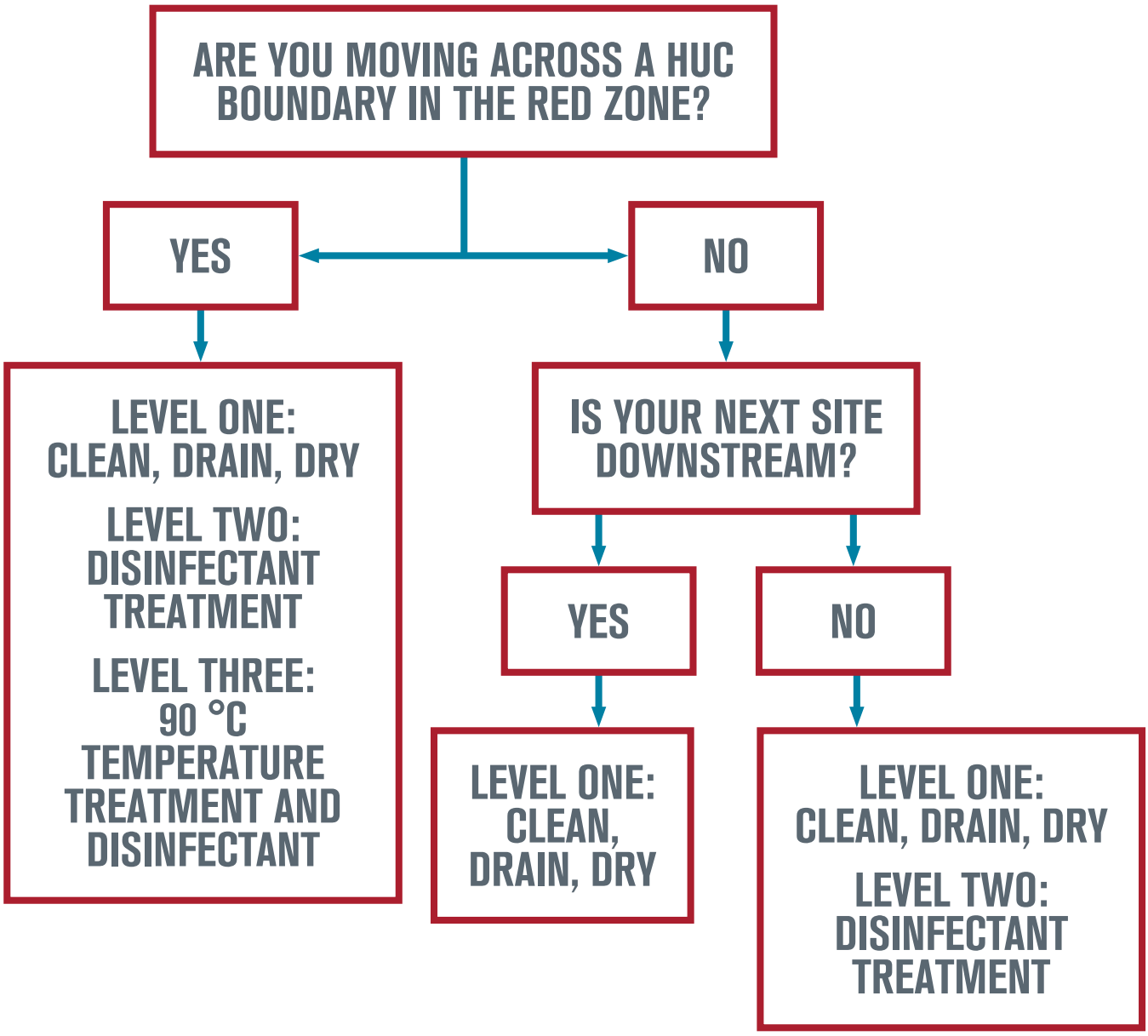
YELLOW ZONE = MODERATE TO HIGH RISK: WITHIN THE SALMONID ZONE HIGH RECREATIONAL ACITIVITY AND HIGH POPULATION BASE.



- When moving outside one Yellow Zone HUC boundary (or at the completion of the field season if staying in one HUC boundary), Level 1 and 2 decontamination must be completed.
- If you are not moving outside of a single Yellow Zone HUC boundary, only Level 1 protocols are required.

SECTION 7.3: RED ZONE – GENERAL PRINCIPLES

RED ZONE = HIGH RISK: WHIRLING DISEASE DETECTED



- Have dedicated equipment for use in the Red Zone whenever possible.
- If equipment or gear is dedicated to a single Red Zone HUC, and is properly labeled and stored, a Level 3 decontamination is not required, only a Level 2 between uses.

> **Note:** Felt-soled waders are not to be used anywhere in the province, unless the soles are removable and able to be properly decontaminated OR if dedicated to a single Red Zone HUC.

Note: When working within a Red Zone, always select sites from upstream to downstream. If this cannot be accomplished, Level 1 and 2 decontamination is required between each site.

- The decontamination risk map denotes irrigation systems that are sourced from infected waters; Red Zone principles apply in the Irrigation District only when working in canals and leaving the district; the rest of the waterbodies within the delineated Irrigation District area may be considered the Yellow Zone.
- Avoid working in, or drawing water from the Red Zone whenever possible.

SECTION 8: CONSIDERATIONS FOR DECONTAMINATION BY ACTIVITY TYPE

The following considerations are in addition to requirements outlined in Section 6 and 7 with the goal of providing additional recommendations by activity type. Also in this section are considerations for recreational activities including ATV's and Float Planes that are not regulated for decontamination requirements but compliance to these considerations reduces the risk of AIS and/or fish disease transfer. Note that activities associated with Wildlife, Water Pumping and Industrial Construction Activities have separate and specific decontamination procedures that can be found in the Appendix B, C and D.

SECTION 8.1: FISH RESEARCH LICENSE ACTIVITIES

Anyone (person, agency or institution) whose work involves collecting, holding or sampling fish for inventory, research, educational or promotional purposes in Alberta must obtain a Fish Research License (FRL). FRL is also required for conducting any fish toxicant work in controlling AIS like goldfish.

General Prevention

- Handling/movement of fish (i.e., live, dead, parts) is the greatest risk for spreading fish disease, so this work generally is higher risk than most activities.
- Avoid transferring water between watersheds or between unconnected waters within the same drainage. Do not dump water from one watercourse or waterbody (i.e., stream, lake, reservoir) into another watercourse or waterbody (defined in Appendix A.). Dispose of excess water over uplands.
- Always err on the side of caution as one can never be certain that AIS are not present, so make sure that your activities are not going to spread what may be there.
- Watercraft and trailers can be a primary source of spread of AIS and fish disease. They must be washed according to the protocols outlined in this guide, and where they were used according to the most up-to-date risk maps between each use (unless using in same waterbody, river drainage, or HUC according to the protocols of that particular zone).
- When working within a Red Zone, always sample from upstream to downstream, and from unaffected zones to infected zones. If this cannot be accomplished, Level 1 and 2 decontamination is required between each site.

Figure 10: *GOA staff and partners completing a fish salvage at Rocky Creek*

- When working in the Red Zone, a Level 1, 2, and 3 decontamination is required, unless you are working only in a single Red Zone HUC, in which case only a Level 1 decontamination is needed. **THIS IS VERY IMPORTANT**. Movement of any fish, fish parts, sediment, and water from the Red Zone to other zones constitutes the highest risk of spread.
- When working in the Yellow Zone a Level 1 and 2 decontamination is required when moving between HUC 6 boundaries.
- If you are working within one Yellow Zone HUC 6 boundary, you may conduct the Level 2 decontamination at the end of your field season at the warehouse (instead of on site), so long as care is taken to avoid potential cross-contamination and the (warehouse) site is appropriate for decontamination activities.

Notes on fish sampling in Red Zone

- All fish must be processed (i.e., weighed and bagged on site), unless specific procedures are in place to quarantine these fish.
- Fish must be processed on non-porous surfaces that can be hot water washed and disinfected.
- Fish samples should be double bagged to reduce potential leakage of contaminated fluids.
- The outside of sample bags must be cleaned to remove any blood or organic matter with a 3000 ppm QAC solution (a higher concentration is specified for these materials given the potential for contamination from direct contact with potentially infected fish) before placing samples on ice within a clean and disinfected cooler.
- The outside of fish aren't likely any more 'infectious' than is the water they've been taken out of. If TAMs are on the outside of the fish, they are in the water too.
- The biggest risk is if workers are cutting off heads in the field with potential for myxospore release from bones/cartilage lesions and subsequent contamination of equipment and cross-over from one sample to another.
- Unless you have been in contact with the lab to ship fresh fish, transfer samples to -80ºC freezer and disinfect coolers. Coolers should be hot water cleaned, sprayed with a 3000 ppm QAC solution and dried completely.
- All surface water and QAC solution should be collected in the cooler and disposed of in accordance with approved procedures (Appendix F).

Disposal of Fish within the Red Zone

When disposing of fish in the Red Zone (re: fish toxicant and fish salvage operations) the appropriate disposal method for potentially infected fish includes:

- Non-salmonids may be disposed of in landfill (no risk of spreading whirling disease).
- Salmonids must be disposed of in a secure manner, either by making special arrangements with the landfill (deep burial) or incineration.
- Landfill considerations: Per the Waste Control Regulation (AR 192/96), fish are not biomedical waste and there is no limitation to Class II Landfill disposal, unless the EPEA approval specifically limits pathogenic animal waste or bio-hazardous or infectious waste. These limitations are generally not listed in the landfill approvals; however, this stresses the need to make arrangements with the landfills prior to disposal. The landfill run-off control system should be isolated so there is no run-off from the disposal areas at the time of disposal. Isolation burial is required to ensure the risk remains with the landfill. A pre-arranged haul into the landfill for all special waste is advised; working with the landfill owner/operator is key to the successful burial.
- Transport Considerations: If there is risk of transmission to organisms other than fish, the infected fish may be considered a risk to animals, but not to humans. The waste material could be classified under the transportation of dangerous goods as an infectious substance (UN2900, INFECTIOUS SUBSTANCE, AFFECTING ANIMALS). CFIA should be able to provide more clarity here.
- Salmonid (including parts) should not be used for bear bait in the Red Zone, as the range of bears is too great not to produce a risk of spreading whirling disease. However, this can still be conducted in the Yellow Zone.

SECTION 8.2: MONITORING/RESEARCH/FLOOD & DROUGHT MITIGATION

Workers monitoring, managing, and/or researching surface water.

General Prevention

- While the movement of water is not considered the highest risk activity for whirling disease, standing water can be a host to a number of fish diseases and AIS. Care must be taken to avoid inadvertently spreading non-native species in water or on equipment.
- Avoid transferring water between watersheds or between unconnected waters within the same drainage. Do not dump water from one watercourse or waterbody (i.e., stream, lake and reservoir) into another watercourse or waterbody. Dispose of excess water over uplands.
- Watercraft and trailers can be a primary source of spread of AIS and fish disease. They must be decontaminated between each use (unless using in the same waterbody or river drainage).
- When working within a Red Zone, always sample from upstream to downstream and from unaffected zones to infected zones. If this cannot be accomplished, Level 1 and 2 decontamination is required in between each site (to avoid spreading whirling disease from an infected downstream area to a unaffected upstream area).
- When working in the Red Zone, a Level 1, 2, and 3 decontamination is required, unless you are working only in a single Red Zone HUC, in which case only a Level 1 decontamination is required. THIS IS VERY IMPORTANT. Movement of fish, fish parts, sediment and water from the Red Zone to other Zones constitutes the highest risk of spread.
- Isolate water samples within separate bags until sampling is complete, then place in a single cooler.
- Sonde probes and calibration cups should be treated with disinfectant and carefully cleaned using a brush and triple-rinsed with clean water.
- Teflon coated sensors in the M9, FlowTracker, StreamPro and ADCP are able to receive the disinfectant (QAC or bleach) spray.

Figure 11: *Example of irrigation equipment that may require decontamination*

SAMPLING OF IRRIGATION DISTRICTS

- Portions of the Western Irrigation District (WID) fall within the Risk Map.
- When sampling within an irrigation district always sample from upstream to downstream, and from unaffected zones to infected zones (if known).
- Irrigation districts have canals that routinely cross watershed lines and as such require special zones for decontamination. Decontamination zones are to be defined based upon shared source water, returning river basins, and susceptible reservoirs (See Table 4 below).
- For specific zone boundaries, please consult irrigation infrastructure schematics and flow patterns.
- Level 1 and 2 decontamination should be completed when leaving one zone for work in another. Level 3 decontamination should be completed when leaving a Red Zone and prior to working elsewhere.

Table 4: Irrigation District Decontamination Zones

ZONE	RETURNING RIVER BASIN	DESCRIPTION
Bow River Irrigation District (BRID)		
1	Bow River	All infrastructure sourcing from the Little Bow Reservoir and returning to the Bow River
2	Oldman River	All infrastructure sourcing from the Little Bow Reservoir and returning to the Oldman River
Eastern Irrigation District (EID)		
3	Headworks/Bow River	All infrastructure sourcing from the Bassano Dam and returning to Crawling Valley Reservoir
4	Red Deer River	All infrastructure sourcing from Crawling Valley Reservoir and returning to the Red Deer River.
5	Red Deer River	All infrastructure sourcing from the Bassano Dam and returning to the Red Deer River
6	Bow River	All infrastructure sourcing from the Bassano Dam and returning to the Bow River
7	Lake Newell/Rolling Hills Reservoir	Any infrastructure within Lake Newell or Rolling Hills Reservoir
8	Bow River	All infrastructure sourcing from Lake Newell or Rolling Hills Reservoir and returning to the Bow River
Lethbridge North Irrigation District (LNID)		
9	Oldman River	All LNID infrastructure
Magrath Irrigation District (MID)		
10	St. Mary River	All MID infrastructure
Mountain View, Leavitt, and Aetna Irrigation Districts		
11	Belly/St. Mary River	All infrastructure within these districts
Raymond Irrigation District (RID)		
12	St. Mary River	All RID infrastructure

Ross Creek Irrigation District		
13	Ross Creek	All Ross Creek Irrigation District infrastructure
St. Mary River Irrigation District (SMRID)		
14	Oldman River	All SMRID infrastructure west of Taber Irrigation District
15	Oldman River	All SMRID infrastructure east of Taber Irrigation District to Sauder (Rattlesnake) Reservoir
16	South Saskatchewan River	All SMRID infrastructure east of Sauder (Rattlesnake) Reservoir
Taber Irrigation District (TID)		
17	Oldman River	All TID Infrastructure
United Irrigation District (UID)		
18	Waterton River/Belly River	All UID Infrastructure
Western Irrigation District (WID)		
19	Headworks/Bow River	AEP main canal from Harvey Passage to Chestermere Lake
20	Red Deer River	All infrastructure sourcing from Chestermere Lake and returning to the Red Deer River
21	Bow River	All infrastructure sourcing from Chestermere Lake and returning to the Bow River
Other Infrastructure		
22	McGregor Lake	AEP main canal sourcing from the Bow River and returning to McGregor Lake
23	McGregor Lake/Travers Reservoir/Little Bow Reservoir	Any infrastructure within and connecting McGregor Lake, Travers Reservoir, and Little Bow Reservoir
24	Little Bow River	Any infrastructure within the Mosquito Creek or Little Bow River Basins

*To be updated as monitoring results become available, as needed.

Disposal of Water Samples from Red Zone

For water quality monitoring, analytical labs should be directed to treat the water with QAC or bleach prior to disposal.

- Decontamination: use a QAC compound like “QUAT Plus” at a concentration of 1500 mg/L (active ingredient) for a minimum of 10 minutes. The alkalinity of the solution can be neutralized prior to disposal.
- Heating: 90ºC for a minimum of 10 minutes
- Freezing: -20ºC for a minimum of 1 week
- Chlorine Bleach: added to sample to achieve a final concentration of 5000 ppm of available chlorine (= 1:10 dilution of household bleach) held for a minimum of 15 min. before disposal. Bleach can be neutralized by adding sodium thiosulphate prior to release.

SECTION 8.3: OFF HIGHWAY VEHICLES

Human activity is a known vector for transferring AIS and fish disease. While it is difficult to demonstrate the specific potential of Off-Highway-Vehicles (OHV) for introducing and spreading AIS and fish disease, these vehicles are a cause for concern if they are crossing bodies of water (particularly between water courses). Whirling disease can be spread through contact with water, mud, and organic debris, particularly if OHV are travelling through multiple watercourses.

OHV use in watercourses has been an issue for public lands management in the province, and as such, it is important that workers set a positive example for the public and reduce their risk of spreading AIS and fish disease. Under the Public Lands Act, it is against the law to use OHV in public waters. It is recommended that the following actions be taken each time workers use OHV for fieldwork.

Figure 12: *OHV's used to complete fieldwork*

General Prevention

- Keep Wheels out of Water! Avoid contact with water when possible and clean OHV as best as possible before transporting them from the field site.
- Plan before you go. Avoid crossing watercourses where there is no infrastructure or measures in place to mitigate the impact to the waterbodies. Use bridges or built-up crossings whenever possible.
- If contact with water is unavoidable, remove mud and organic debris from the OHV between watercourses.
- Know where your work is occurring within the 'Decontamination Risk Map,' and avoid OHV contact with water in the Red Zone.
- Avoid taking an OHV from the Red Zone to any other zone.
- Use a high pressure wash unit to clean all mud and organic debris from OHV when returning from field activities.

Notes on OHV Use in the Red Zone

- In Red Zones, contact with water should be avoided at all times unless it is critical and the OHV is dedicated for use in the whirling disease positive zone (see Risk Map).
- Use Red Zone dedicated equipment where possible as OHV are difficult to decontaminate (particularly in the field).
- Disinfectant (QAC or bleach) can be applied via sprayer as part of the decontamination procedures, but all mud and organic debris must be removed prior to application to ensure efficacy.

SECTION 8.4: FLOAT PLANES AND AVIATION

Fish disease and AIS such as invasive mussels and Eurasian watermilfoil, can be unintentionally transported from one waterbody to another on the floats of float planes. Therefore, it is always important to clean aircraft of any organic debris, mud and standing water before traveling rather than after landing at new locations and incorporate these procedures into the operation of the float plane.

Recommended Actions

BEFORE ENTERING THE AIRCRAFT:

- Inspect and remove aquatic plants from the floats, wires or cables, and water rudders;
- Pump floats (which may contain infested water);
- If moored in a waterbody known to have AIS or fish disease for extended periods: check the transom, chine, bottom, wheel wells, and the step area of floats. Use the following options to remove or kill any potential fish disease or AIS that may be attached to the floats:
  - wash with hot water; or
  - spray with high-pressure water; and/or
  - dry all parts of the floats in the sun for at least 5 days
  - Hand clean the submerged portion of floats with a scrub brush and physically remove any organic debris and organisms

Figure 13: *Underside of a float plane*

PRE TAKE-OFF CHECK:

- Avoid taxing through heavy surface growths of aquatic plants before takeoff;
- Raise and lower water rudders several times to clear off plants;

AFTER TAKE-OFF:

- Raise and lower water rudders several times to free aquatic plant fragments;
- If aquatic plants are visible on floats or water rudders, return to the lake you left and remove plant fragments

STORAGE/MOORING:

- Remove aircraft from the water (as is often done at float plane bases) and allow all parts of the floats to dry. During hot summer temperatures, a few days will kill most AIS (longer drying times are required to kill AIS during cool, humid weather);

SECTION 9: INFORMATION SOURCES

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APPENDIX A: DEFINITION OF TERMS

1. **Infected Zone:** Zone that immediately surrounds a location that has tested positive for whirling disease.
2. **HUC:** Hydrologic Unit Code (HUC) Watersheds of Alberta define hydrologic units that form a standardized baseline across Alberta. HUCs represent a collection of nested hierarchically structured drainage basins and consist of successively smaller hydrologic units that nest within larger hydrologic units. There are currently individual feature classes for HUC 2 (coarsest level), HUC 4, HUC 6, HUC 8 and HUC 10 (finest level). The HUC 6 Watersheds of Alberta represent a seamless basin-wide coverage that falls completely within the Hydrologic Unit Code 4 Watersheds of Alberta.
3. **Clean water:** Water not likely to be contaminated with whirling disease, which has typically been obtained off-site from a potable water supply.
4. **Hot water:** Water being used for decontamination purposes which is 90°C or hotter.
5. **Containment Mat:** A waterproof, chemically resistant ground cover that is designed to hold the hot water and disinfectant solutions used to disinfect equipment, vehicles and machinery. Mats are usually portable, leak proof, one piece systems large enough to accommodate a trailer with self-supporting sides to capture treatment water. Typically, two containment mats are utilized during decontamination: one mat for temperature treatment and a second mat for disinfectant treatment. A two mat system provides for the separation of hot wash water from disinfectant solutions for ease of containment and eventual disposal. Specifications: impervious containment mat material with lip height appropriate to items being decontaminated on mat (i.e., drive on/off ability for vehicles and trailers), drain protector – impervious (urethane) drain protector/seal, impervious dykes/pads (not filter socks)
6. **Watercourse or Waterbody:** Waterbody: Any location where water is present, whether or not the presence of water is continuous, intermittent or occurs only during a flood, and includes but is not limited to wetlands and aquifers. Watercourse: A river, brook, stream or other natural water channel (includes ephemeral draws), and the bed along which water flows continuously or intermittently. See Alberta Public Lands Glossary of Terms for definitions by following this link https://open.alberta.ca/publications/alberta-public-lands-glossary-of-terms

APPENDIX B: BEST MANAGEMENT PRACTICES FOR WILDFIRE MANAGEMENT EQUIPMENT DECONTAMINATION

Activities associated with workers preventing and managing wildfire is a possible source of aquatic invasive species (AIS) and fish disease introductions and spread. Firefighter and public safety is still the number one priority, but AIS and fish disease pose a significant risk to the environment. Avoidance and decontamination can prevent the spread of these organisms. Given that wildfire management and mitigation are considered emergency activities, the non-traditional types of equipment used for wildfire management, as well as the complexity and scope of the work, it was deemed most appropriate to adopt them as Best Management Practices, to be implemented whenever possible, instead of including them in the mandatory protocols for other GOA field staff. Mud and standing water are known vectors of spread for AIS and fish disease, so care should be taken during each use to minimize the risk of transfer.

The Risk Map shows the distribution of known whirling disease positive watersheds in Alberta (Red Zone), as well as those that are considered high risk or susceptible to AIS or fish disease (Yellow Zone). While the White Zone captures watersheds that are considered a lower risk than other locations in Alberta, care should always be taken to prevent the spread of AIS and fish diseases by ensuring equipment is CLEAN, DRAINED and DRY after each use.

PREVENTION PROTOCOLS

GROUND OPERATIONS

ALL ZONES

- CLEAN (remove organic material and mud as best as you can), DRAIN (drain all lake/river/ stream standing water from tanks and equipment after each use), and DRY (a minimum of 24 hours is ideal) all equipment that came into contact with water between each use.
- Avoid transferring water between watersheds or between unconnected waters within the same drainage. Do not dump water from one waterbody (i.e., stream, lake and reservoir) into another waterbody. Dispose of excess water over uplands.
- Use proper drafting and water handling procedures:
  - When possible, fill engines from a municipal hydrant, a water tender, or from a pump assigned to a single drafting source
  - To minimize the potential for engine water leakage through the foot valve, prime with water from the drafting source rather than water from the engine tank. Unit should carry a spare foot valve in case one leaks.
  - When priming by filling the drafting hose with a bucket, first make sure that the bucket is clean so that it does not transfer AIS or fish disease.
  - During drafting and water tending operations, do not leave draft hose full with foot valve engaged and submerged in water source when not pumping.
  - When filling the engine tank, avoid tank overflow into the water source.
- Use proper pumping and water handling procedures:
  - Elevate foot valves above the bottom of the waterbody for clean, sediment-free operation—for example, duct tape foot valve to a shovel or place the valve in a hardhat or bucket.

- Remove water drain plug/s from self-priming pumps (i.e., trash pumps) to empty pump housing before moving to a new waterbody.
- When done using pump, remove all mud and organic debris before subsequent use. This may be done by entering deeper water and cleaning mud off pump and foot valve. In particular, mud should be removed from equipment before it is used at any other site.

- When spraying water to suppress a fire, avoid application of untreated water into local water bodies (ponds, lakes, rivers, streams, wetlands, seeps or springs), especially if the hose water came from a different watershed.
- Avoid drafting from known whirling disease/AIS positive waterbodies.
- Avoid training (pump, engine, airtanker/helitanker practices) in whirling disease/AIS positive waterbodies.

RED ZONE

- If collapsible tanks can be filled with municipal water, draft from those tanks instead of untreated water sources.
- Avoid obtaining water from multiple sources during a single operational period unless drafting/ dipping equipment is decontaminated or changed out with clean equipment between sources.
- Use green 'Aquatic Invasive Species Risk' flagging tape to mark any ground equipment used in the 'Red Zone.'

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.

AIR OPERATIONS

ALL ZONES

- Whenever possible, avoid operating from whirling disease/AIS positive waterbodies.

RED ZONE

- If possible, avoid dipping or scooping water from multiple water sources minimize cross-contamination of water sources.
- Whenever possible, use water dipped from the same watershed that it will be dropped.
- Use deeper (blue) water whenever possible. Avoid areas that will intake mud or plants.
- Switch out a contaminated helicopter bucket with a clean bucket before moving to a new water source. Alternating used (possibly contaminated) helicopter buckets with spare (clean) buckets can save time and increase efficiency, as the first bucket can be decontaminated while the second bucket is being used.
- Snorkel ends and foot valves that encounter untreated water must be decontaminated.
- Pumps, suction hoses, and foot valves must be decontaminated prior to being used outside of the Red Zone.

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.

DECONTAMINATION PROTOCOLS

GROUND OPERATIONS

RED ZONE

- At the end of operations within the Red Zone, decontaminate all equipment (i.e., foot valves, suction hose, hand tools etc.). Three options are:
  - Dry the gear until dry to the touch (sunlight accelerates the process).
  - Use hot water (90°C), allow spray to contact surface for 5 to 10 seconds (up to 5 minutes preferred).
  - Use a disinfectant solution (Quaternary Ammonium Compounds (QAC). Surfaces can be decontaminated by submerging in a bucket for ten minutes filled with disinfectant.
- Consider carrying spare, clean dry draft hoses and foot valves to switch out with used ones when moving to a new water source.
- Hose gets melon rolled, flagged with green flagging tape and sent to the Provincial Warehouse

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.

AVIATION

Out of province import aircraft

- When importing helitankers, helicopters with buckets, or skimmer airtankers, from out of province, or when these aircraft are returning to Alberta, they must be thoroughly decontaminated (temperature treated) and dried prior to being utilized in Alberta waterbodies.
- Decontamination of these aircraft is not required for quick strikes into neighboring jurisdictions unless directed by the provincial aircraft coordinator.
- For skimmer airtankers, the Forest Area Duty Officer, with guidance from the Provincial Aircraft Coordinator, will arrange for a steam truck to be on-site upon the aircraft's arrival.
- Helicopter companies are responsible for decontaminating their tanks and buckets prior to being utilized in Alberta waterbodies.

Figure 14: *Decontaminating a float plane*

RED ZONE

- Disinfectants such as bleach and Quaternary Ammonium Compounds (QAC) do not meet corrosion requirements for aluminum and **shall not be used on aircraft fuselages or water delivery components such as helicopter buckets and foot valves**.
- When contact with untreated water has occurred or is suspected, decontamination is needed.
  - Flush with uncontaminated water and dry the gear until dry to the touch (sunlight accelerates the process).
  - Use hot water (90°C), allow spray to contact surface for 5 to 10 seconds (up to 5 minutes preferred).
- Decontaminate internal tanks by spraying the internal surface with hot water (90°C). Allow spray to contact surface for 5 to 10 seconds (up to 5 minutes preferred). This method is recommended for scooper and Fire Boss aircraft. Tanked helicopters have tank doors that open widely from below for easy tank access and draining. Hot water spray or thoroughly dry these surfaces. A steam truck may also be used.

YELLOW/WHITE ZONE

- “CLEAN, DRAIN, DRY” principles are strongly encouraged in both Yellow and White Zones.

APPENDIX C: BEST MANAGEMENT PRACTICES FOR AGRICULTURE AND FORESTRY WATER PUMPING PROGRAM EQUIPMENT DECONTAMINATION

Water pumping activities associated with drought mitigation and emergency response (flood, fire, drought, etc.) is a possible source of AIS and fish disease introduction and spread. Emergency response personnel and public safety is still the number one priority, but whirling disease and AIS pose a significant risk to the environment. Avoidance and decontamination can prevent the spread of these organisms. Given that water pumping equipment is often used in emergency situations, the large-scale equipment used, as well as the scope of the work, it was deemed most appropriate to adopt them as Best Management Practices, to be implemented whenever possible, instead of including them in the mandatory protocols for workers. Mud and standing water are known vectors of spread for AIS and fish disease, so care should be taken during each use to minimize the risk of transfer.

The Risk Map shows the distribution of known whirling disease positive watersheds in Alberta (Red Zone), as well as those that are considered high risk or susceptible to whirling disease (Yellow Zone). While the White Zone captures watersheds that are considered a lower risk than other locations in Alberta, care should always be taken to prevent the spread of AIS and fish diseases by ensuring equipment is CLEAN, DRAINED and DRY after each use.

PREVENTION PROTOCOLS

NON-EMERGENCY OPERATIONS (INCLUDES FILLING OF DUGOUTS FOR AGRICULTURAL USE)

ALL ZONES

- CLEAN (remove organic material and mud as best as you can), DRAIN (drain all lake/river/ stream/dugout standing water from pump, pipe and equipment after each use), and DRY (a minimum of 24 hours is ideal) all equipment that came into contact with water between each use.
- Avoid transferring water between watersheds or between unconnected waters within the same drainage. Do not transfer water from one natural waterbody (i.e., stream, lake, and reservoir) or irrigation canal into another natural waterbody or irrigation canal.
- Dispose of excess water over uplands where the runoff doesn't directly drain into a waterbody; it either evaporates or seeps into the ground.
- When transferring water between natural waterbodies or irrigation canals and dugouts/ reservoirs containing fish, ensure all equipment (intake, hose, pump, pipe, etc.) has not been used in a Red Zone
  - If equipment has been used in a Red Zone, it must be decontaminated before use
  - Use proper pumping and water handling procedures:
  - Drain water from primer and drain pump housing before moving to a new waterbody.

When done using equipment, remove all mud and organic debris before subsequent use. This may be done by entering deeper water and cleaning mud off intake screen and intake pipe. In particular mud should be removed from equipment before it is used at any other site.

Figure 15: *Example of a set up that may require decontamination after drawing water*

Figure 16: *Example of irrigation equipment that may require decontamination*

RED ZONE

- Avoid obtaining water from multiple sources during a single operational period unless intake pipe and hose is decontaminated or changed out with clean equipment between sources.
- All equipment must be decontaminated prior to being used outside of the Red Zone.
  - Consider segregating equipment that has been used in the Red Zone to only be used in Red Zone areas for the remainder of the season

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.

EMERGENCY OPERATIONS (FLOOD, FIRE, DROUGHT)

ALL ZONES

- Whenever possible, avoid operating from whirling disease/AIS positive waterbodies.
- Change footwear, waders, etc. on high ground
- Use proper pumping and water handling procedures:
  - Drain water from primer and drain pump housing before moving to a new waterbody.
  - When done using equipment, remove all mud and organic debris before subsequent use. This may be done by entering deeper water and cleaning mud off intake screen and intake pipe. In particular mud should be removed from equipment before it is used at any other site.

RED ZONE

- If possible, avoid pumping water from multiple water sources to minimize cross-contamination of water sources.
- Use deeper water whenever possible. Avoid areas that will intake mud or plants.
- If possible, switch out a contaminated intake pipe and hose with a clean intake before moving to a new water source. Alternating used (possibly contaminated) intakes with spare (clean) intakes can save time and increase efficiency, as the first intake can be decontaminated while the second intake is being used.

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.

DECONTAMINATION PROTOCOLS

NON-EMERGENCY OPERATIONS (INCLUDES FILLING OF DUGOUTS FOR AGRICULTURAL USE)

RED ZONE

- At the end of a pump job within the Red Zone, before leaving the site:
  - Clean off all mud and debris and drain all equipment (pumping and personal)
  - Spray down any surfaces that were in contact with mud or water (intake pipe, hose, pump,) from contaminated waterbody with QAC solution using a hand pump/backpack sprayer
  - Surfaces of small equipment (boots, etc.) can be decontaminated by submerging in a bucket/ container filled with QAC solution for ten minutes.
- After completion of a pump job, decontaminate all equipment (either at site or after transferring to regional storage location)
  - For pumping equipment (i.e., intake pipe, hose, pump, pipe etc.), leave out until dry to the touch (sunlight accelerates the process.).
  - Launder all clothing that was in contact with contaminated water in hot water
- Consider keeping spare, clean dry intake pipe and hose on hand to switch out with used ones when moving to a new water source.
- Consider segregating equipment that has been used in the Red Zone to only be used in Red Zone areas for the remainder of the season.
- After pumping season is complete (fall/winter), all pumping equipment must be decontaminated by completely drying and exposed to freezing (i.e., outside winter storage)
- Before leaving Red Zone (and entering Yellow/White):
  - Remove gaskets to allow for decontamination either by submerging in a bucket/container filled with QAC solution for ten minutes, or
  - Complete drying (sunlight accelerates the process).

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.
- After pumping season is complete (fall/winter), all pumping equipment must be decontaminated by completely drying and exposed to freezing (i.e., outside winter storage)

EMERGENCY OPERATIONS (FLOOD, FIRE, DROUGHT)

RED ZONE

- If possible, clean off all mud and debris and drain all equipment before leaving the site.
- If possible, dry all equipment (sunlight accelerates the process) before moving to another site.

YELLOW/WHITE ZONE

- "CLEAN, DRAIN, DRY" principles are strongly encouraged in both Yellow and White Zones.

APPENDIX D: DECONTAMINATION INSTRUCTIONS FOR INDUSTRIAL AND CONSTRUCTION OPERATIONS

The Decontamination Protocol for Watercraft and Equipment supports the provincial **Fish Conservation and Management Strategy**. Fisheries are a crown resource and the Government of Alberta's primary goal is to ensure the conservation of healthy, productive fish habitats and sustainable fish populations. By following the protocol when working in or near water, we are taking some of the most effective steps to reduce the spread of whirling disease and other aquatic threats.

Note: These instructions are intended to reduce the risk of Aquatic Invasive Species (AIS) and whirling disease both of which have potential detrimental impacts on Alberta's wildlife, infrastructure and recreational opportunities.

Prevention

1. Be aware of the risk of whirling disease in the watercourse or waterbody[1]. The Whirling Disease Risk Zone Map (https://www.alberta.ca/stop-whirling-disease.aspx) illustrates the areas of high (Red[1]), medium (Yellow[1]) and low (White[1]) risk.
2. Avoid entering the bed and the banks of a watercourse or waterbody[1] whenever possible, if you do not enter the bed and banks, decontamination is not necessary. Use equipment, vehicles and machinery on dry ground as much as possible to minimize work in water. Reach into the waterbody with as few parts of the equipment as possible.
    a. **Note:** the use of mats/temporary bridges could create additional mechanisms for AIS and whirling disease to be transferred and will need to be decontaminated after use.
3. Proper disposal of contaminated items and decontamination products: Appendix F.
4. When working in the Red zone, complete work from upstream to downstream to reduce the risk of transferring whirling disease or AIS upstream.
5. If work involves moving between a Red zone (infected zone[1]) and a non-Red zone (yellow or white), attempt to complete work in the non-Red zone first to reduce the risk of spread.
6. Use dedicated footwear for work in water and never wear this contaminated footwear inside a vehicle, or machine. Change footwear on dry ground and keep it isolated until it is decontaminated.
7. Sediment, vegetation or water originating from a waterbody in the Red zone should not be transported outside the Red zone.
8. Do not transfer/dump water between watersheds or between unconnected waterbodies. Disposal or use of water should be done upland in an area that has been isolated to prevent drainage to any surface waterbodies, wetlands, or sewer or storm drainage.

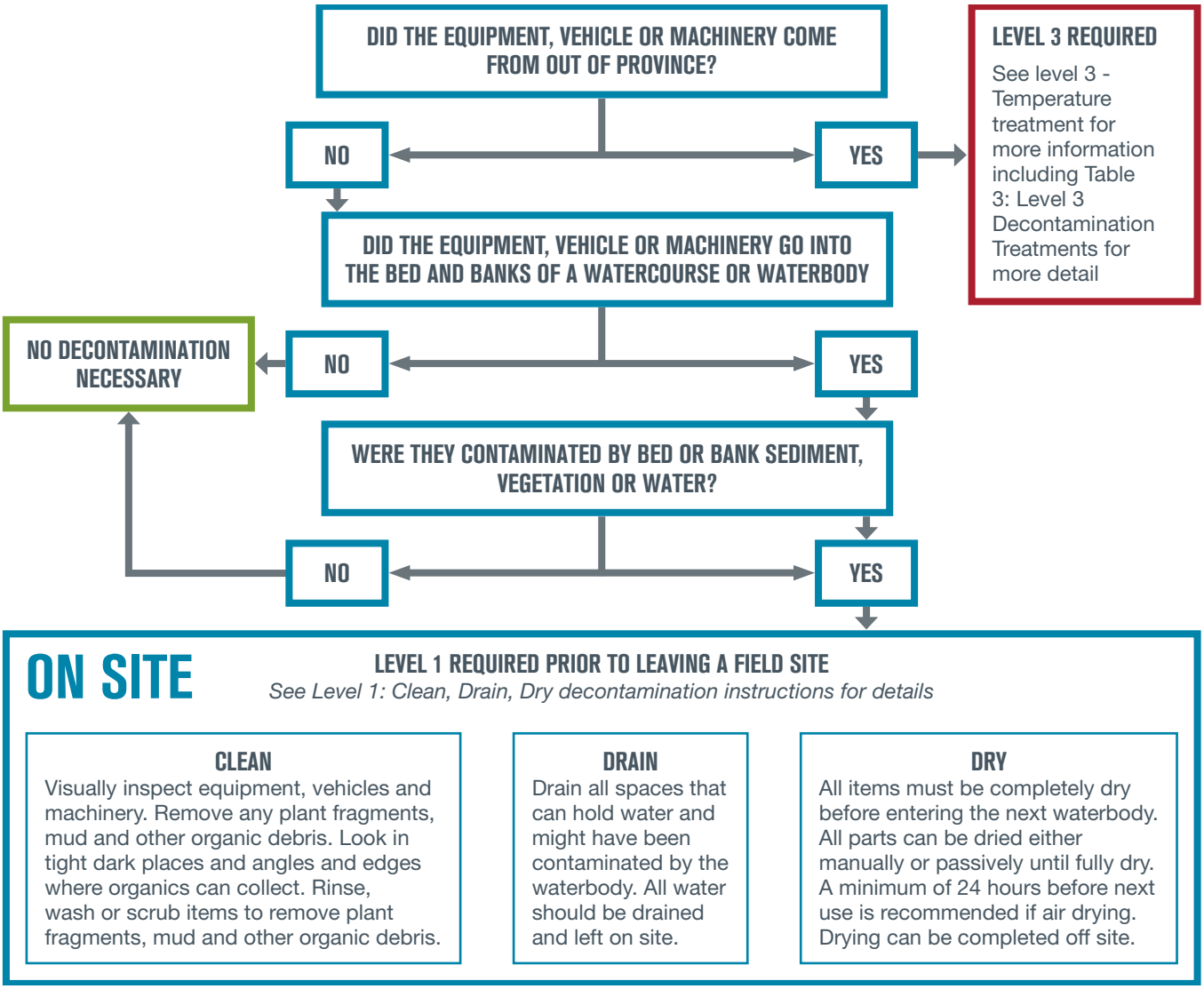
Decontamination

1. Follow the Decontamination Flow Chart for instructions on when and how to decontaminate.
    a. For detailed descriptions on methods see the appropriate sections in the Decontamination Protocol that are referenced in the flow chart:
2. For a sample list of equipment, vehicles and machinery, review the Decontamination Equipment List on the Stop the Spread website.
3. A template of a "Decontamination Record" form can be found in Appendix I. The intent of the form is for tracking decontamination efforts.

1. The definitions can be found in Appendix A

Figure 17: *Decon technician cleaning a piece of heavy equipment to complete a level 1 decontamination*

Decontamination Flow Chart for Industrial and Construction Users



APPENDIX E: CHEMICAL TREATMENTS

- Quaternary Ammonium Compounds (QAC) are common cleaning agents used in homes and hospitals, and are safe for MOST gear and equipment when used at recommended concentrations and rinsed.

  NOTE: QAC products can cause corrosion when used on aluminum. Alternative cleaning methods should be utilized for aluminum equipment.

- Chlorine products are not recommended for use in these protocols because of their corrosiveness to fabrics, plastics, rubber, and metal and their limited effectiveness against snails.

Approved Products

- Of the Quaternary Ammonium Compounds (QAC) available, 'QUAT Plus' (Dustbane) has been found to be most effective against whirling disease and AIS, at concentrations no lower than 1500 ppm. This is the product recommended for use in Alberta for activities however; there are other options as listed in the table.
- QAC compounds are toxic to aquatic organisms but are immobile in soil.
- Keep effluent containing this product at least 30 m from lakes, ponds, streams or other waters.

Table 5: Available QAC's and Manufacturer's Concentrations

BRAND NAME	MANUFACTURER	QAC ACTIVE INGREDIENT(S)	QAC CONCENTRATION (AS SUPPLIED)
QUAT Plus*	Dustbane	n,n-dialkyl –n, n-dimethyl ammonium chloride	4.8%
QUAT Plus M5	Dustbane	n,n-dialkyl –n, n-dimethyl ammonium chloride	7.7%
Vanguard	Dustbane	Didecyl dimethyl ammonium chloride n-alkyl; dimethyl benzyl ammonium chloride	2.88% 1.92%
Pinosan	Dustbane	Didecyl dimethyl ammonium chloride n-alkyl; dimethyl benzyl ammonium chloride	1.44% 0.96%
QUAT 128	Sanicare	Didecyl dimethyl ammonium chloride Dimethyl benzyl ammonium chloride	5.07% 3.38%
SparQUAT 256	Spartan Chemical	Dialkyl dimethyl ammonium chloride Alkyl dimethyl benzyl ammonium chloride	5-10% 5-10%

*Recommended Product (AEP)

Recommended Concentration and Dilutions

The recommended concentration of active ingredient for QAC compounds (listed above) is 1500 ppm. The dilution rate for QAC compounds will be specific to the brand name and the concentration of active ingredient in that product.

The dilution rate can be calculated by:

- Convert the percent active ingredient identified from the label or MSDS sheet for the product into ppm by multiplying the % times 10,000 (i.e., QUAT Plus: 4.8% active ingredient X 10,000 = 48,000 ppm).
- To determine the dilution rate to obtain the desired concentration of 1500 ppm of active ingredient, divide the ppm obtained above by 1500 ppm. Using QUAT Plus as the recommended product, this would result in a dilution rate of 32 (i.e., 48,000 divided by 1500 = 32). To make up a stock solution this would require diluting one liter of QUAT Plus with 31 liters of clean water to yield 32 liters of stock solution at a concentration of 1500 ppm.

> **Note:** These calculations assume no organics present and no interference(s) from other chemicals/minerals in the dilution water. Solutions should be tested with QAC test strips initially to confirm concentrations and dilution rates.

Table 6: Common dilution rates for use with QUAT Plus

QUAT PLUS 4.8 % (LITERS)	WATER (LITERS)	CONCENTRATION
2	62	1500 PPM
1	31	1500PPM
0.5	15.5	1500PPM
0.25	7.25	1500PPM
0.125	3.625	1500PPM
4	62	3000PPM
2	31	3000PPM
1	15.5	3000PPM
0.5	7.25	3000PPM
0.25	3.625	3000PPM

APPENDIX F: DISPOSAL OF PRODUCTS AND ITEMS

Disposal of Single-Use Items

A number of items that are used in these protocols are considered disposable either due to the difficulty in adequately disinfecting them or because of their insignificant purchase cost. These items include:

- Boot covers and single-use laboratory coveralls
- Wet wipes, or paper “shop towels”
- Bags for contaminated gear
- Single use gloves

This material must be secure and double bagged in heavy duty garbage bags (leak and tear resistant) and dispose of these materials in a safe location (i.e., municipal waste management) away from water.

Incineration is also an option for disposal.

Disposal of Disinfection Solutions

- Small quantities of diluted QAC products may be disposed of in a sanitary sewer if indicated on the product label or MSDS sheet.
- Always consult the product label in determining the appropriate Personal Protective Equipment (PPE) necessary for the mixing and use of these disinfectants, and for final direction on a given products use and disposal.
- Do NOT allow these products to enter storm drains, lakes, streams, or other waterbodies.
- Some products may be allowed to be disposed of into municipal waste systems in accordance to municipal, provincial, and federal regulations, please review and print applicable MSDS sheet for products.

On-Site Product Disposal (Level 2)

The disposal of QAC used for Level 2 for on-site decontaminations. Note that it is important to also check with legislative requirements for disposal of contaminated water to ensure that you are in compliance.

- Volume limitations: Follow label rate, mixing instructions and dilution rate of product (See Appendix E, Table 6: Dilution rates.) Use care in applying decontamination solution to minimize runoff.
- Large equipment decontamination runoff concerns: applied to equipment in the following areas over dry bare ground such as concrete or asphalt surfaces, or gravel or vegetated areas away from surface water, ditches, or storm drains. No containment mats are necessary if no surface drains are present.
  - Prevent off-site runoff using containment mats and surface drain protection, when the above criteria cannot be met.
  - Water body proximity buffers–decontamination not to be conducted on boat ramp or ramp approach/setup areas–flat, level area a minimum of 30 m from water and with no slope towards water.
  - Restricted/sensitive areas–Avoid decontamination activities in these areas: low-lying, non- level, surface drainage present to water body, standing water present, and sandy soils.
  - Containment mats – when using, collect water for transport back to warehouse for consolidation and disposal.
- Equipment decontamination soak – tubs/pails: not to be disposed of on-site.
  - Return to warehouse/operations facility for consolidation and disposal. These larger quantities must be disposed of properly.
  - Do not allow decontamination solution to enter storm water drains or floor drains.

- Contact local wastewater treatment facility for disposal authorization for used decontamination solution (volumes, concentrations, and point of disposal information likely required). Determine disposal for larger volumes of decontamination solution that must be determined on a site- by-site basis depending on location and wastewater treatment options.

Off-Site Product Disposal (Level 3)

It is the responsibility of the generator of the wastewater to ensure proper disposal of their wastewater. This would include receiving consent of the ultimate wastewater treatment provider. Individual wastewater treatment plants are responsible for ensuring that what gets discharged to their system can be appropriately treated – they can restrict what enters the wastewater system through municipal sewer bylaws. The wastewater treatment providers are also in better position to investigate and determine if a particular waste can be managed/treated by their system or not.

Regarding smaller municipalities who may not have the same wastewater expertise as a large municipality–the generator should err on the side of caution and should not assume that smaller municipal wastewater systems can treat their waste appropriately.

APPENDIX G: DECONTAMINATION KIT – RECOMMENDED CONTENTS

Cleaning And Disinfectant Supplies

1. Two plastic (no wooden components), nylon stiff bristle brushes (two sizes, one small hand scrub brush, a second larger, long handled brush for exterior/interior of watercraft, trailers and trucks);
2. Three 100 L rigid plastic totes with tight fitting lids (or equivalent) to be used as follows: (1) for cleaning of equipment, (1) for disinfectant bath, (1) clean water rinse of equipment. Alternatively, the tubs can be used as a secure container for transporting equipment to decontamination hub; note, do not use the third, clean water rinse tub for transporting contaminated gear.
3. Pump-style liquid sprayers–hand-pump and back-pack style sprayers work well (typically labelled as suitable for use with chlorine);
4. Zepp® instant hand sanitizer (or equivalent);
5. Test strips for measuring concentration of QAC in the field;
6. Measuring container marked out in liter increments for use with QAC;
7. Pail marked out in liter increments for filling plastic disinfecting containers. Alternatively, mark solution levels directly onto plastic totes.
8. 4L Jug of Quat Plus

Personal Protective Equipment

> **Note:** Please review and reference individual manufacturers MSDS and SDS sheets for appropriate safety equipment and precautions for use.

1. Shoulder length, chemical resistant gloves (disposable preferred): Neoprene, rubber, polyvinyl chloride, Vitron or nitrile;
2. Chemical resistant apron or Tyvek® suit, in case of spill;
3. Waterproof, chemical resistant foot wear (rubber boots);
4. Eye protection: safety glasses with side shields, which protect from splash.
5. Portable eyewash containers.

APPENDIX H: MSDS SHEET FOR QUAT

NOTE: Comprehensive Safety Data Sheet for QUAT PLUS can be found at: http://www.dustbane.ca/sds/Quat-Plus.pdf

Government of Alberta

Decontamination Record

This template can be used to document and track decontamination efforts. Organizations may adapt this template for their use, however; the information from this template is required.

TRACKING INFORMATION			
Date:		Tracking number:	
Company:			
Contact name, location and contact number:			
Project title:			
Activity description:			
HUC 6 or waterbody name(s):		Risk zone:	☐White ☐Yellow Red
Location (ATS, Lat/Long, Address):			

EQUIPMENT INFORMATION						
Mobilize (in) Date	**Demobilize (out) Date**	**Item (general) and unit number**	**Highest decontamination level***			**Initials**
			☐1	2	3	
			1	2	3	
			1	2	3	
			1	2	3	
			1	2	3	
			1	2	3	

	INITIALS & SIGNATURES	CLOSE OUT DATE
Contractor:		

* Highest decontamination level definitions are found in *Decontamination Instructions for Construction and Industrial Operations*

EQUIPMENT INFORMATION						
Mobilize (in) Date	**Demobilize (out) Date**	**Item (general) and unit number**	**Highest decontamination level***			**Initials**
			☐1	2	3	
			☐1	2	3	
			☐1	2	3	
			1	2	3	
			☐1	2	3	
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			☐1	2	3	
			☐1	2	3	
COMMENTS OR NOTES						

* Highest decontamination level definitions are found in *Decontamination Instructions for Construction and Industrial Operations*


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