



California Department of Fish and Wildlife, Aquatic Invasive Species Disinfection/Decontamination Protocols (Northern Region)

The California Department of Fish and Wildlife (CDFW) is committed to protecting the state's diverse fish, wildlife, and plant resources, and the habitats upon which they depend. Preventing the spread of aquatic invasive species (AIS) in both CDFW's activities, as well as those activities CDFW permits others to conduct is important to achieving this goal. The protocols outlined below are a mandatory condition of your CDFW authorization to work in aquatic habitats intended to prevent the spread of AIS. This applies to CDFW personnel and as a condition for permitting work in aquatic environments in Region 1.

Information about New Zealand mudsnails (NZMS), quagga and zebra mussels, chytrid fungus and Sudden Oak Death Syndrome is summarized in Attachments A through D. For more complete information on the threats of AIS and aids to their identification, please visit the links provided in this document and the Department's Invasive Species Program webpage at:

<https://www.wildlife.ca.gov/Conservation/Invasives>

Many AIS are difficult, if not impossible, to see in the environment and can be unknowingly transported to new locations on equipment. Therefore, decontamination is necessary to prevent the spread of AIS between different waterbody locations. To achieve this, equipment should be decontaminated following the protocols outlined in this document. All equipment that comes into contact with water during field activities and watercraft should be decontaminated using one or more of the protocols listed below.

General procedures to prevent the spread of AIS:

- If decontamination is **not** done on site, transport contaminated equipment in sealed plastic bags and keep separate from clean gear.
- Gear may be dedicated for a specific field site but should be left on site and be cleaned when moved off site.
- Sets of field gear may be rotated in and out of field per cleaning cycle.
- When practical, begin work upstream and work downstream. This avoids transporting AIS to non-infested upstream areas.

Equipment Decontamination/Disinfection Methods

Option 1: Standard Decontamination (Office Method)

Freeze + Saltwater Immersion + Dry

This option consists of three parts, as freezing alone may not kill some organisms (e.g. chytrid fungus, Sudden Oak Death Syndrome, etc.).

- Scrub gear before leaving field with a stiff-bristled brush to remove all debris. Thoroughly brush small crevices such as boot laces, seams, net corners, etc.
- Bag gear for transport from field to office.
- Place gear and bag in a freezer below 32°F for a minimum of eight hours.
- Thaw gear and bag.
- Immerse gear and bag in 5-10% saltwater solution for 10 minutes (see Dilution Table on p. 4).
- Rinse gear.
- Hang gear to dry.

References

Johnson M.L, L. Berger, L. Philips, R. Speare. Fungicidal effects of chemical disinfectants, UV light, desiccation and heat on the amphibian chytrid *Batrachachytrium dendrobatitis* in DISEASES OF AQUATIC ORGANISMS. Vol. 57: 255-260, 2003

Richards, D.C., P. O'Connell, and D.C. Shinn. 2004. Simple control method to limit the spread of the New Zealand mudsnail, *Potamopyrgus antipodarum*. North American Journal of Fisheries Management 24(1):114-117.

USFS Intermountain Region Technical Guidance, For Resource Advisors, Preventing the Spread of Aquatic Invasive Organisms Common To The Intermountain Regions. 2014 Technical Guidelines for Fire Operations.

Option 2: Chemical Treatment (Field Method)

In general, **chemical** decontamination/disinfection should only be used when Option 1 cannot be performed and clean gear is not available. This would be the case when conducting activities at more than one watershed or between long distances with one set of gear before returning back to the base office where a freezer, salt water immersion and drying rack are located.

- Prepare disinfection solution by diluting concentrate containing GS HD 256 (quat) in a well-ventilated space using gloves, eye protection and a NIOSH approved N95 filter mask. See Dilution Table on page 4 for dilution factors. Pour decontamination solution into a suitable holding container and submerge gear for at least 10 minutes. Gear may need to be weighed-down and/or rotated for complete and sustained immersion.
- Check field gear immersed in disinfection solution and inspect it to make sure all surfaces have been wetted for the required time.
- After treatment, rinse field gear with *fresh* water (**not water from previous waterbody--to avoid further contamination**). Dispose of *rinse water* at least 100 feet from any surface water.
- Make up fresh solution as needed and discard after it becomes heavily soiled with organic matter. Check with quat test strips: readings should be above 500 ppm for adequate disinfection.
- Disinfection solution should be saved to be disposed of in a wastewater sewer facility (not in a septic system) **or** it can be neutralized on site. For onsite neutralization of quat solution, mix the remaining working solution with bentonite clay as directed in the Dilution Table, below. Mix the bentonite/quat. decon. solution slurry a couple of times before pouring it out on the ground at least 100 ft. away from surface water. This method will neutralize quaternary ammonium in 3-5 hours.

Dilution Table

Concentrate	to 1 gal. water	to 5 gal. water
NaCl ¹ (rock salt)	1.5 cups (9% salt)	7.5 cups (9% salt)
GS HD 256 ²	2.5 oz. (1.8% solution)	12.5 oz. (1.8% solution)
bentonite clay ^{3,4}	12 tbs.	3.75 cups

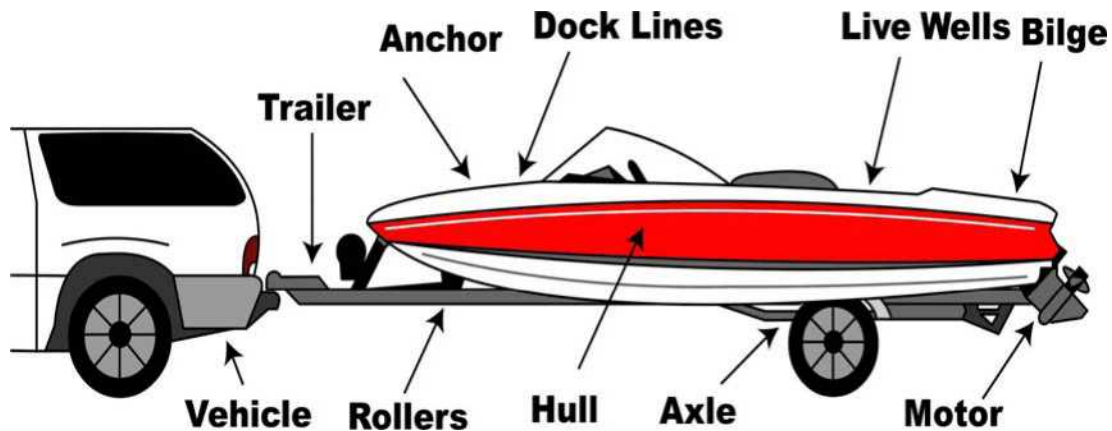
References

1. Johnson M.L, L. Berger, L. Philips, R. Speare. Fungicidal effects of chemical disinfectants, UV light, desiccation and heat on the amphibian chytrid *Batrachachytrium dendrobatitis* in DISEASES OF AQUATIC ORGANISMS. Vol. 57: 255-260, 2003
2. USFS Intermountain Region Technical Guidance, For Resource Advisors, Preventing the Spread of Aquatic Invasive Organisms Common To The Intermountain Regions. 2014 Technical Guidelines for Fire Operations
3. United States Patent, Petrille, III et al. Methods of Detoxifying Quaternary Ammonium Compounds Toward Aquatic Organisms. Patent# 5518636. May 21, 1996
4. CDFW Northern Region unpublished data.2016

Safety Data Sheets

GS HD 256: http://www.spartanchemical.com/msds_sds/downloads/AGHS/EN/3508.pdf

Watercraft Decontamination



- Prior to leaving the launch area, remove all debris from your watercraft, trailer, and equipment. Dispose of all material in the trash, on site if possible.
- Prior to leaving the launch area drain all water from your watercraft and dry all areas, including motor, motor cooling system, live wells, bilges, and lower end unit. Before leaving water body area, run motor dry for 5-10 seconds to flush water from engine.
- After leaving a ***known or suspected invasive mussel infested water*** pressure wash the watercraft and trailer at base facilities, with 140°F water¹, including all of the boat equipment (i.e. ropes, anchors, etc.) that had come into contact with the water.
- Flush the engine, live wells, bilges, and all other areas that could contain water with hot water that is at least 140°F. Make sure that water is contained sufficiently so that it doesn't run into storm drains or surface waters.

¹To ensure 100% mortality the water needs to be 140° F or greater at the point of contact.

Attachment A

New Zealand Mudsnaill:

- NZMS reproduce asexually therefore it only takes a single NZMS to colonize a new location.
- NZMS are prolific, and a single NZMS can give rise to 40 million snails in one year.
- Densities of over 750,000 NZMS per square meter have been documented.
- NZMS out-compete and replace native invertebrates that are the preferred foods of many fish species and alter the food web of streams and lakes.

Identifying NZMS:

- NZMS average 1/8 inch in length, but young snails may be as small as a grain of sand. Adults bear live young.
- See the photos, below, for assistance identifying NZMS. Expert identification will be necessary to confirm identification.

NZMS Habitat:

- NZMS can live in most aquatic habitats, including silted river bottoms, clear mountain streams, reservoirs, lakes and estuaries.
- NZMS have a temperature tolerance of 32-77° F.
- NZMS can survive out of water for more than 25 days in cool, moist environments, and have been found alive over 40 feet from water.

Known locations can be found and new records should be reported to the USGS at: <http://nas.er.usgs.gov/taxgroup/mollusks/default.aspx>

Descriptive features of the New Zealand Mudsnaill

IDENTIFYING THE NEW ZEALAND MUDSNAIL

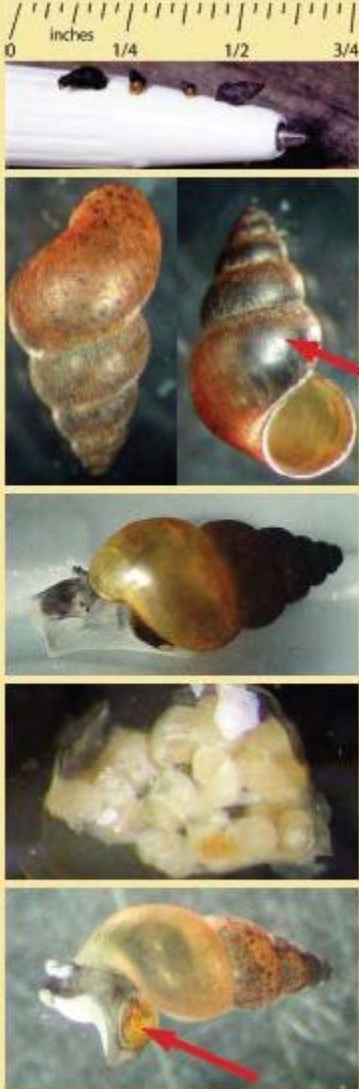
Size: A mature snail is usually less than 5 mm (.2 in) long. (Photo by Jane and Michael Liu.)

Shape: Shell is elongated and dextral (its whorls or spirals lean toward the right). Snail typically has between 5 to 6 whorls on its shell. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms/>.)

Color: Most snails have a light- to dark-brown shell that may appear to be black when wet. (Photo by Jane and Michael Liu.)

Embryos: Upon dissection, mature snails will have brooded embryos. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms/>.)

Operculum: The mudsnail operculum (a rounded plate that seals the mouth of the shell when the animal's body is inside) can be seen on live snails but is not easily visible on dead or preserved snails. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms/>.)



Attachment B

Quagga and Zebra Mussels:

- Dreissenid mussels multiply quickly and out-compete other species for food and space.
- Their presence can alter food webs and environments, negatively affecting native and game fish species.
- Dreissenid mussels attach to hard and soft surfaces, and physically disrupt water delivery systems, hydroelectric facilities, agriculture, recreational boating and fishing.
- Adults can survive up to 30 days out of water in cool, humid conditions.
- They produce microscopic larvae that can be unknowingly transported in water, including live-wells, bilges, and motors.

Identifying Dreissenid mussels:

- Typically the same size as a fingernail but can grow up to about 2 inches long.
- Variable, usually dark and light alternating stripes. May also be solid cream, brown, or black.

Dreissenid mussel habitat:

- Variable, including both hard and soft surfaces in freshwater.
- From surface depth to more than 400 feet in depth.



Current known locations of Dreissenid mussels in California can be found at: <http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/>

Attachment C

Chytrid Fungus

The disease has been linked to dramatic population declines and even extinctions of amphibians in several parts of the world including North America. Thirty percent of amphibian populations may have been affected by this disease, worldwide. Chytrid fungus or Bd (*Batrachochytrium dendrobatidis*) is invisible to the naked eye, but its effects can be seen in many amphibian populations that have been exposed to it. Certain animals/populations, however, seem to be immune and some may actually act as carriers of the disease. The fungus breaks down amphibians' keratinized tissue causing morbidity. This subsequently causes mortality. For more information on chytrid fungus see:

http://cirs.ucr.edu/chytrid_fungus.html



Effects of Chytrid fungus.

Attachment D

Sudden Oak Death Syndrome (SODS)

Since the mid-1990s Sudden Oak Death Syndrome, *Phytophthora ramorum*, has killed millions of tanoak trees and several oak (*Quercus*) tree species (coast live oak, California black oak, Shreve oak, and canyon live oak), and caused twig and foliar diseases in numerous other plant species, including California bay laurel, Douglas-fir, and coast redwood.

P. ramorum thrives in cool, wet climates. In California, coastal evergreen forests and tanoak/redwood forests within the fog belt are the primary habitat. For more information, visit www.suddenoakdeath.org



Tanoak mortality in Humboldt Co. circa 2006.

For questions on CDFW Northern Region Aquatic Invasive Species procedures contact:

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