



AIS Guidance for Wildland Fire Operations

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The AIS Risk

Firefighting Equipment & Operations

Vectors for spread:

- Any surfaces that hold raw water and don't drain and dry completely



Many different vectors



Fixed Wing Aircraft

- Heavy Air Tankers (3000 gal)
- Single Engine Air Tankers (700 g)
- Scooper planes (1400 gal)

Many different vectors



Helicopters

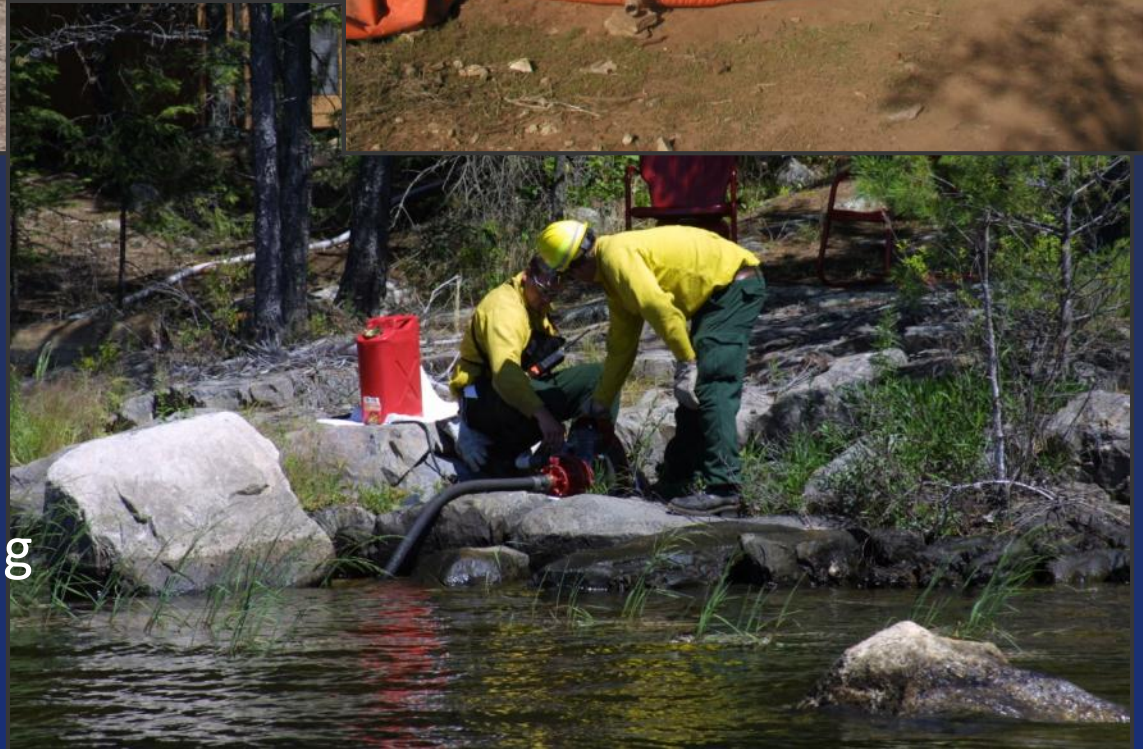
- Snorkels
- Internal tanks
- Buckets

Many different vectors



Ground-based

- Engines
- Portable tanks
- Water tenders
- Portable pumps/drafting







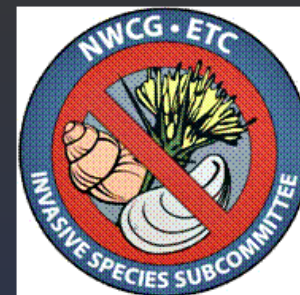






National Wildfire Coordinating Group (NWCG)

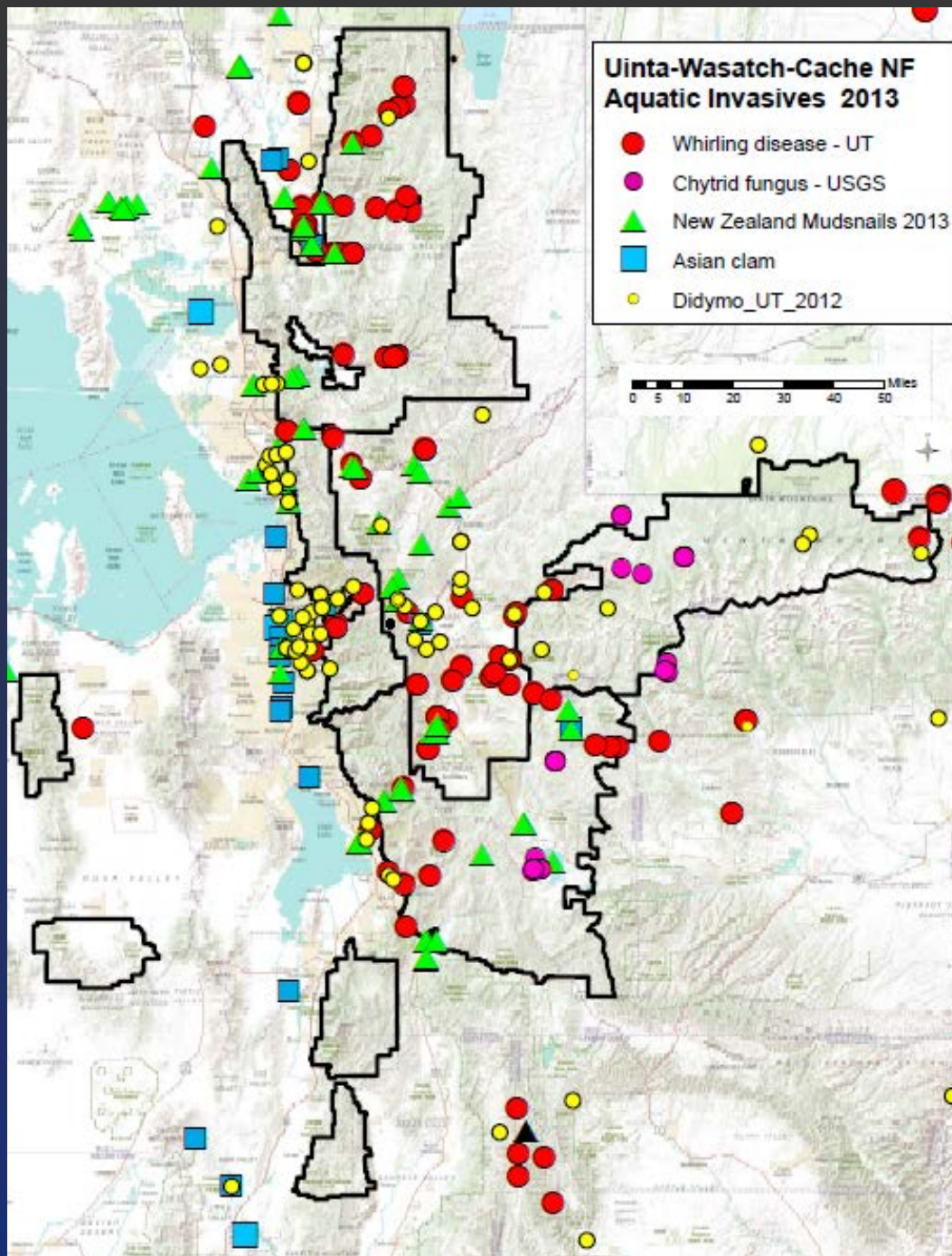
Equipment Technology Committee



Invasive Species Subcommittee

- Their goal is to 'develop recommendations for policies, standards and procedures to mitigate the risk of transporting invasive species in all activities related to fire and incident response.'
- National Interagency Aquatic Invasive Species Guidebook that determines:
 - the best procedures for sanitizing equipment (e.g. scoopers, tenders, helitankers)
 - whether or not to use chemicals, and, if so, which chemicals
 - procedures that certifies equipment is cleaned and ready for the next user

GEOSPATIAL TECHNICAL
CENTER in SLC is testing
feasibility of a central AIS
spatial database



Zebra & Quagga Mussels

Dreissena polymorpha & *Dreissena rostriformis bugensis*



Photo credit: The Nature Conservancy

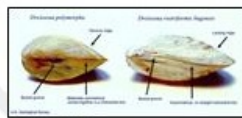


Photo credit: U.S. Geological Survey

General Information:

- Quagga Mussel Distribution:** CA, NV, UT, AZ, CO, NM, OK, TX, Midwest, Great Lakes region and NE US. For most up-to-date information on distribution, please see: <http://nas.er.usgs.gov/teagroup/mollusks/zebra/quagga/>
- Zebra Mussel Distribution:** CA, UT, CO, OK, KS, NE, SD, ND, IA, AR, MO, IA, MN, MS, TN, AL, KY, IN, other Midwest and Great Lakes regions and NE US. For most up-to-date information on distribution, please see: <http://nas.er.usgs.gov/teagroup/mollusks/zebra/quagga/>
- Habitat:** Both mussels attach to hard surfaces in temperate lakes and slow rivers. Microscopic mussel larvae are released into open water where they swim about for several days before settling.
- Fire Activities Posing Risk:** Most concern is with microscopic larvae present in water column. Larvae can survive for 3 days in internal tanks with residual water (summer months). Risks include: contact with untreated water; helicopter buckets, snorkels, and other drafting gear that capture bottom sediments, mud, or aquatic plants; internal tanks and hoses that retain residual untreated water.
- Environmental Impacts:** Zebra and quagga mussels colonize water supply pipes and pipelines, hydroelectric and nuclear power plants, public water plants, and industrial facilities. These species remove nutrients in aquatic ecosystems and litter beaches with sharp-edged shells.

Disinfection Protocols:

Methods of Control for Firefighters	Details of Method	References	Notes
Temperature	HOT WATER SPRAY	Comeau et al. 2011	

Methods of Control for Firefighters	Details of Method	References	Notes
	<p><u>To kill Quagga or Zebra mussel adults</u> $\geq 140^{\circ}\text{F}$ (60°C) for 3 to 10 seconds</p> <p><u>To kill Quagga/Zebra mussel free-swimming larvae</u> $\geq 140^{\circ}\text{F}$ (60°C) likely to be "instantly lethal"</p> <p><u>HOT WATER IMMERSION:</u> <u>To kill Quagga/Zebra mussel adults and free-swimming larvae</u> $\geq 120^{\circ}\text{F}$ (50°C) for 1 minute</p> <p><u>FREEZING</u> $\leq 32^{\circ}\text{F}$ (0°C) for 48 hours or more for adults</p>	<p>(Quagga adults): Morse 2009 (zebra adults)</p> <p>R. McMahon, pers. comm. (2014)</p> <p>Beyer et al. 2011</p> <p>McMahon 1996</p>	
Drying	In summer, 5 days survival time for larvae in internal tanks with residual water; in cooler months: 28 days	Choi et al. 2013	
Mechanical	Scraping, brushing, hot water pressure washing to flush larvae	Comeau et al. 2011 and multiple sources	
CHEMICALS			
Quaternary ammonium Compounds (e.g. alkyl dimethyl benzylammonium chloride (ADBAC); decyl dimethyl ammonium chloride (DDAC))	<p><u>To kill Quagga mussel larvae:</u></p> <p>2.1% Sparquat256[®] solution</p> <p>Mixing instructions: 4.3 oz per 1 gallon water 3.4 gallons per 100 gallons water Contact time = 10 minutes</p> <p>OR</p>	<p>Britton and Dingman 2011</p>	<p>Quat compounds methods are specifically for larvae likely found in the water column.</p> <p>Quat</p>

Methods of Control for Firefighters	Details of Method	References	Notes
	<p>1.8% Green Solutions High Dilution 256[®] solution</p> <p>Mixing instructions: 2.3 oz per 1 gallon water 1.9 gallons per 100 gallons water Contact time = 10 minutes</p>	Britton and Dingman 2011	Compounds can corrode aluminum; not for use on aircraft equipment
Bleach (e.g. Clorox [®]) 6% sodium hypochlorite	<p>0.5% bleach solution (250 ppm sodium hypochlorite)</p> <p>Mixing instruction: 0.6 oz bleach per 1 gallon water 1.1 Tablespoons of bleach per gallon water 1/2 gallon bleach per 100 gallons water Contact time = rinse only, no time specified.</p>	Modrak et al. 2011 (Based on Cope et al. 2003 which cited Gatenby 2000.	Bleach is corrosive to gear and metals
Other Disinfectants	<p><u>To kill Quagga mussel adults & larvae:</u></p> <p>2% Virkon Aquatic[®] solution</p> <p>Mixing instructions: 20 g/liter 76g per 1 gallon of water 760g per 100 gallons water Contact time = 10 minutes</p>	Stockton 2011	Virkon is corrosive to soft metals. Although not specifically tested, may not be applicable for use on aircraft equipment

Methods of Control for Firefighters	Details of Method	References	Notes
	Contact time = 10 minutes		

What are the standard operating procedures for a decontamination unit?

Be sure to follow the manufacturer's operating procedures specific to your unit.

Step-by-Step Operating Instructions for Trailered Hydro Tek Decontamination Units

Before start up

1—Check pump oil. Check pump oil by locating the yellow oil dip stick on top of the pump.

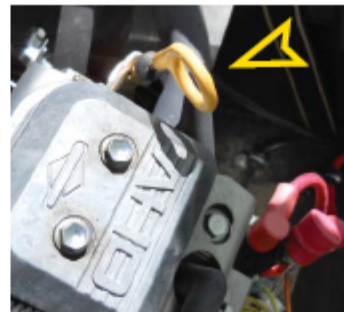


2—Check fluid levels. Check engine oil by locating the yellow dip stick on the engine. Check gasoline and diesel fuel levels in the tank.



3—Roll out the hose and double check all quick connects.

4—Connect the water supply and turn water on. Maintain an adequate supply of water using a ¾ inch I.D. hose with a pressure between 25 and 60 psi. Burner power switches should be off before starting. If the decontamination unit is tank fed, be sure there is water in the tank and valve is switched for supply tank feed. Do not run dry.



From: *ANS Watercraft Decontamination Manual*—CDOW





New Quagga Veliger Study

- Quagga mussel veligers can survive 5 days in summer and about 27 days in autumn in contained water.
- Veligers may survive overland transport in the residual water of tanks to any location in the US.

Choi, et al. 2013. *Estimating survival rates of quagga mussel veliger larvae under summer and autumn temperature regimes in residual water of trailered watercraft at Lake Mead, USA*