Uniform Minimum Protocols and Standards for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States

UMPS III

Editors

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DISCLAIMER: The following protocols and standards are provided here to protect natural resources from the damage caused by aquatic invasive species.

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PREFACE

The purpose of Uniform Minimum Protocols and Standards for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States (UMPS III) is to 1) provide the best possible recommendations for watercraft inspection and decontamination (WID) programs and 2) to provide the best standards, practical science and technology currently available for WID program consistency.

Since the original publication in 2009, UMPS has provided the current scientific information and minimum standards as a guideline for new or ongoing WID programs. The *Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species* (Brown, 2015) incorporates the scientific information and minimum standards to provide step-by-step procedures for inspection and decontamination to reduce the risk of introduction of aquatic invasive species (AIS). The *Trainer Manual for Aquatic Invasive Species Inspection and Decontamination Courses* (Brown, 2015) provides consistent guidance to AIS trainers who are responsible for the certification of individuals to perform watercraft inspection and decontamination. UMPS, the student curriculum and the trainer manual together provide the necessary components to implement a WID program.

The protocols and standards recommended in this document are primarily directed at preventing the inadvertent transfer of dreissenid mussels from areas where they are currently present to unaffected waters on watercraft, seaplanes and water-based equipment. Further, the protocols and standards are effective for reducing the risk of overland transport of other AIS such as aquatic plants, fish, disease pathogens, plankton species and other AIS.

The primary goal of all watercraft inspection programs are to prevent the transfer of quagga and zebra mussels and other aquatic invasive species (AIS) in order to safeguard natural resources, water supplies, recreation opportunities and other important water dependent values. Further the primary objectives of an inspection program are to keep public and private waters open to recreational use to the greatest extent possible, and provide education to the boating public.

INTRODUCTION

Following the discovery of adult quagga mussels in the western United States at Lake Mead, Nevada in January 2007 and their subsequent detection downstream, many water and resource management agencies and organizations in the western United States initiated watercraft inspection and decontamination (WID) programs to prevent the further expansion of dreissenid mussels. Inspection programs are an important tool used by state, federal and other jurisdictions to address watercraft and other high profile vectors in minimizing the spread of aquatic invasive species. These inspection programs have been critical in slowing the spread of dreissenid mussels to other waterbodies. Between 2012-2014 over 750 dreissenid-fouled watercraft have been intercepted and decontaminated by WID programs throughout the Western states (Phillips, Pacific States Marine Fisheries Commission, personal communication).

The use of WID programs has become a major strategy to prevent the spread and introduction of dreissenid mussels throughout the Western states. By implementing consistent and effective protocols, managers have realized success in identifying watercraft and other equipment that pose a risk. Implementing regionally consistent watercraft inspection programs across the West does pose difficulties. With a large number of programs already in place and a wide range of agency and organization capacity to implement programs, consistency across jurisdictional boundaries is difficult to achieve. Regardless, interjurisdictional coordination and cooperation will be the key to preventing the range expansion of dreissenid mussels in the western United States.

An inspection program is typically a component of a larger invasive species program which often also includes outreach and education, monitoring, control and rapid response. Whether a novel or established inspection program, successful watercraft inspections contain common elements and are guided by robust scientific information. Uniform Minimum Standards and Protocols for Inspection and Decontamination Programs for Dreissenid Mussels in United States (UMPS) provide the source of coordination and consistency to guide inspection programs across the West and beyond.

The recommended protocols and standards in this document reflect the current scientific research on dreissenid mortality. For over a decade, scientific studies to determine mortality of dreissenid mussels under a variety of circumstances have shown that hot water and drying are highly effective tools. In general, the use of 140°F high pressure water for direct contact and 120°F for flushing are recommended for effective watercraft decontamination. Further, millions of inspection and decontaminations conducted on boats throughout the West have informed current protocols and standards as well. Researchers continue to explore methods to improve inspection processes.

The focus of resource agency WID programs have been on trailered watercraft, however natural resource managers recognize that other types of equipment and vehicles should be subject to inspection or decontamination. To adequately address the broad range of equipment types and vehicles, inspections and decontaminations may require variations or additional details to address specific vectors. The subsequent sections are separated into major types to allow for ease of use and they include watercraft, commercially hauled watercraft, seaplanes and water-based equipment.

The need to apply consistent strategies across a wide geographic area improves boater relations, internal dialog and improved confidences in the quality of the inspection itself. The goal is to provide the best possible recommendations for WID programs that benefits boaters and managers, and provides increased protection for our water resources.

!! Safety Alert !!

The protocols in this document should be conducted by trained individuals. Use extreme caution when handling hot water, decontamination equipment and working around vehicles to avoid serious human harm and to avoid damage to watercraft and watercraft equipment.

THE DEVELOPMENT AND METHODS OF UNIFORM MINIMUM PROTOCOLS AND STANDARDS

UMPS III is a living document and will continue to evolve as new information becomes available. This version is updated from the original UMPS I and UMPS II (Zook and Phillips, 2009 & 2012), however basic principles and program elements remain effectively unchanged. As in previous revisions, a process to reconcile and adopt UMPS III protocols and standards was utilized to incorporate the best available science and information.

The use of best available science has been the strategy to guide the inspection and decontamination protocols and standards of UMPS. In some cases this scientific information has been in the form of unpublished data, but also as peer reviewed publications (See Table 1). For a decade, the Pacific States Marine Fisheries Commission (PSMFC) training program and many comprehensive WID programs have been established and in operation. The information gathered from practical hands on experiences and as a result of nearly 100 Watercraft Inspection Training (WIT) classes taught has influenced the methods recommended in this manual.

The Quagga-Zebra Mussel Action Plan (QZAP) for Western U.S. Waters (2010) summarizes current strategies to address the invasion of quagga and zebra mussels in the West, and identifies and prioritizes the specific actions needed to comprehensively prevent the further spread of these mussels, respond to new infestations, and manage existing infestations. To address the growing quagga mussel problem, the authors of QZAP identified "*Continue the Development of Effective Watercraft Inspection and Decontamination Protocols and Standards*" as a "Highest Priority Action." UMPS III directly fulfils this Highest Priority Action item.

In 2014, the Western Regional Panel on Aquatic Nuisance Species (WRP) formed the Watercraft Inspection and Decontamination Committee to develop the WIT curriculums, and oversee the development of UMPS III. Extensive review and discussion by this committee as well as open review by the WRP was part of this process. The protocols and standards recommended here are the products of:

1. An extensive literature search, review and surveys conducted in the 2009/2012 versions of UMPS and additional information collected in developing the current version of this document.
2. The experience and feedback gained from PSMFC watercraft inspection and decontamination trainings.
3. Information gathered through discussions and consensus building on WID programs.

The process to update this current publication engaged the Watercraft Inspection and Decontamination Committee of the WRP. The following individuals have contributed valuable professional feedback on the process to inspect and decontaminate watercraft and other equipment.

Western Regional Panel on Aquatic Nuisance Species, Watercraft Inspection and Decontamination Committee Members:

Beth Bear, Wyoming Game and Fish Department
Elizabeth Brown, Colorado Parks and Wildlife, Committee Chair
Dee Davis, Quagga D LLC
Glenn Dolphin, Oregon State Marine Board
James Dominguez, New Mexico Department of Game and Fish
Dominique Norton, California Department of Fish and Wildlife
Stephen Phillips, Pacific States Marine Fisheries Commission
Gene Seagle, Black Canyon of the Gunnison and Curecanti National Recreation Area
Kami Silverwood, Arizona Game and Fish Department
Benjamin Smith, Lake Mead National Recreation Area

WATERCRAFT INSPECTION AND DECONTAMINATION PROGRAMS

Implementation

A national inspection and decontamination training program has helped guide professionals in creating programs, train staff and broaden resource professional knowledge. The combination of watercraft inspection trained professionals and the application of protocols and standards found in UMPS have resulted in a coordinated effort that effectively addresses the vector of watercraft. Consequently, throughout Western states watercraft inspection programs utilize similar components.

There are currently a range of programmatic inspections that can be encountered by boaters including, but not limited to, self-inspection, screening for high-risk watercraft, comprehensive inspection and decontamination, and quarantine. This document provides the necessary details to understand the general implementation of these types of programs. By following the guidelines provided here, an effective watercraft inspection and decontamination program can be implemented that readily identifies and addresses high-risk watercraft to protect water resources.

The policies, protocols and standards used to establish and implement Western WID programs have utilized the UMPS document. Additionally, a majority of WID program staff and managers have attended the 100th Meridian Initiative and WRP certified watercraft inspection training conducted by PSMFC. Programs in many jurisdictions have now existed for a decade while others are now looking to create a program. The larger community of managers continues to share and expand on the current knowledge of inspection and decontamination programs. The UMPS document and training have been primary drivers in creating consistency and serves as a continual source for information.

Coordination

The members and partners of the WRP have recognized the need for better coordination and more consistency in the application of programs used to prevent the overland transport of dreissenid mussels and other AIS on watercraft. To address this need, the WRP Building Consensus Committee was created in 2012. This committee addresses a variety of action items and brings together a larger community of expertise with contributions from the National Sea Grant Law Center, attorneys general, state and federal law enforcement, as well as AIS managers. Numerous subcommittees of Building Consensus address work needs associated with watercraft inspection and decontamination programs including: Legal Committee, Watercraft Inspection and Decontamination Training Committee, Outreach Committee, and Data Sharing Committee. Each of these committees is a reflection of aspects of inspection programs where improved consistency and clarification are a goal.

Continued information exchange, cooperation, communication and coordination among agencies and organizations engaged in WID programs in the western United States is necessary. Adopting uniform minimum protocols and standards for these programs is one step toward achieving that

goal and increasing the overall effectiveness of these programs. When the many resource management jurisdictions across the West undertake prevention efforts that include mutual support, consistency, and cooperation, the West will be safer from the damaging impacts of aquatic invasive species. Changes to regulations at the federal, state, local, and tribal level may be necessary to implement a comprehensive multi-jurisdictional program in the West.

Consistency

In 2010, U.S. Fish and Wildlife Service (USFWS) funding became available to implement portions of the QZAP. The goals of the QZAP, developed by the WRP and adopted by the Aquatic Nuisance Species Task Force (ANSTF) in 2010, were to summarize current strategies to address the invasion of quagga and zebra mussels in the West, and to identify and prioritize the specific actions that are needed to comprehensively prevent the further spread, respond to new infestations, and manage existing infestations. To address the growing quagga mussel problem, QZAP listed "Continue the Development of Effective Watercraft Inspection and Decontamination Protocols and Standards" as one of its "Highest priority actions" needed. As a result, UMPS was developed and continues to fulfill this identified high priority.

Many WID programs in the western United States have adopted and implemented the protocols and standards recommended in earlier versions of UMPS (Zook and Phillips, 2009 & 2012). As a result, there are many similarities between WID programs currently being implemented in the western United States. However, variations in programs still exist due to local conditions, budgetary restrictions and differing regulations. Refer to Figure 1 for an overview of Watercraft Inspection and Decontamination Programs currently implemented in the western United States.

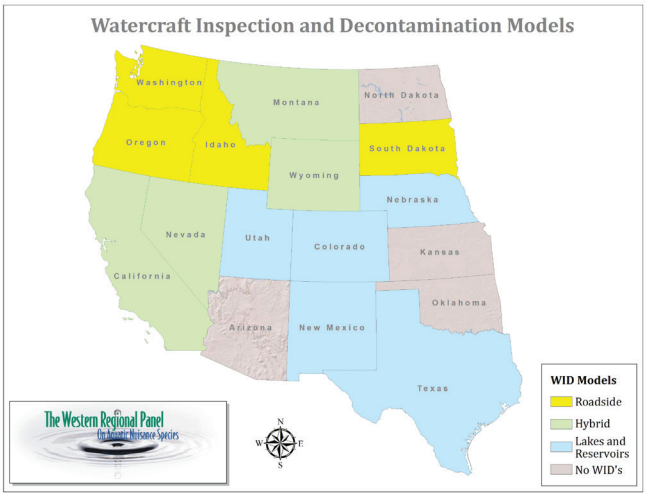


Figure 1. Watercraft Inspection and Decontamination Program Models in the Western United States

Achieving a greater level of consistency in protocols and standards employed by WID programs across the western United States benefits water and resource managers and the boating public in a number of important ways, including:

- Increased effectiveness by ensuring that all programs utilize the best practical science and technology currently available to protect aquatic resources.
- Establishing a high level of quality and confidence in the effectiveness of programs and trust in the programs implemented by others.
- Reducing the amount of staff time and funding required of all programs by avoiding unnecessary duplication of effort while increasing effectiveness and public acceptance.
- Making it easier for the boating public to understand, anticipate and comply with watercraft inspection and prevention programs.

Not every agency or organization currently has the resources or authority to implement all of the protocols and standards identified here. In those cases where capacity is lacking, steps may be taken to obtain the regulatory authority and resources

necessary to implement a robust program. Model legislative provisions (Otts and Nanjappa, 2014) have been developed through a process of consensus building among Western resource managers, legal professionals and law enforcement leaders via the WRP Building Consensus Committee. These model provisions can serve as a helpful tool in creating or modifying watercraft inspection and decontamination programs.

Economic Rationale

Since the discovery of dreissenid mussels in the Great Lakes in 1988, their economic impact has resulted in billions of dollars spent on control measures for power producers, municipal water suppliers, agricultural producers and other water users. The economic impact of quagga mussels since the 2007 Lake Mead discovery has also been significant. The U.S. Bureau of Reclamation at its Lower Colorado projects (Hoover, Parker and Davis Dams) spends approximately $1 million annually on quagga mussel control (Willett, U.S. Bureau of Reclamation, personal communication). The Metropolitan Water District of Southern California spent over $40 million between 2008 and 2014 for quagga mussel prevention related operations, maintenance and capital costs in the Colorado River Aqueduct and associated facilities (De Leon, Metropolitan Water District of Southern California, personal communication).

Establishing and implementing a comprehensive dreissenid mussel prevention program also comes at a considerable cost. State, federal, tribal and local agencies and organizations in the western United States spend tens of thousands to millions per jurisdiction annually on WID programs. These prevention programs may also include investments for risk assessment, education and outreach, early detection monitoring and response planning. WID is the highest cost item within these programs.

As dreissenid populations expand in the West, this will result in mitigation costs that far exceed the estimated costs required to implement the prevention efforts outlined in QZAP. Assessments by the Independent Economic Analysis Board (IEAB) (2010 & 2013) concluded that even if dreissenid mussels were to eventually become established in Western waters, there is great value in delaying establishment. The annual cost saving for each year of delay would be substantial. Any delay would allow important scientific advances to occur which may help prevent an introduction, contain an introduction or eradicate a newly established population. In contrast, dreissenid mitigation costs would far exceed the cost of implementing a comprehensive prevention program as envisioned by QZAP.

Finally, while WID programs are an important public outreach and education tool in their own right, all agencies and organizations are encouraged to use other outreach strategies to engage sectors of the public in preventing the spread of AIS and what role they can play in those prevention efforts. A WID program by itself is not sufficient to gain public involvement, support and cooperation. Public outreach and education should be the cornerstone of all state, federal and local AIS prevention programs.

WATERCRAFT INSPECTION AND DECONTAMINATION TRAINING

In 2004, the PSMFC developed the Watercraft Inspection Training Program (WIT) with funding from the USFWS 100th Meridian Initiative and Bonneville Power Administration. It was originally designed as a 90 minute training to enlist the voluntary help of boating law enforcement officers in the western United States to educate boaters and inspect high-risk watercraft during normal boater safety duties. The WIT program now includes three levels of training. Each level of training is designed to provide the necessary tools for watercraft inspection program staff to provide consistent information.

When quagga mussels were discovered at Lake Mead in January of 2007, the WIT program underwent major reconfiguration. The program was expanded to a minimum of 8 hours of training (now called Level One WIT) with a hands-on component, and the target audience changed from boating law enforcement officials to state, federal, tribal and local water, land and wildlife resource management agencies and organizations. The WIT program offered an immediate opportunity for agencies and organizations to train their staff on the dreissenid mussel issue and included prevention strategies and watercraft inspection protocols and standards. The Level One WIT course offered by the PSMFC is highly recommended for anyone who will be directly involved in watercraft inspection.

In 2008, a Level Two WIT program was developed. Level Two WIT training is an intensive two-day training for 10-12 individuals typically held at Lake Mead, Nevada. This training, developed by PSMFC contractors, Wen Baldwin and Bill Zook, is designed for people who will be responsible for developing or managing WID programs for their agency, tribe or organization. The current training, now conducted by PSMFC contractor Quagga D LLC, focuses on hands-on inspection and decontamination of watercraft and equipment that is infested with live quagga mussels. To date over 50 Level Two classes have been conducted training over 600 agency attendees representing over one hundred agencies from nearly every Western state and Canadian province. Trainings have also been attended by commercial boat haulers, boat mechanics, marina operators, boat sellers and others with a professional interest in boat inspection. The advanced training of Level Two should be taken by

at least one agency or organization representative, engaged in or planning to become engaged in watercraft inspection. The Level Two training provides the knowledge, tools and resources necessary to become a supervisor or an in-house trainer for Level One for their respective agency or organization.

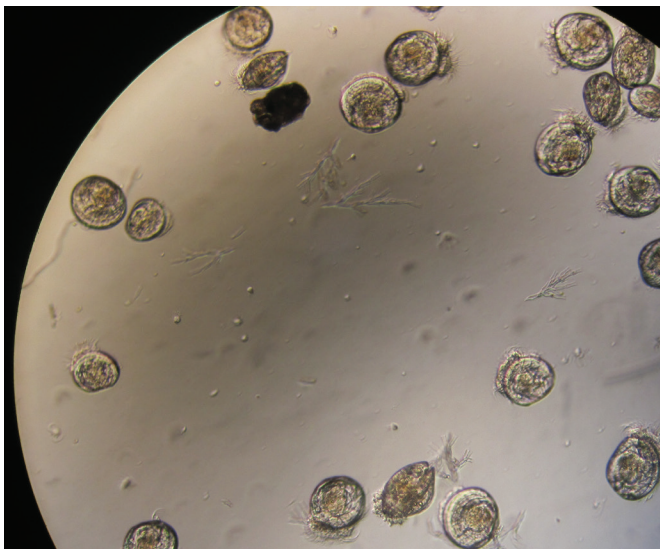
In 2015, a Level Three Trainer Training program was created to train Level Two individuals to train others to conduct inspections and decontaminations for AIS. Level Three is based on the *Trainer Manual for Aquatic Invasive Species Inspection and Decontamination Courses* (Brown, 2015) which was adapted from the Colorado WID Trainers Manual.

Since the original publication in 2009, UMPS has provided the current scientific information and minimum standards as a guideline for new or ongoing WID programs. The *Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species* (Brown, 2015) incorporates the scientific information and minimum standards to provide step-by-step procedures for the inspection and decontamination to reduce the risk of introduction of aquatic invasive species (AIS). The *Trainer Manual for Aquatic Invasive Species Inspection and Decontamination Courses* (Brown, 2015) provides consistent guidance to AIS trainers who are responsible for the certification of individuals to perform watercraft inspection and decontamination. UMPS, the student curriculum and the training manual together provide the necessary components to implement a WID program.

THE SCIENCE OF DECONTAMINATION

Research on Decontamination Efficacy

The published scientific research related to decontamination has focused on the efficacy of methods to achieve mortality of dreissenid mussels or other invasive species (Table 1). Further, the research provided here informs the UMPS recommendation to utilize lethal temperatures of water as the preferred decontamination method, as well as appropriate drying time. There continues to be a need for scientific exploration of the use of hot water for a variety of situations and equipment.



Dreissenid veligers

Specifications for Decontamination Units

In order to properly perform decontaminations, the equipment must meet a suite of specifications; the following provide basic needs that a decontamination unit must have. Additional information on guidelines and purchasing appropriate decontamination units are included (Appendix B and C). The following are specifications for units used to perform decontaminations:

- Operating temperature recommendations are 120°F internal or 140°F engines/external at the point of contact to achieve effective decontamination. Note: Units are capable of a maximum burner temperature of 211°F degrees; operating temperatures must be constantly checked to ensure proper performance at the above specifications.
- Minimum 5 gallons/minute
- 3000 - 3500 pounds per square inch
- Proper attachment tools, including 40° tips

Alternative Technologies

There is no shortage of alternative technologies and methods that have been explored to kill dreissenid mussels. These alternatives may be both physical and chemical. By and large, the application of chemicals or other alternatives are not recommended for use in WID programs. Chemicals do kill mussels, but their use poses additional risks to the boats, boat owners and the environment. The use of physical alternatives has been limited primarily due to practicality. There are some circumstances where chemical or physical alternatives may have appropriate applications, (e.g. wildland firefighting equipment, field gear, etc.), but their use among watercraft owners is discouraged. The key difference between the WID programs and other situations that use chemicals (e.g. agency fish transfer) is the resident time available for treatment. For example, fish stocking trucks effectively use chemicals for dreissenids and other AIS, but have unlimited time available for treatment. Within WID programs, chemicals also have liability, warranty, disposal, permitting and correct use as per label aspects that must be considered. Finally, if alternative decontamination technologies are pursued as part of a WID program, additional research is recommended before widespread use.

Table 1. Published research on the mortality and decontamination efficacy of dreissenid mussel and other AIS.

Date	Authors	Title and Publication	Results	Summary
1995	Riccairdi A, R Serrouya and FG Whoriskey.	Aerial exposure tolerance of zebra and quagga mussels (Bivalvia: Dreissenidae): implications for overland dispersal. *Canadian Journal of Fisheries and Aquatic Sciences.*	This study found that survivorship of mussels in air significantly increased with increasing relative humidity, decreasing temperature and increasing adult mussel size.	Out of water, large mussels may survive 5 days in typical temperate summer conditions (20°C, 50% relative humidity); and 10-15 days in cool conditions (10°C, 95% relative humidity)
1995	Ussery TA and RF McMahon.	Comparative Study of the Desiccation Resistance of Zebra Mussels (*Dreissena polymorpha*) and Quagga Mussels (*Dreissena bugensis*). Center for Biological Macrofouling Research, University of Texas at Arlington.	A direct result of this research was the development of a conversion table to determine the drying time required to kill all on-board mussels when exposed to air. The "Drying Time Calculator" determines how long watercraft and equipment must be out of the water (dried) in order to completely desiccate and render harmless all attached dreissenid mussels. The calculator can be found at http://www.100thmeridian.org/emersion.asp.	Drying time to effectively kill mussels will vary based on geographic location, season and air temperature.
2009	Morse JT.	Assessing the effects of application time and temperature on the efficacy of hot-water sprays to mitigate fouling by *Dreissena polymorpha* (zebra mussels Pallas). *Biofouling.*	This was the first published study to look at the efficacy of hot water sprays to mitigate dreissenid fouling. Morse found that zebra mussels required a 10 second spray time with 140°F water to achieve 100% mortality. Morse noted that "it is of interest that quagga mussels (*D. rostriformis bugensis*) are reported to have thinner shells and less tightly sealing shell valves than zebra mussels which may make them more susceptible to hot water sprays. However, this supposition requires experimental confirmation."	100% mortality of zebra mussel adults can be achieved with 10 second spray time of 140°F water.
2011	Comeau SR et al.	Susceptibility of quagga mussels (*Dreissena rostriformis bugensis*) to hot-water sprays as a mean of watercraft decontamination. *Biofouling.*	This study examined the efficacy of hot water sprays to decontaminate boats fouled with quagga mussels. Comeau et al. recommended a spray temperature of 140°F for 5 seconds to mitigate fouling by quagga mussels.	100% mortality of quagga mussel adults can be achieved with 5 second spray time at 140°F.
2011	Bayer J et al.	Acute Upper Thermal Limits of Three Aquatic Invasive Invertebrates: Hot Water Treatment to Prevent Upstream Transport of Invasive Species. *Environmental Management.*	Bayer et al. found that for *D. polymorpha*, *D. r. bugensis* and *Bythotrephes* 100% mortality was achieved with exposure to 110°F hot water for 5 minutes.	100% mortality of adults dreissenid mussel can be achieved with 5 minutes exposure of 110°F water

2012	Jerde CL et al.	Eurasian watermilfoil fitness loss and invasion potential following desiccation during simulated overland transport. *Aquatic Invasions.*	This study examined survival rates following desiccation. Jerde et al. found that plant fragments that experienced desiccation for more than 24 hours had little risk of surviving.	Milfoil fragments showed decreased survival probability as the plant becomes desiccated under average summer conditions.
2013	Choi WJ et al.	Estimating survival rates of quagga mussel (*Dreissena rostriformis bugensis*) veliger larvae under summer and autumn temperature regimes in residual water of trailered watercraft at Lake Mead, USA. *Management of Biological Invasions.*	This study examined veliger survival following exposure to seasonal air temperatures. Choi et al. found that veligers could survive up to 5 days of summer temperature conditions and up to 27 days of autumn temperature conditions at Lake Mead.	Veligers experience 100% mortality after 5 days under summer conditions and 27 days under autumn conditions.
2014	Snider JP et al.	Assessment of quagga mussel (*Dreissena bugensis*) veliger survival under thermal, temporal and emersion conditions simulating overland transport. *California Fish and Game.*	This study examined veliger survival under simulated conditions found on recreational watercraft and equipment and using small amounts of water.	There is a risk of transporting live immersed quagga veligers in small droplets of water when air temperatures up to 77°F for at least 7 days.
2015	Anderson LG et al.	Invaders in hot water: a simple decontamination method to prevent the accidental spread of aquatic invasive non-native species. *Biological Invasions.*	This study examined the efficacy of killing a range of invasive species with hot water as well as drying. 113°F water for 15 minutes caused 99% mortality among species tested (e.g. zebra mussels, parrot's feather and signal crayfish).	99% mortality across 7 AIS was achieved with 113°F within 1 hour of submerged treatment.
2015	Comeau S et al.	Boat decontamination with hot water spray: Field validation. *Biology and Management of Invasive Quagga and Zebra Mussels in the Western United States.*	This study examined the water temperature and exposure time needed for mortality of quagga mussels and further examined specific boat areas for the time needed to reach lethal levels.	Seasonal validation of live well, bait well and gimbals were conducted to determine the lethal time and temperature for quagga mussels.

PROGRAMMATIC GUIDELINES FOR WATERCRAFT INSPECTION AND DECONTAMINATION

It is the responsibility of the managing agency to determine the level of acceptable risk and which type of watercraft inspection program most closely reflects the mission, values and capacity of their agency or organization. Many agencies and organizations do not have the capacity to implement a comprehensive watercraft and equipment inspection program. Funding, authority, and policies all play a role in determining the establishment of a watercraft inspection program and how extensive that program will be. Carefully crafted outreach (e.g. "Clean, Drain and Dry") that engages boaters in preventing the spread of invasive species is a critical component of all watercraft inspection programs.

The two most common approaches to implementing a WID station are at geographic borders (or roadsides) and at waterbodies (lakes or reservoirs). Border (roadside) inspection stations are typically used to prevent AIS from entering a defined geographic area. These programs use a series of inspection stations placed at entries to an area and all watercraft passing the station are required to stop for an inspection. Stations at waterbodies utilize a WID station placed at the access point to a waterbody and can further function in a prevention or containment scenario. An inspection program used for prevention would primarily conduct watercraft inspection prior to launch to prevent potentially high-risk boats from entering the water. A program used for containment would primarily conduct watercraft inspection for watercraft exiting a waterbody known to have established dreissenids or other AIS. In some cases, WID stations at waterbodies perform inspections both entering and exiting.

Another important dynamic for WID program development are voluntary versus mandatory aspects. Depending on the legal authorities of the managing agency there may be considerable variation in programs. Voluntary and mandatory requirements can range from the ability to stop a vehicle to quarantine of that vehicle.

A helpful tool for an agency that manages multiple waterbodies that is interested in implementing a waterbody WID program is to conduct

risk assessments on waterbodies and use that information to direct those limited resources to waters with the highest risk for and impact from mussel introduction and establishment. The examination of several features of a waterbody should help determine if that waterbody is at a particular risk for dreissenid establishment (e.g. Whittier et al., 2008, Wells et al., 2010, Prescott and Claudi, 2012). The following may be considered in a waterbody risk assessment:

- water quality parameters that support the survival, growth and reproduction of dreissenid mussels (e.g. calcium, pH, salinity, conductivity, food supply, water temperatures)
- amount, origin, and type of watercraft
- proximity to dreissenid positive or suspect waters
- the waterbody is a headwater, municipal water, power supply system or agricultural use

- supports species listed under the Endangered Species Act
- other waterbody parameters and uses (access, recreational uses, etc.)

Program Levels

WID programs across the Western states will vary due to a range of factors. Three program levels have been identified here to characterize inspection activities found across the West. However, on the ground, a continuum of details within Western programs is found. Program levels defined in this document are intended to be recommendations of best management practices in an ideal world. Variations of actual implementation are understood to be based on authority, resources and needs. To provide the best line of defense in protecting resources from the threat of invasive species, a comprehensive watercraft program that utilizes decontamination, quarantine, or exclusion is highly recommended.

Self-inspection and screening for high-risk watercraft programs are options for local jurisdictions when the capacity to implement more aggressive and effective programs is lacking. These programs, however, do not provide the level of security required for any type of cross-jurisdictional acceptance because they do not offer any assurance that watercraft and/or equipment was actually inspected by an individual.

Self-Inspection: The self-inspection program is a relatively low cost program for low-risk waters or on higher risk waters where organization or physical capacity prevents a more aggressive approach. This type of program involves providing an inspection form which can be made available at an entry station, kiosk or online with instructions for the watercraft or equipment operator to complete questions and inspect all areas of watercraft, trailers and equipment. The form is then placed in the transport vehicle where it can be easily seen. If the program is mandatory, spot checks by enforcement personnel can be used to reinforce compliance.

A continuum of inspection and decontamination programs exists on the ground. WID programs are a reflection of authority, resources and needs for each jurisdiction.

Self-inspection programs, whether voluntary or mandatory, offer a limited level of protection because compliance and effectiveness are not guaranteed. However, self-inspection programs can be an effective boater education tool, provide some level of protection for waters where implemented, and are cost-effective. If a higher level of protection is not available because of insufficient funding, physical site limitations, lack of intervention authority or the sheer volume of waters needing coverage, this type of program may be considered as a minimal inspection tool or "off-hours" adjunct to a more comprehensive program.

Self-inspection programs have limited effectiveness because they rely on self compliance and contaminated watercraft can still be launched by unknowing or irresponsible boaters. Self-inspection programs can be implemented relatively inexpensively for individual waterbodies. Including staff time for verifying and/or enforcing compliance, can add to both effectiveness and cost. Enforcement actions aimed at ensuring compliance are a necessary tool to let the public know that agencies are serious about compliance. Mandatory programs work best if the authority to enforce provisions of the program (e.g., authority to require that all watercraft operators complete and post self-certification form) is in place. In the absence of that authority, a voluntary program may be implemented.

Self-Inspection Program Example: Utah Division of Wildlife Resources utilizes self-inspection at secondary risk waters in the state.

Screening for high-risk watercraft and equipment: This program includes a screening interview at a staffed entry-point to a waterbody to identify high-risk watercraft and/or equipment followed by a brief inspection to verify interview information of all watercraft. It maintains boating access for the majority of low-risk watercraft. All watercraft that are not clean, drained and dry or those reported coming from dreissenid mussels waters within the last 30 days (unless watercraft has been decontaminated and has accompanying paperwork) are excluded from accessing that waterway. This program is recommended for priority waterways where budget or other considerations prevent the implementation of a comprehensive program.

This type of program can often be incorporated into an existing entry station operation that is set-up to collect access fees, confirm reservations or provide use information and regulations. Current entry station staff can be trained to conduct screening interviews and verifying inspections, and the number of watercraft excluded would normally be expected to be low on waters where this type of program would be implemented. Because a rigorous inspection is not required and decontamination or quarantine facilities are not used, this is a relatively low cost protection option. If existing screening facilities and staff are available, the cost for such a program can be nominal. However, if those assets are not already in place, the cost can be considerably higher as there will be infrastructure and staffing needs.

Screening for High-risk Watercraft and Equipment Program Example: Lake County California, Invasive Mussel Prevention Program.

Comprehensive: A comprehensive program is recommended for providing the highest level of protection for natural resources. In general, a comprehensive program is one that can inspect, decontaminate and either quarantine or deny access to watercraft. A comprehensive program should include: screening interviews at the point of entry; a comprehensive watercraft or equipment inspection of all watercraft/equipment; the decontamination and/or quarantine or exclusion of watercraft and watercraft certification. When possible, inclusion of quality assurance is recommended. Only comprehensive programs offer any opportunity for cross-jurisdictional reciprocity.

This type of program may require construction or modification of entry facilities, traffic patterns, parking lots or boat ramps, purchase of a hot water pressure wash and wastewater containment system, inspectors and decontamination operators, providing a safe and secure quarantine facility, a good working relationship with law enforcement authorities, and adequate laws and regulations.

Comprehensive programs (Appendix A) are implemented across the West by federal, state, local and tribal agencies and organizations, and are operated at either waterbodies or on highway roadsides. Costs will vary depending on the size of waterbody, the number of access points, type of equipment and facilities used, and hours of operation. Comprehensive programs cost between tens of thousands to millions depending on the geographic scope.

The authority to stop, inspect, decontaminate, quarantine and exclude watercraft or equipment varies between jurisdictions. Further there may be legal reporting requirements when encountering a mussel fouled watercraft. It is critical to understand your legal authority and exercise it according to the law with regard to search and seizure.

RECOMMENDED UNIFORM MINIMUM PROTOCOLS AND STANDARDS FOR WATERCRAFT INSPECTION AND DECONTAMINATION PROGRAMS:

These protocols and standards reflect the best currently available science, technology and understanding. However, watercraft inspection and decontamination is a rapidly evolving field and new information may affect these protocols and standards in the future. For in-depth coverage of step by step procedures for inspection and decontamination, refer to Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species (Brown, 2015). The term "Uniform Minimum Protocols and Standards" implies that all states, agencies and organizations should strive to adopt the information in this document as an integral component of their WID program.

Self-Inspection

Self-inspection is implemented at a waterbody and can require voluntary or mandatory participation from the watercraft operator. This program provides an inspection form (Figure 2) that is made available at an entry station, kiosk or online with instructions for the watercraft/equipment operator to complete questions and inspect all areas of watercraft, trailers and equipment. The form is then placed in the transport vehicle where it can be easily seen. This program provides education to boat operators on AIS and boat inspection processes.

Protocols:

1. Provide a self-inspection form at the point of entry, kiosk, dedicated check-in area, or online and clear directions on how the boater can inspect their watercraft following the checklist.

You must complete and sign this form before launching your boat

In the past 30 days, has your boat been used in any of the areas affected by zebra and quagga mussels listed below?

- **Utah:** Electric Lake, Lake Powell, Red Fleet Reservoir and Sand Hollow Reservoir
- **Colorado, California, Nevada, New Mexico or Arizona**
- **Waters in states east of Montana, Wyoming, Colorado and New Mexico**
- **Canada:** Waters in the provinces of Ontario and Quebec
- **Mexico**
- **Other:** Waters established by the Wildlife Board in rule R657-60 and published on the DWR website at *wildlife.utah.gov/rules*.

If you answered No to the above question, then simply sign this form, put the bottom portion in your launch vehicle and launch your boat!

If you answered Yes to any part of the question, you must decontaminate your boat using one of the methods below:

A Self-decontamination process
See the front of this form for details.

B Professional decontamination **Seal #** _____
See the front of this form for help locating the nearest professional decontamination unit.

Decontamination agency _____ Agent signature _____ Date _____

Please take our online survey about your experience with the Aquatic Invasive Species program at ***Wildlife.Utah.Gov/MusselSurvey***

Keep the top portion in your boat.

Keep the bottom portion in launch vehicle, with the signature side facing up on your dashboard.

Certificate of decontamination

I have not used my boat in any waters listed at the top of this form, or I have decontaminated my boat and trailer as outlined at the bottom of this form.

Boater signature _____ Date _____ *(not valid unless signed and dated)*

Certifying false information on this form is unlawful (per Utah Administrative Rule R657-60).

Figure 2. The Utah Division of Wildlife self-inspection form.

2. Require (with required authority) or request (without required authority) that the form be completed, signed, and posted in clear view on the dash of watercraft/equipment transport vehicle prior to launching.

3. Failure to complete and display a required form can be a punishable crime.

Standards:

Before launching, boat operator must confirm that the following conditions have been met by signing and displaying a completed self-inspection form.

1. Watercraft, trailer, and equipment have

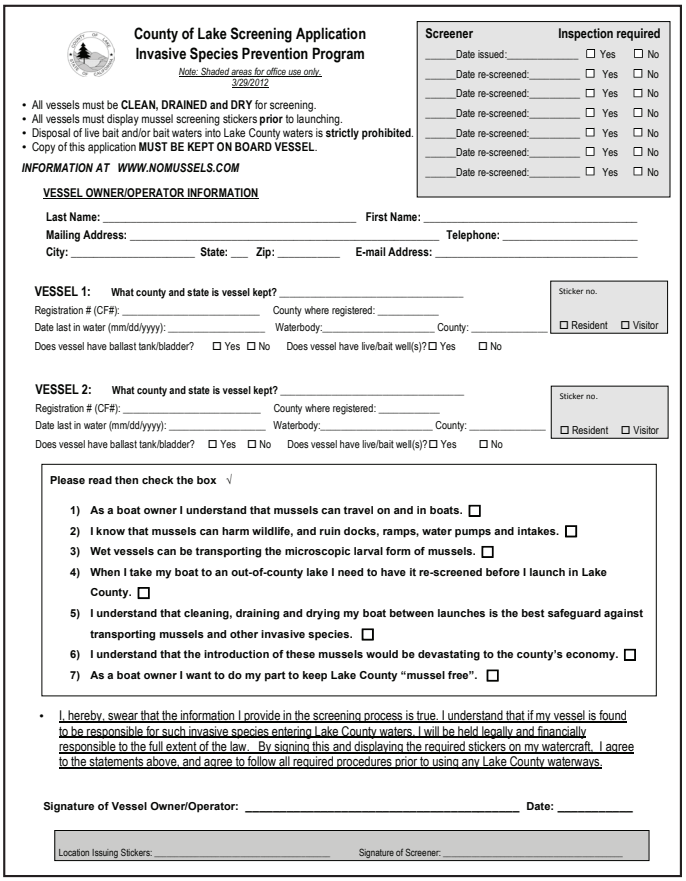
not been in any water known or suspected of having quagga/zebra mussels or other AIS in the past 30 days. Consider adding a checklist of those waterbodies of most concern in your area so boaters can indicate if they have been in any of those specific waters.

2. Watercraft, trailer and equipment are cleaned, and to the extent practical, drained and dried.

3. Watercraft, trailer and equipment have been visually inspected by the operator at the site prior to launching.

Screening for High-Risk Watercraft

This program utilizes a screening interview which involves collecting information from the boat operator through a standard set of questions prior to launching or entry at a waterbody. These questions are designed to determine the level of risk posed by that watercraft based on its recent history of use (Figure 3). The screening interview should not rely completely on the responses given. The person conducting the interview should make sure that the responses given match the physical evidence available, which may require a brief confirmation inspection. This program provides education to boat operators on AIS and boat inspection processes.



County of Lake Screening Application
Invasive Species Prevention Program
Note: Shaded areas for office use only.
3/29/2012

Screener	Inspection required
_____Date issued:_____	☐ Yes ☐ No
_____Date re-screened:_____	☐ Yes ☐ No
_____Date re-screened:_____	☐ Yes ☐ No
_____Date re-screened:_____	☐ Yes ☐ No
_____Date re-screened:_____	☐ Yes ☐ No
_____Date re-screened:_____	☐ Yes ☐ No
_____Date re-screened:_____	☐ Yes ☐ No

- All vessels must be **CLEAN, DRAINED and DRY** for screening.
- All vessels must display mussel screening stickers **prior** to launching.
- Disposal of live bait and/or bait waters into Lake County waters is **strictly prohibited**.
- Copy of this application **MUST BE KEPT ON BOARD VESSEL**.

INFORMATION AT WWW.NOMUSSELS.COM

VESSEL OWNER/OPERATOR INFORMATION

Last Name: _____ **First Name:** _____
Mailing Address: _____ **Telephone:** _____
City: _____ **State:** ___ **Zip:** _____ **E-mail Address:** _____

VESSEL 1: **What county and state is vessel kept?** _____
Registration # (CF#): _____ County where registered: _____
Date last in water (mm/dd/yyyy): _____ Waterbody:_____ County: _____
Does vessel have ballast tank/bladder? ☐ Yes ☐ No Does vessel have live/bait well(s)? ☐ Yes ☐ No
Sticker no. ☐ Resident ☐ Visitor

VESSEL 2: **What county and state is vessel kept?** _____
Registration # (CF#): _____ County where registered: _____
Date last in water (mm/dd/yyyy): _____ Waterbody:_____ County: _____
Does vessel have ballast tank/bladder? ☐ Yes ☐ No Does vessel have live/bait well(s)? ☐ Yes ☐ No
Sticker no. ☐ Resident ☐ Visitor

Please read then check the box √

1) **As a boat owner I understand that mussels can travel on and in boats.** ☐
2) **I know that mussels can harm wildlife, and ruin docks, ramps, water pumps and intakes.** ☐
3) **Wet vessels can be transporting the microscopic larval form of mussels.** ☐
4) **When I take my boat to an out-of-county lake I need to have it re-screened before I launch in Lake County.** ☐
5) **I understand that cleaning, draining and drying my boat between launches is the best safeguard against transporting mussels and other invasive species.** ☐
6) **I understand that the introduction of these mussels would be devastating to the county's economy.** ☐
7) **As a boat owner I want to do my part to keep Lake County "mussel free".** ☐

- I, hereby, swear that the information I provide in the screening process is true. I understand that if my vessel is found to be responsible for such invasive species entering Lake County waters, I will be held legally and financially responsible to the full extent of the law. By signing this and displaying the required stickers on my watercraft, I agree to the statements above, and agree to follow all required procedures prior to using any Lake County waterways.

Signature of Vessel Owner/Operator: _____ **Date:** _____

Location Issuing Stickers: _____ Signature of Screener: _____

Figure 3. Lake County, California, screening for high risk form.

Protocols:

1. Develop and use a standard screening interview form that, at a minimum, includes the following questions:

   - The home state or postal code where the watercraft or equipment is registered
   - The specific waterbody where the watercraft or equipment was last used (and if possible a 30 day history)
   - The date of the last use
   - If the watercraft/equipment has been cleaned, drained and dried

2. Verify the responses by checking the license plate or registration (boat ID) number and do a brief visual inspection for mussels, mud, plants or water.

3. Clarify any inconsistencies between the responses given and the physical evidence before clearing the watercraft or equipment for launch or continued travel.

4. Utilize the screening interview as an educational opportunity.

Standards:

1. Watercraft that have been used in any dreissenid mussel infested, positive or

suspect waterbody in the past 30 days or are not clean, drained and dry should be subject to a thorough inspection by a trained professional before being allowed to launch, or excluded if inspection or decontamination is not possible.

2. If there is reasonable suspicion of deception on the part of the owner/operator/transporter during the screening interview, the vessel should be subject to a thorough inspection before being permitted to launch.

Comprehensive Watercraft, Trailer and Equipment Inspection

This level of program requires a multi-step process to evaluate the boat for risk by inspection using both a screening interview and a physical and visual inspection, and may include, if appropriate, decontamination, quarantine or exclusion. Watercraft or equipment that were last used in infested, positive or suspect dreissenid mussel areas within the past 30 days and have not been decontaminated or been out of the water for the required time (determined by the Drying Time Calculator) should be:

1. Decontaminated and/or;
2. Placed in quarantine for the required time frame per the Drying Time Calculator; or
3. Excluded

Watercraft that are not clean (attached vegetation, debris or surface deposits that can mask the presence of small mussels), drained (having visible water in any live well, bait well, bilge area, floor, cooler or unverifiable water in a ballast tank or engine compartment) and dry (not been out of the water long enough for attached mussels to desiccate) should be decontaminated and/or quarantined, or excluded. The authority to stop, inspect, decontaminate and/or quarantine watercraft or equipment varies between jurisdictions. Make sure you understand your authority and exercise it according to the law with regard to search and seizure. For detailed information on training agenda, teaching materials and registration for inspection training events are available at www.westernais.org under the training tab.

Inspection: Inspecting watercraft, trailer and equipment for the presence or likelihood of dreissenid mussels is perhaps the most important and difficult element of a successful inspection program. Conducting an effective inspection requires some knowledge of dreissenid mussel identification, life history and biology; a good understanding of the working parts of a wide range of watercraft types

State of Colorado
WATERCRAFT INSPECTION AND DECONTAMINATION ACTIVITY LOG

Location: _____

*See first line for example.

Initial Assessment			Registrations				Seals	Determine Risk Factors (2 or more = High Risk Inspection, ✓ = Yes)					Live Bait	Ballast	Protocols (✓ = Yes)			Procedures (✓ = Yes)						Results (✓ = Yes)				
Date	Inspector's Number	Start Time	In or Out	Boat Type	Boat Registration (CL Number)	Trailer License Plate Number	Seal Removed or Applied (Seal Code)	Seal Order (Front Or Rear)	First Port Within the Last 30 Days	Boat in Positive Water in the Last 30 Days	Dirty/Muddy Ballast	Complete Boat	Standing Water on Trailer	Live Bait Present	Number of Ballast Tanks	Exterior Inspection	High Risk Inspection	Exit Inspection	Mud, Trailer, Exterior Fish & Checklist	Engine & Motor, Drain Plug & Checklist	Anchor & Equipment Checklist	Drain & Check Interior Compartments	Standing Water Decontaminated	Bait Decontaminated	Bait Freshwater or Decontaminated	Plant Decontaminated	Bait Freshwater or Decontaminated
*6/24/15	3198	1:42 PM	I	P	CL 1108 SB	CO E929774				✓		✓	✓				✓		✓	✓	✓	✓	✓				
TOTALS:																											

Distribution: White—Statewide Invasive Species Coordinator Colorado Parks & Wildlife Yellow—Inspection Location

2/2015 – 5,000 15-EB1-13-222/18994-15

Figure 4. State of Colorado comprehensive inspection and decontamination form.

and equipment (See Special Considerations below); and the cooperation of the boat/equipment operator. In addition, watercraft and equipment inspection needs to be systematic and thorough.

Protocols:

1. Use and follow an inspection checklist. The inspection checklist should include, at a minimum, the following information (Figure 4):

   - The home state or postal code where the watercraft or equipment is registered
   - The vessel ID number
   - The specific waterbody where the watercraft or equipment was last used
   - The date of the last use
   - If the watercraft/equipment has been cleaned, drained and dried
   - A checklist of areas to be inspected

2. A checklist of areas to be inspected should include all of the following:

   - Exterior Surfaces (at and below the waterline): Hull, transducer, speed indicator, through-hull fittings, trim tabs, water intakes, zincs, centerboard box and keel (sailboats), pontoons (pontoon boats) and foot-wells (personal watercraft)
   - Propulsion System: Lower unit, cavitation plate, cooling system intake, prop and prop shaft, bolt heads, gimbal area, engine housing, jet intake, paddles and oars
   - Interior Areas: Bait and live wells, storage areas, splash wells, under floorboards, bilge areas, water lines, ballast tanks, and drain plug
   - Equipment: Anchor, anchor and mooring lines, Personal Flotation Devices, swim platform, wetsuits and dive gear, inflatables, down-riggers and planing boards, water skis, wake boards and ropes, ice chests, fishing gear, bait buckets and stringers, and bumpers

- Trailer: Rollers and bunks, light brackets, cross-members, hollow frame members, license plate bracket, springs and fenders

3. Inspect all high-risk watercraft. At this point if a watercraft has standing water, or is suspected or found to be fouled, a variety of responses are possible: decontamination, quarantine, and/or exclusion. All include extensive communication among affected jurisdiction managers. Use a systematic and repeatable plan when conducting inspections to ensure consistent and complete coverage of every area of the watercraft.

4. If dreissenid mussels are found anywhere on the watercraft or equipment, the inspection should continue to document all occurrence of AIS on the entire watercraft, trailer and equipment. Then the watercraft will need to be decontaminated or quarantined (preferably both) before being allowed to launch or leave. If needed, contact management or appropriate agency to report the interception.

5. Use the inspection process as an opportunity to educate the boat operator on the importance of practicing of Clean, Drain, and Dry. Demonstrate the proper way to conduct a watercraft inspection.

Standards:

1. If attached mussels or standing water (verifiable or unverifiable) are found on a high-risk vessel, it should not be allowed to launch without first being decontaminated or subject to the appropriate quarantine based on the Drying Time Calculator or both.

2. If verifiable standing water is found on exposed areas of an otherwise low-risk and clean watercraft, the watercraft should be thoroughly wiped dry first and allowed to launch.

3. If no mussels or standing water are found following a thorough inspection of the watercraft that is considered high risk because it has been in known mussel waters within the last 30 days, but has been out of the water long enough to be considered safe by applying the Drying Time Calculator, it should be allowed to launch, except for watercraft that have unverifiable water in ballast tanks, engines, or other difficult to access and completely drained raw water storage areas. Normal drying time standards do not apply when areas that cannot be visually inspected and completely drained are present. These areas need to be decontaminated to kill any mussels or veligers that may be present.

4. Any watercraft or piece of equipment with attached vegetation (including algae growth) should not be allowed to launch without their complete removal, or plant decontamination if necessary, and reinspection.

5. Any watercraft with enough dirt, calcium or bio-fouling build-up which makes inspection for small attached mussels or other AIS difficult should be required to be cleaned and reinspected before being allowed to launch.

Table 2. Quagga mussel mortality (%) under different treatments at day 10.* Treatments of four control groups and eight exposure duration groups for each of the seven temperatures were tested. Adapted from Comeau et al., 2011.[1]

Temp (°F)	1 s (%)	2 s (%)	5 s (%)	10 s (%)	20 s (%)	40 s (%)	80 s (%)	160 s (%)
68	4	4	6	0	0	2	2	0
104	2	2	8	12	94	**100**	**100**	**100**
122	10	22	36	82	**100**	**100**	**100**	**100**
129	54	72	98	**100**	**100**	**100**	**100**	**100**
140	72	92	**100**	**100**	**100**	**100**	**100**	**100**
158	88	98	**100**	**100**	**100**	**100**	**100**	**100**
176	86	98	**100**	**100**	**100**	**100**	**100**	**100**

[1] Susceptibility of quagga mussels (*Dreissena rostriformis bugensis*) to hot-water sprays as a means of watercraft decontamination. Comeau et al., 2011. Biofouling. Reprinted by permission of Taylor & Francis Ltd, www.tandfonline.com

*Note the above table reflects research on the mortality of quagga mussels. This scientific information has informed the current protocols and standards found within this document and are a reflection of a maxiumum time and temperature that will achieve mortality of quagga and zebra mussels. Zebra mussels have thicker shells and consequently require more exposure time.

Decontamination: Following inspection, if a watercraft is confirmed or suspected to have mussels on board, three options are available: 1) decontamination, 2) quarantine to allow sufficient drying or 3) exclusion. Hot water decontamination using a pressure washing unit is currently the only scientifically validated method that kills and removes mussels. Coupling hot water spray with a recommended period of drying (using the 100th Meridian Initiative Drying Time Calculator) is the most effective means to assure that all mussels are killed, and to the extent practical, all visible mussels are removed. The objective of decontamination is to KILL all mussels and to the extent practical REMOVE all visible mussels. Killing prevents establishment of new populations resulting from watercraft/equipment transfer, but removing dead mussels is also important. It may be possible that dead mussels could influence monitoring results by affecting environmental DNA (eDNA) or polymerase chain reaction (PCR) samples from waterbody monitoring efforts (i.e. resulting in a false positive). Furthermore, determining the viability of attached mussels in the field within the context of a watercraft inspection or decontamination can be problematic. Therefore, mussels on watercraft or equipment that appear dead do not necessarily indicate that those mussels are in fact dead.

The best current technology available for watercraft and equipment decontamination is hot water pressure washing (Table 2). The exclusive use of hot water (140°F or 120°F *at the point of contact*) and pressure washing or flushing equipment with various attachments to kill and remove any possible mussels and kill all veligers from every area of the watercraft, engine, trailer and equipment is recommended.

Protocols:

1. Find a location to conduct the decontamination that is away from the waterbodies and where the run-off and solids from the decontamination process can be contained and will not re-enter any waterbody. Compliance with all state and federal discharge regulations is advised. If possible, wastewater and solids as a result of the decontamination process should be totally contained and directed to an appropriate waste treatment or dis-

posal facility.

2. Consider requesting a liability waiver signature from the watercraft operator as a condition of the decontamination. Most operators typically agree to sign a liability waiver when the option is quarantine or exclusion. Agencies should consult with their legal staff on liability issues.

Note: Temperature and Duration
Scientific studies have determined lethal temperature and exposure time for a variety of AIS. There may be temperatures and times capable of effectively killing that are lower than those recommended here for some AIS. However, the temperatures and times recommended here were determined to increase the success of killing AIS during the decontamination process for the most resilient species or when species are unknown. For any decrease in lethal temperature, protocols must be amended with an increased exposure time.

3. Once decontamination process and alternatives have been explained and before beginning a decontamination procedure, permission from the vessel operator should be granted.

Standards:

1. Use a plastic scraper, brushes and gloves to remove attached mussels before applying hot water spray to significantly reduce the time required to complete the watercraft decontamination.

Note: Decontamination Safety Advisory
Extreme caution should always be used when working in and around watercraft and equipment, specifically when working with high pressure equipment, hot water and vehicles.

2. Monitor water temperature at the nozzle and at the point of contact to be sure that equipment is operating as required before initiating decontamination. Water loses approximately 10-15°F degrees per foot of distance when sprayed from a power nozzle, so initial temperature should be increased to account for this heat loss to the point of contact. Always use a thermometer or temperature logger to verify and maintain proper water temperatures at the point of contact.

3. Use 140°F water at the point of contact to kill mussels and veligers on the exterior (hull, engine and trailer) and 120°F on the interior (compartments) (Table 3).

4. When using a hot water pressure washer or flushing attachment to kill and remove attached mussels from the surface of watercraft/equipment, allow 10 seconds

Table 3. A summary of scientific research indicating the lethal water temperature at point of contact and duration for decontamination. Information is grouped by the location of the boat that is targeted and the life form of dreissenid mussel targeted (e.g. adult mussel or veliger). Please refer to the *Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species* for complete step by step procedures.

	Boat Part/Location	Water Temperature	Duration*	Type of application	Target Life Stage
Exterior	Hull	140°F	10 seconds	High pressure spray[1]	Adult
	Trailer	140°F	70 seconds	Low pressure spray[2]	Adult
	PFDs, anchor, paddle	140°F	10 seconds	Low pressure spray	Adult or Veliger
Propulsion System	Gimbal	140°F	132 seconds	Low pressure spray	Adult
	Engine	140°F[4]	See Note	Flush	Veliger
Interior	Ballast tanks	120°F[4]	130 seconds	Low risk – Flush[3]	Veliger
				High risk– Fill and flush	
	Live well/Bait well	120°F	130 seconds	Low pressure spray or flush	Veliger
	Bilge	120°F	130 seconds	Flush or low pressure spray	Veliger

*the times listed are the minimum times necessary to achieve mortality
[1] High pressure = 3000 psi
[2] Low pressure = Using the pressure from the decontamination unit with no nozzle, essentially a garden hose flow
[3] Flush = Adding water to a compartment of a boat and forcing the water out
[4]These temperatures denote the exit temperature (i.e. temperature of water exiting the boat not exiting wand or flush attachment).
Note: Engine flushing relies on the exit temperature as a guideline for decontamination duration, see page 26.

to elapse from the leading edge of the spray to the tailing edge when moving the wand across the surface to maintain sufficient "lethal" contact time. If larger mussels are present, it may require more time to remove them from the surface than to kill them.

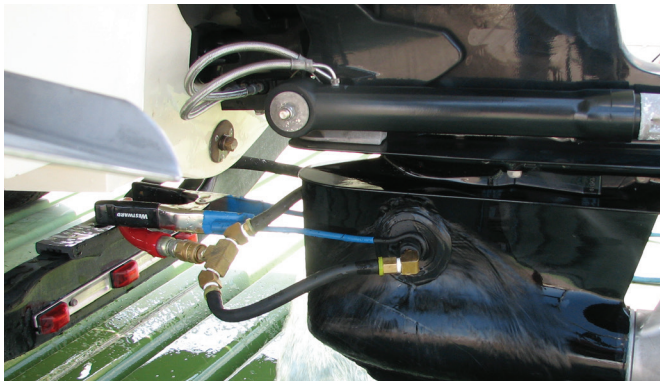
5. Use a power wash unit with 40 degree spray nozzle attachment to remove attached visible mussels from all exposed surfaces of the watercraft, piece of equipment, trailer and engine.

6. Use a flushing attachment to rinse all hard to reach areas and those areas where pressure may damage the watercraft or equipment (such as the rubber-boot in the gimbal area). A brush may also be used in conjunction with flushing to remove more mussels from hard to access areas.

Note: Power Wash Specifications
A power wash unit that can spray 5 gallons/minute with 3000 psi nozzle pressure are the recommended specifications. The 5 gallon/minute provides an adequate rate for cooling most watercraft engines. 3000 psi strikes a balance in effectively removing encrusted mussels and minimizing human hazards. Larger engines may require more gallons/minute to ensure a safe and effective flush. Specifications can be found in Appendix B.

7. When flushing hard to reach and sensitive areas, maintain a contact time of 130 seconds to assure that mussels receiving only indirect contact are killed since it may not be possible to remove them from these areas.

8. First drain and then use a flushing attachment and 120°F water to maintain contact time of 130 seconds to flush the live well, bait well, wet storage compartments, bilge areas, to kill any mussels and veligers that might be present. [Note: alternatively live/bait well, bilge areas can be filled with 120°F water and held for 130 seconds, and then drained. If the fill method is used, care must be taken in the bilge area to not flood the engine or reach the float valve which will expel water from the discharge port.]



9. To kill mussels in the engine cooling system, use appropriate attachment (e.g. fake-a-lake) connected to the pressure wash unit or other hot water source. Start the engine and make sure adequate water flow is provided to engine cooling system. Run ambient temperature water to allow the engine to warm up, and watch temperature gauge to ensure proper cooling is taking place. Engine manufacturers have preliminary recommendations that inlet water temperature is to be no greater than 140°F. Run the engine until exit temperature reaches 140°F to avoid possible damage to watercraft internal systems. Please refer to Special Considerations below for further information on engine cooling systems.

10. Some ballast system manufactures have indicated that their pumps or other electrical system components are designed for temperatures of no more than 120°F. For that reason, it is recommended to use a 3-4 foot hose extension from the end of the flushing attachment to the attachment to the system or component of the watercraft. The extension allows the water temperature to cool by an additional 15 to 20°F. To achieve 100% mortality, it is important to pump water into the area until the exiting water reaches a temperature of 120°F and for a minimum of 130 seconds. The water temperatures both entering and exiting the vessel need to have continual monitoring, not to exceed 120°F. [Note: ballast tank decontamination can be time consuming; it is recommended that this be undertaken at the beginning of the decontamination process].

11. Use a garden hose or diffuser attachment to treat personal flotation devices, anchor and lines, paddles, oars, water toys, boat fenders and other equipment that has been in the water by using low pressure 140°F water (or spraying if it will not damage the equipment) to kill any veligers or mussel present . Remember that equipment fouled with settled mussels will require more time to decontaminate.

12. All accessible surfaces of a trailer should be sprayed with 140°F water. Since trailers are normally out of the water, juvenile and adult mussel are not normally attached to any surfaces. However, mussels can be scraped off of watercraft and equipment during loading and become lodged on the trailer and should be removed with hot water spray. Be sure to drain and flush all hollow frame members. When carpeted bunks are present, do not use high pressure and flush for at least 70 seconds with 140°F water using a slow flush along the bunk that will allow the capillary action to pull enough hot water through the carpet to kill any veligers present. Any dislodged adult or juvenile mussels landing on the bunks will be killed by crushing action, so the boat does not need to be removed to access this area.

Note: Nozzle Head Configuration
Be sure to use a nozzle head that directs the water in a fan-like rather than a pinpoint spray. The shape of the spray as determined by the nozzle head used should be 2-3 inches wide and 8 inches out from the head to avoid any paint damage and allow a wider spray area of greater lethal contact time. Use a 40 degree flat fan spray nozzle and a 12-inch standoff to get the maximum coverage and to prevent damage to the vessel.

Note: Live Baitfish
If the use of live baitfish is permitted in your jurisdiction and they are found during inspection, remove the bait, place in a holding bucket, drain and flush the live bait container with 120°F water and then return the bait to the clean container. While this process does not assure that mussel veligers or even small settlers are not present on or in the fish, it is the best minimum standard for dealing with this situation. If the live or bait well uses a pump, make sure to check the owner's manual for maximum temperature to avoid damaging equipment.

WARNING: WATERCRAFT/ENGINE DAMAGE CAN OCCUR IF DECONTAMINATION PROTOCOLS ARE NOT CAREFULLY FOLLOWED. The most likely place where the decontamination process may cause damage to a watercraft or marine engine are during the cooling system flush where it is critical that engines are run at idle for a maximum of 130 seconds and that the engine flushing mount ("ear muffs") or "fake-a-lake" attachments are properly and securely sealed. **It is recommended to treat water in the pump areas with lower temperatures and longer exposure.** In the ballast tank flush it is critical that water temperature be reduced to avoid damage to the pumps. Please refer to the *Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species* (Brown, 2015) for step by step procedures.

Quarantine or Drying Time: The use of quarantine or drying time can be used for a variety of situations. In its simplest form, drying is a technique for desiccating dreissenids or other invasive species to decrease their viability. Quarantine/drying is likely the most effective way to assure that live mussels are not transported between waterbodies on trailered watercraft or equipment (Morse 2009). The two primary situations where drying is utilized are 1) following watercraft decontamination of an infested conveyance, and 2) when decontamination is not possible.

The 100th Meridian Initiative's Drying Time Calculator is the recommended tool for determining the appropriate quarantine time. The Drying Time Calculator determines the length of quarantine or drying time needed to assure that a watercraft or piece of equipment is safe to launch (except when ballast tanks or other inaccessible raw water storage systems are involved). The amount of time required to achieve complete desiccation varies depending on temperature, relative humidity and size of the mussels, and can range from 1-30 days (McMahon, University of Texas at Arlington, personal communication). Further, the drying time may be less effective in some geographic locations with widely varying temperature or humidity compared to more uniform weather locations. Therefore, current conditions should be considered when utilizing the calculator.

In the case of a decontamination process, the manual application of hot water decontamination is not always 100% effective in removing all mussels from hidden areas found on some types of watercraft and/or equipment. Further, the survivability of attached mussels in some areas of watercraft is difficult to determine visually. Therefore, it is **recommended all watercraft and equipment with attached mussels are subject to a drying period sufficient to achieve complete desiccation after inspection, mechanical removal and hot water decontamination.** Further, drying time will not apply in the same way to watercraft with ballast tanks or other water storage areas that are not easily accessed for inspection or cannot be completely drained. If these areas maintain water, then the actual time required to achieve 100% mortality either through desiccation or anoxia will most likely exceed the drying time standards recommended (Choi et al., 2013).

If watercraft and/or equipment suspected of carrying quagga or zebra mussels cannot be decontaminated for any reason, then the watercraft must be held out of water for an appropriate period of time necessary to desiccate and kill all mussels and veligers on-board. This is often referred to as quarantine. Quarantine can be voluntary or mandatory in that a boater may have to leave their watercraft in dry storage on site, or may be required to keep it out of the water at home. The legal act of seizing the watercraft is considered impound and must be performed by law enforcement personnel. Both quarantine and impound have significant implications for liability and logistics. Program managers should fully explore legal and logistic options before conducting quarantine or impound operations.

The major concern with quarantine/drying alone is that it does not remove attached mussels.

If mussels remain on the vessel, they will eventually drop off. If that occurs at a boat ramp or beach, the presence of mussel shells can raise concern of a new infestation (either by someone finding a shell or via eDNA monitoring of the waterbody), triggering alarm and resulting in expensive and unnecessary action. In many states the possession of dead AIS is prohibited in addition to live AIS. For those reasons, it is recommended that all visible mussels be removed from quarantined/dried watercraft before they are allowed to launch.

Protocols:

1. Requiring quarantine or drying time should be applied to all watercraft following full decontamination on watercraft with adult mussels attached. It is also recommended in lieu of, or in addition to, decontamination for watercraft that have operated on or in any suspect, positive or infested waterbody in the last 30 days.

2. Implementation can take several forms:

    - Physical quarantine of a watercraft or piece of equipment requires providing a safe and secure holding area where it can be parked for the amount of time required to desiccate all mussels. A few agencies/organizations have used this option to take or over-see possession of suspect watercraft (with or without the owner's permission, depending on individual jurisdiction authority) until they remain out of the water long enough to be considered safe. Establishing and maintaining a dedicated quarantine facility can be expensive and comes with some potential liability issues.
    - When a quarantine facility is not available, then quarantine/drying time can be achieved by sealing (secured connection between watercraft and trailer) the watercraft or piece of equipment to the trailer or other means of transport. The operator is advised or required not to launch until the date indicated on the seal and/or an accompanying receipt.
    - The final option is simply to require that all high-risk watercraft serve a predetermined drying/waiting period prior to launch, or after exiting an infested, positive or suspect water (duration determined by risk level and current temperature and humidity conditions). Under this scenario, all high-risk watercraft are prohibited from launching in a new water until the required drying time has passed, as determined by the inspection.

3. All visible mussels should be removed from watercraft or equipment following quarantine or drying period before being allowed to launch.

Note: "Hidden" Mussels

The standard is to remove all visible mussels; however, it may not be possible to remove all attached mussels from every area of the watercraft/equipment. A day or two following decontamination, it is not unusual for mussels to appear as byssal threads begin to decompose. If properly treated, these mussels are dead and in the process of decay. In addition there are some areas of a watercraft or piece of equipment that cannot be easily accessed to remove dead mussels. Brushes may be used in conjunction with flushing in some of these areas to increase the effectiveness of mussel removal.

Standards:

1. To determine the appropriate drying time refer to the Drying Time Calculator

2. Watercraft with ballast or other internal

water storage tanks that cannot be completely drained should be treated differently with regard to drying time. NOTE: Because of the difficulties of removing residual water of ballast tanks, it is recommended to utilize decontamination with hot water. If hot water decontamination is not possible an extended drying time will be required to kill veligers. Research suggests that veligers can survive 27 days in residual water of compartments (Choi et al., 2013). Variation in ballast tanks drainage capabilities will influence the length of time required to dry.

Watercraft/Equipment Exclusion: High-risk watercraft that is not decontaminated and/or quarantined should be excluded and not allowed to launch. Exclusion can be the result of vessel operator refusal to submit to an inspection, lack of available equipment or trained applicators, traffic or facilities.

Exclusion will vary based on state regulation or local authority. The use of exclusion should not be a long-term substitute for development of a more user-friendly and proactive inspection program that recognizes the value of recreational boating to the economy and the legitimate interests and enjoyment of the boating public.

The case for using exclusion as a prevention strategy has diminished as agencies and organizations have been able to develop public policy, establish regulations, budget for equipment and manpower, train staff and purchase equipment needed for more proactive and considerate approaches.

Protocols:

1. Watercraft and equipment that have not been or cannot be inspected, decontaminated or meet the quarantine/drying time standard are excluded from launching.

2. The information obtained from the screening interview used to determine risk level should be shared with the watercraft owner/operator and made available on a real-time basis at all access points to prevent excluded watercraft/equipment from attempting to launch from any other point of access on the same waterbody.

Standards:

1. Watercraft or equipment that were last used in infested, positive or suspect dreissenid mussel areas within the past 30 days and have not been decontaminated and/or been out of the water for the required time (determined by the Drying Time Calculator) should be:

   - decontaminated if appropriate facilities are available or
   - placed in quarantine for the required time frame or
   - excluded

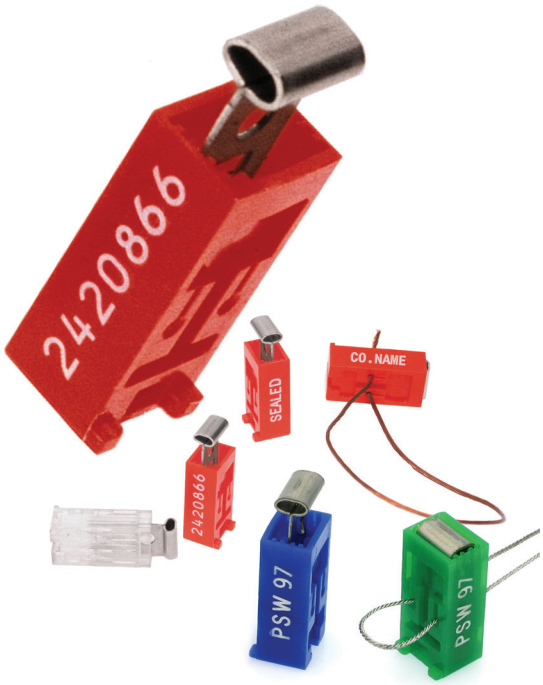
2. Watercraft that are not clean (attached vegetation, debris or surface deposits that can mask the presence of small mussels), drained (having visible water in any live well, bait well, bilge area, engine compartment, floor or cooler) and dry (not been out of the water long enough for attached mussels to desiccate) should be decontaminated and/or quarantined or excluded.

Watercraft Sealing and Certification: Many boating and water management agencies and organizations currently utilize some form of certification for watercraft or equipment that can signify inspection, decontamination or quarantine/drying time requirements (Appendix D). Certification of this type helps the operator avoid repeated time delays upon re-entry and makes it easier for the jurisdiction implementing the WID program by reducing work load, processing time and focusing limited resources on higher risk watercraft.

Some entities currently offer a sticker or paper certification. These paper certifications can convey the date and location of previous inspections, and often include additional AIS educational information. However, since there is no way to determine where that watercraft or equipment has been between inspections, this form of certification has its limitations. Many agencies and organizations apply seals that connect the watercraft/equipment to the trailer so that it cannot be used between inspections without detection. A seal serves as a form of communication between or among managers. There can be different scenarios in which a seal is utilized but it often signifies some level of inspection or decontamination that has already been done to the watercraft. In many cases, a written receipt is also issued with the watercraft seal.

If agencies and organizations choose to offer certification, it is recommended that the watercraft and/or equipment be sealed in such a manner that it cannot be launched between inspections without detection. If sealing is coordinated between jurisdictions, further management action can be expedited (at the discretion of the implementing agency/organization) at the next launch or inspection site anywhere in the western United States so long as the seal remains intact. Such a system would reduce the amount of staff and equipment time required at inspection facilities region-wide, thereby increasing resource protection, saving money, and increase positive boater relations. For example, currently Colorado Parks and Wildlife and New Mexico Game and Fish practice a level of reciprocity between their WID programs.

Seals and certification paperwork can serve a variety of purposes and offer a form of communication both within jurisdiction agencies and between differing jurisdiction agencies. The information that is generated when a seal is applied should be archived for further internal use. For the purposes of reciprocity between jurisdictions, the below protocols and standards are suggested.



3. Specific information can either be incorporated into the seal or provided on an accompanying paper receipt or certificate. While a variety of different seal styles and materials may continue to be used, all seals should have the following features:

    - The name of the agency/organization applying the tag and the geographic location where it is being applied.
    - Some way to indicate the basis for certification as one of the following three categories; type of inspection, decontamination or quarantine (several options are available including color coding or pre-printed number or letter coding (See Appendix D).
    - In the absence of an automated tracking system, the sealing date should be indicated on the tag or on the accompanying paper receipt.

Protocols:

In an effort to implement a region-wide program that may be acceptable to most agencies and organizations in the western United States, the following conditions are recommended:

1. The agency/organization applying the seal and receipt should follow the Uniform Minimum Protocols and Standards at a minimum to insure that the best practical science and technology has been employed in inspecting and/or decontaminating the watercraft or equipment.

2. All agencies and organizations participating in the certification program should use a seal system that attaches the watercraft to the trailer which cannot be tampered with or removed without detection. The certification is no longer valid if the seal has been tampered with, severed or removed.

Standards:

1. Only watercraft or equipment that have passed an inspection or have been decontaminated or quarantined by trained personnel in accordance with the Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species (Brown, 2015) or appropriate equivalent should receive a watercraft seal.

2. Certification sealing should only be applied by a trained inspector.

3. Watercraft and equipment that have been certified and sealed by an agency or organization utilizing these Uniform Minimum Protocols and Standards <u>may</u> receive expedited processing at the discretion of the receiving agency/organization in other jurisdictions.

Special Inspection Considerations – Unique Boat Design and Function: There are a variety of boat designs and purposes which pose unique aspects to conducting inspections and decontamination. Several specific boats are highlighted here to provide examples of different aspects of boats that should be considered, however there are many other boats design features that could be considered in training and implementation of programs. The *Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species* (Brown, 2015) is a resource that examine all boat types and the special consideration that come with these boat types. Further training in boat specifics will be a critical component for WID staff to understand boats.

Pontoon boats: There are specific design aspects of pontoon boats that suggest they may be capable of retaining water in areas similar to ballast tanks. However not every portal of a pontoon boat has a functional drain. The flotation portion of the pontoon boat is designed to contain air and no water should enter this portion of the boat. They are equipped with manufacturer placed "drain plug" and they are not engineered to be removed on a frequent basis. The only reason for possible water inside the tube is a structural failure, loose or improperly sealed drain plug or a puncture. Annual inspection by boat manufacturer or mechanic of the tubes and drain plugs is recommended.

Fire boats: Specialized rescue and response-boats have additional water storage capacity for the function of boats to respond to fire situations. This water storage capacity may require decontamination between uses and waterbodies.

Wake boats: Wake boats are recreational boats that have additional design features to create a large wake. The additional design feature typically includes increased ballast areas. The ballast areas may require decontamination between uses and waterbodies.

Jet engines: During decontamination procedures, the water must be turned on after the watercraft is already running. Different flushing attachments are needed, as well as important additional decontamination steps, such as cleaning out two plastic cylinders called "clean outs" which retain water in addition to the jet engine.

Please refer to the *Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species* (Brown, 2015) for a thorough examination of all boat types and special considerations for a variety of boats that may be encountered.

RECOMMENDATIONS FOR OTHER TYPES OF WATERCRAFT

Commercial Watercraft and Equipment Haulers Recommendations

Large watercraft and equipment transported by commercial haulers represent a risk in the overland transport of dreissenid mussels and other aquatic invasive species. Watercraft and equipment that require a commercial hauler tend to be larger, more structurally and functionally complex and more likely to have been in the water for an extended period of time. Those factors elevate the level of risk for having attached mussels, mussel larvae or other invasive species on-board when these vessels are moved from contaminated to uncontaminated waterways.

The same watercraft inspection protocols and standards that apply to smaller watercraft should be used for large vessels and equipment that are commercially hauled. However, large watercraft that are typically commercially hauled generally require more time, effort and focus because of their large surface areas and complex raw water storage systems. Watercraft and equipment haulers should adhere to the above mentioned protocols and standards. It is recommended haulers contact the specific state agency based on the state the watercraft is destined to and adhere to all associated state laws. A summary of state laws can be accessed online.

Additional Resources: The Utah Division of Wildlife Resources offers a Commercial Haulers AIS Awareness Program online information and test.

The Idaho Department of Agriculture directly contacts commercial hauling companies alerting of the AIS issue and watercraft inspection requirements. A sample letter to commercial haulers can be used for reference (See Appendix E).

Seaplane Recommendations

For more than a decade water resource managers throughout North America have been concerned about seaplane activity as a pathway for the spread of aquatic vegetation, dreissenid mussels and other AIS. In 1998 the Great Lakes Panel of the national Aquatic Nuisance Species Task Force (ANSTF) developed "generic" voluntary guidelines for seaplanes that were adopted by the ANSTF as national guidelines in April of 1999. Those guidelines still serve as the national standard even though some local jurisdictions have recently expanded on them, and in a couple of cases, made them mandatory.

While the primary focus of most water resource managers has been and will continue to be on the potential threat of AIS via the overland transport of watercraft and equipment, the seaplane pathway has been receiving more attention recently as significant progress is being made with other types of more traditional watercraft and equipment inspection. As aquatic invasive species continue to spread throughout North America, individual jurisdictions with relatively high seaplane use are beginning to consider, and in some cases, implement, more aggressive regulation of this activity.

Note: Seaplanes
All seaplane pilots should be aware that some individual agencies or organizations responsible for establishing and/or administering access regulations on public and private waterways to protect water supply, ecosystem integrity and other valuable resources have already implemented more stringent and water specific requirements established by law or regulation that supersede these guidelines. Pilots are responsible for being aware of these rules before accessing those waterways.

Screening Interview Prior to Inspecting Seaplane:

According to the National Seaplane Pilots Association (SPA) there are an estimated 35,000 seaplane rated pilots and about 1,500 new seaplane ratings issued each year in the United States. The Federal Aviation Administration (FAA) does not distinguish between airplanes with floats, wheels or skis so the exact number of seaplanes operating in the United States is not known. The SPA estimates that there are between 5,000 and 10,000 seaplanes currently in use in the United States.

Protocols:

1. All seaplane pilots should view the seaplane inspection and cleaning video.

Standards:

1. Before entering the watercraft:
   a. Inspect and remove all aquatic plants or attached mussels, snails or other animals from all exterior surfaces of floats, wires, cables, transoms, spreader bars and rudders.
   b. To the extent practical pump, remove or otherwise treat all water from floats, wheel wells and any other compartments or areas of the aircraft that can contain or maintain raw water with 140°F water.
2. Before takeoff:
   a. Taxi clear of any aquatic plants.
   b. Re-inspect for any visual sign of aquatic vegetation.
   c. Raise and lower rudders several times or otherwise remove any aquatic vegetation.
   d. Make sure all floats remain dry internally during takeoff.
3. After takeoff:
   a. Raise and lower rudders several times to free any remaining aquatic vegetation while over the departing waterbody or over dry land.
   b. If aquatic plants persist and are still visible on floats, cables or rudders, return to the same waterbody and manually remove them.
4. Storage and mooring:
   a. Remove aircraft from the water whenever

practical to better facilitate self-inspection, drainage, removal, cleaning and drying.

b. Maintain floats and hulls to make sure they remain water tight; including sealing seams, replacing gaskets on inspection covers and repairing any cracks.

The use of chemicals to decontaminate seaplanes is not recommended nor endorsed.

Water-Based Equipment Recommendations

A variety of water-based equipment is routinely moved between waterways and presents the same risks as watercraft and seaplanes. Construction equipment used to build and repair bridges, dredge navigation channels and install docks and breakwaters can move mussels from contaminated to uncontaminated waterways if not decontaminated before moving between waters. Boat hoists and lifts are also a potential source of contamination.

Equipment used to sample fish populations, collect water samples, survey aquatic vegetation, stock fish and even to sample for dreissenid mussels can also be a pathway for mussels or other AIS to be moved between waters. All agencies and organizations engaged in these types of activity are encouraged to adopt internal policies and procedures for equipment inspection, decontamination and drying, especially when working in waterways known or suspected of harboring dreissenid mussels or other AIS.

There are a variety of resources that can be helpful in identifying and minimizing the spread of AIS as well as manual that target specific activities or equipment for decontamination. One strategy that identifies activities that may be a pathway for spread and subsequent ways to address a pathway is the use of Hazard Analysis and Critical Control Point (HACCP) plan development and implementation. Information specific to HACCP plans and AIS can be found at: http://www.fws.gov/fisheries/ANS/ANS-HACCP.html. Further, the Unites States Bureau of Reclamation has developed a decontamination manual for the handling and cleaning of equipment that can serve as a model for the development or adoption of internal equipment cleaning policies (DiVittorio et al., 2012). Finally, there are additional resources that have been developed for wild land firefighting equipment for inspection and decontamination. These additional resources include: Wyoming Aquatic Invasive Species Fire Equipment Inspection and Decontamination Manual (Manual); Interagency Fire Team Operational Guidelines (Manual); Interagency Fire Team Technical Guidelines (Manual).

GLOSSARY

Aquatic Invasive Species (AIS) – A non-indigenous plant, animal or microbe that causes ecological or economic harm. Note: Also often referred to as Aquatic Nuisance Species (ANS).

Certification – A process whereby watercraft/equipment are determined to present minimal risk based on inspection, decontamination or quarantine/drying time and receive some visible form of certification of that fact (e.g., trailer tag, seal, band, paper certificate, etc.). It is important to note that is not possible to certify watercraft as "free of mussels", only that the most currently available and effective protocols and standards have been applied to kill all mussels and to the greatest extent possible remove all visible mussels.

Clean – A watercraft, trailer or equipment that does not show visible AIS or attached vegetation, dirt, debris or surface deposits. This includes mussel shells or residue on the watercraft, trailer, outdrive or equipment that could mask the presence of attached mussels or other AIS.

Containment – To stop or attempt to stop AIS from spreading to other waterbodies.

Conveyance – Something that carries people or things from one place to another (e.g. watercraft, trailer, vehicle, etc.).

Decontamination – Hot water treatments with the intent to kill, destroy, and remove AIS to the extent technically and measurably possible.

Drain – To the extent practical, all water drained from any live-well, bait-well, storage compartment, bilge area, engine compartment, deck, ballast tank, water storage and delivery system, cooler or other water storage area on the watercraft, trailer, engine or equipment.

Dreissenid mussel – Dreissenids are the common term associated with the family Dreissenidae which are small freshwater mussels who attach themselves to hard surfaces using byssal threads. Two invasive dreissenid species of interest in North America are the quagga (Dreissena rostriformis bugensis) and the zebra mussel (Dreissena polymorpha).

Dry – No visible sign of standing water, or in the case of equipment, wetness on or in the watercraft, trailer, engine or equipment. Watercraft that has been out of the water long enough for attached mussels to desiccate.

Drying time – The amount of time out of the water required to assure that all AIS are killed through desiccation. This time requirement varies widely depending on temperature and humidity conditions.

Emersion – The process or state of emerging from or being out of water after being submerged.

Environmental DNA (eDNA) – DNA collected not directly from the tissue of an organism, as is normally done, but filtered from an environmental sample such as stream, lake or reservoir water.

Exclusion – Not allowing high-risk watercraft or equipment to be launched when it has not been or cannot be decontaminated or meet the quarantine/drying time standard. In extreme cases, exclusion can be applied to all watercraft at a waterbody.

Fouled watercraft – A watercraft known to be contaminated for infestation of AIS. Notifi-

cation of any fouled conveyance will occur among destinations or travel states.

High-risk Watercraft/Equipment – High-risk watercraft or equipment can include one or more of the following; i. watercraft or a piece of equipment that has operated on or in any suspect, positive or infested waterbody known or suspected of having AIS in the last 30 days; ii. watercraft or equipment that is not clean, drained and dry and to the extent practical; iii. watercraft that is complex (e.g. with a closed hull, inaccessible containers or compartments, ballast, inboard/outboard motor, inboard motor, etc.); or iv. watercraft that is undocumented, and does not have a seal or receipt; or v. the hauler is non-compliant, non-cooperative, and deceptive.

Inspection – A process to determine whether a watercraft or equipment presents an AIS risk by physically examining watercraft/equipment/conveyance per protocols supplied in this document.

Impound – A law enforcement action to seize a watercraft and hold it to ensure the drying time is met or decontamination procedures are performed.

Low-risk Watercraft/Equipment – Low-risk watercraft or equipment can include one or more of the following: i. watercraft coming from undetected or negative waterbody; ii. watercraft coming from a state with no known positive or infested waterbodies; iii. watercraft with a valid seal and receipt from an undetected or negative water; iv. watercraft that has been cleaned, drained and dried; v. watercraft that is simple (e.g. with an open hull, no compartments or easily accessible containers, a single outboard motor, etc.).

Prevention – To stop, or attempt to stop, the introduction of AIS.

Quarantine – The voluntary or mandatory act of securing a watercraft out of water for a required period of time.

Reciprocity – The acceptance of watercraft/equipment inspection and/or decontamination by multiple jurisdictions when equivalent protocols and standards are employed by similarly trained professionals.

Screening Interview/Risk Assessment – Asking the vessel operator a series of questions prior to launching or entry into a waterbody that are designed to determine the level of risk based on the history of use.

Seal – A tamper-proof device that locks the watercraft to the trailer. A seal is affixed to a conveyance indicates that the boat has not been launched since it was inspected, decontaminated, and/or quarantined. Seals are often accompanied by a valid seal receipt.

Self-Inspection (voluntary or mandatory) – An inspection conducted by a conveyance owner, operator, or transporter. A process in which an individual clean, drains and dries their own conveyance. Note: Self-inspection is not decontamination.

Unverifiable Water – Water that is found within compartments of boats that cannot be visually or physically inspected, such as in ballast tanks or engines.

Veliger – The free-floating larval form of a dreissenid mussel.

Verifiable Water – Water that is found within boat compartments that you can feel or visually inspect, such as in wells or bilges.

Waterbody Risk Assessment – The determination of waterbody risk is the prerogative of the responsible managing entity. Some of the factors that may be used to determine risk potential include: water quality parameters that support the survival, growth and reproduction of dreissenid mussels; the amount and type of boater use; proximity to dreissenid positive or suspect waters; waterbody is a headwater, water or power supply system or supports listed species. Assessments may include references to high-risk waterbody, secondary risk waterbody and low-risk waterbody.

Waterbody Status – The status of a waterbody based on monitoring and the presence/absence of AIS as defined below.

I. Status unknown – Waters that have not been monitored.
II. Undetected/Negative – Sampling/testing is ongoing and nothing has been detected, or nothing has been detected within the time frames for delisting.
III. Inconclusive – Waterbody has not met the minimum criteria for detection (i.e. two independent results from the same sample using scientifically accepted techniques).
IV. Suspect – Waterbody that has met the minimum criteria for detection.
V. Positive – Multiple (2 or more) subsequent sampling events that meet the minimum criteria for detection.
VI. Infested – A waterbody that has an established (recruiting or reproducing) population of AIS.

Watercraft Inspection and Decontamination Program (WID) – Any program which seeks to prevent the spread of dreissenid mussels and other AIS on watercraft and/or equipment by requiring that they be cleaned, and to the extent practical, drained and dried prior to launching or upon exiting.

Western States – The geographic reference including all the 19 states west of the 100th Meridian, including those bisected by the 100th Meridian.

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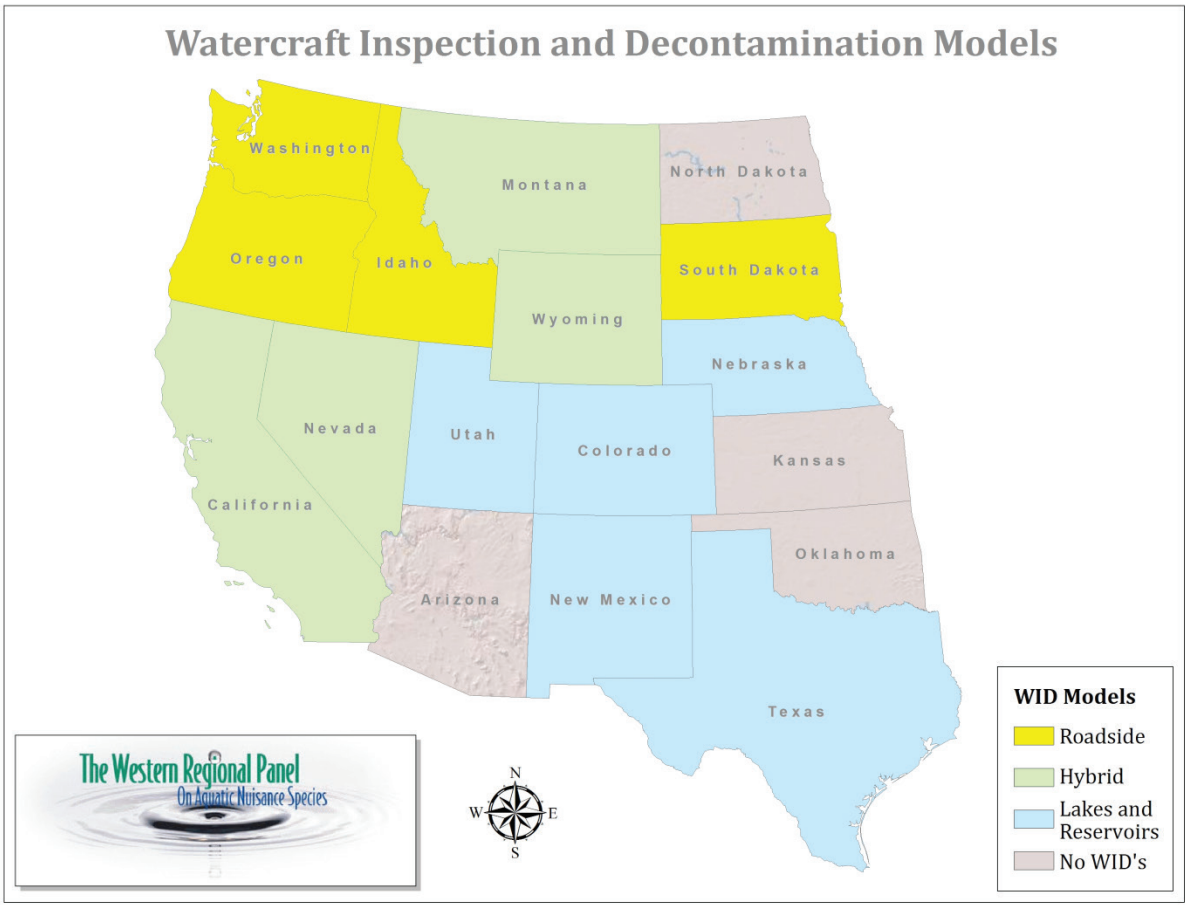
APPENDIX A

Watercraft Inspection and Decontamination Program Models in the Western United States



Roadside Watercraft Inspection Model – Roadside inspection refers to watercraft inspection conducted at a port of entry, major highway junction, management area or other geographically relevant choke point. The roadside inspection is typically used to prevent AIS from entering a defined geographic area.

Hybrid Watercraft Inspection Model – Hybrid refers to the use of both roadside inspection and lakes and reservoirs inspection within an inspection program.

Lakes and Reservoirs Watercraft Inspection Model – Lakes and Reservoirs refers to inspection stations conducted at a specific waterbody. Inspection can occur as watercraft is entering the water, exiting the water or both.

No WIDs – No formal organized inspection and decontamination program exists.

APPENDIX B

Specification Guidelines for Decontamination Units

When purchasing any type of specialty equipment it is important that you ask specific questions to the supplier prior to making the investment. Decontamination protocols have been long established stating the requirements for water flow, temperature and working pressures. It is essential that the equipment you choose fulfills all the requirements as stated in the UMPS. This will protect you and the public from any potential property damage due to bad or inappropriate equipment.

Ask your vendor who conducted the testing on their equipment to validate the performance statements. It is recommended to have a 3rd party validate equipment and understand who tested and if the testing was certified.

By using a 3rd party testing facility such as Pressure Washer Manufactures Association (PWMA) (http://www.pwma.org/docs/PWMA-101StandardFinal2010.pdf) you can be assured that the claims made for the unit's performance have been validated with no bias and documented.

There are many manufacturers that build equipment that state performance standards for their units, it recommended that you validate the stated standards to understand if the unit actually meets or exceeds the standards. The following denote the standards for decontamination units: including Underwriters Laboratories, Inc 1776, High pressure Cleaning Machines, 2002 or most recent; Canadian Standards Association C22.2 NO. 68-09 "Motor-operated appliances" and Society of Automotive Engineers International J1349: Surface Vehicle Standard. For more information on standards can be found at Cleaning Equipment Trade Association (CETA) website: http://www.ceta.org/Media/Default/PDF/CETA_CPC100_Performance.pdf. CETA's objective in publishing this standard is to provide a uniform method for testing and rating pressure washers. A performance-based standard focuses on desired characteristics of the final product.

When working with your specification writers to make your purchase it is suggested that the specification include: any training, maintenance agreements, spare service parts for two years, and a clause for a potentially large expense item replacement.

Example specifications sheets have been provided below.

These are the specifications that were used to receive bids for actual contract. They were based on a specific model that is referenced in the specifications but the unit does not need to be this specific make or model.

Example Specification 1

http://files.dnr.state.mn.us/jobs/watercraft/decontamination-specs.pdf

Decontamination unit specifications – Decontamination/Recovery System with Trailer

Scope of Project:

Self contained decontamination system that includes pressure washer, trailer with water tank(s), containment mat, underlayment pad (if applicable), vacuum recovery system, and decontamination attachments. The water recovery system is powered by a generator mounted on the trailer; no external power source required. Accessories and parts should be contained/stored within the trailer. Unit price must include all costs associated with the tanks, trailer and accessories. Vendors must be an authorized dealer or reseller(s) for the product requested. The state will reject any unit that is substandard in quality, workmanship, or craftsmanship.

New 400 Gallon Unit - Minimum Pressure Washer/Generator/ Tank (trailer mounted)

Make: LANDA Model: ECOS 7000 or agency approved alternate, if bidding alternate include all pertinent information.

Pressure: adjustable, with maximum pressure between 3000 and 3500 PSI

Flow: 4.5 GPM

Water supply tank size: 400 gallon (Preferred

with baffles or another system to reduce water movement.
Water supply tank: Seamless polyethylene with baffles
High-pressure hose length: 100 ft.
Hose Type: 3/8", 4000 psi, 250 degree rated
Spray gun operation: trigger
Wash Wand: Adjustable pressure (down to 1500 PSI)
Wash wands: (1) 48 inch
Burner fuel type: diesel
Output water temperature range: 100-210°F
Hose reels: 2 – the second hose reel is for the inlet fill reel for fresh water, with
100 ft. hose to fill tank
Generator: 2900 Watt, 115v
Generator Engine Fuel Type: gasoline
Generator Engine Fuel Capacity: 8 gal.
Generator Engine ignition: Electric
Generator Engine horsepower: 18
Generator Battery: 12V

Reclamation System Specifications – (pad listed separately)

Wash water reclamation system: Collect, filter, and reuse wash water; Vacuum pump that recovers 5 gmp, 120V/8.6 amp or equivalent) powered by on generator.

Vacuum hose - 2 inch diameter by 50 ft. Multi Stage Filter System: Filters down to a maximum nominal pore size: 5 micron

Trailer Standards

All products must be delivered to the DNR with MSO/Titles and inventory sheets, if applicable.
Trailer must meet or exceed all current Minnesota and Federal Motor Carrier Safety Regulations.
Tandem Axle - minimum 7,000 lb. capacity - or to pull trailer at full capacity with tank filled.
Maximum weight with equipment and filled tank must not exceed GVWR - It's important not to exceed the manufactures Axle ratings (GAWR)
What is the GVWR for this unit? If GVWR is greater than 5,000 lbs, appropriate couple required - 2 inch ball coupler with adjustable pintel hitch
Four 15 inch Steel Wheels (or appropriate for trailer size and weight)
Four ST205/75/R15 radial tires (or appropriate for trailer size and weight)
Type D style tires
Matching spare tire and wheel mounted on bracket
Adjustable drop leg tongue jack with footplate sized to accommodate weight and design of unit.
12 GA fenders capable of being a step
Safety chains with snap hooks appropriately rated for trailer and load.
7- Spade RV electrical connector (must be hard-wired, no adapters allowed)
All trailer lighting must be LED's and meet or exceed Federal, DOT and MN DOT requirements.
Trailers with a GVWR of 3,000 lbs or more require brakes on all wheels as well as break-away brakes.
If equipped with electric brakes must include battery
If equipped with surge brakes must include a reverse release lever/switch/pin
Conspicuity Tape
Trailer hubs must be equipped with stainless steel bearing buddies; EZ-lube, or an oil bath system. (Either system must include protective covers, if applicable);
MSO must be included with delivery. Failure to provide MSO/Titles and inventory sheet with O.E.M description and part numbers may result in refusal of delivery.
All equipment must be delivered with the line setting ticket or parts inventory sheet with the O.E.M. part numbers and descriptions and part number for every part used during the final build at the factory.

Trailer must be complete and ready to operate
Trailer should include an accessory storage areas (for wand, vacuum hoses, and other accessories) - Should be large enough to prevent damage to vacuum hose when coiled

Minimum Accessories to be included
Attachments for decontamination
Short hose 3 ft – connects handle to diffuser, muffs and fake-a-lake.
Diffuser – low pressure hose end fitting that connects to short hose.
Muffs – low pressure, used to apply water to engine intakes and connects to short hose. Two sizes, large and medium.
Fake-a-Lake – low pressure, connects to short hose, with extending (shortest length 1' to longest length 3')
Under trailer sprayer with coasters preferred

Containment Pad
Containment Pad, if bidding alternate include all pertinent information.
Durable Portable Wash water containment pad – Not to exceed 100 lbs by weight
Approximately 12 ft by 24 ft, with a 4-6 inch berm to hold water; Poly product with UV protection; Geo-textile ground protection pad (waterproof) - Not to exceed 100 lbs by weight; if it's a part of the containment pad the combined weight may not exceed 100 lbs by weight.
One Repair kit for each type of pad;
One year warranty on containment and Geo textile protection pads, parts, labor and all costs associated with the repair or replacement

Pricing for Additional Supplies and Accessories
Vacuum hoses: 50 Foot hose:
Short hose: 3 foot hose that connects handle to diffuser:
Diffuser: low pressure hose end fitting that connects to short hose
Filters: types necessary for system
Muffs: low pressure, used to apply water to engine intakes; heavy duty clamp with spacer for when stored
Large Muffs:
Medium Muffs:
Fake-a-Lake: low pressure, connects to short hose, with extending (shortest length 1' to longest length 3')
Under trailer sprayer with turbo nozzle and coasters or other glides preferred
List prices for additional related accessories not listed in this solicitation:

Warranty - Minimum of 1 year parts & labor warranty. All equipment and parts must be new, no refurbished equipments of parts. One year warranty for failure of equipment with normal wear and tear.
Training and Manual -The cost of the equipment must include training to the customer that includes, but is not limited to, equipment operating instructions, product demonstration (prior to award, if applicable) and safety instructions. All applicable parts, service, operator manuals (either Paper or CD format), to be included at no additional charge.

Additional Decontamination/Recovery System with Trailer
Vendor may bid smaller gallon size decontamination/recover systems (no less than 200 gallon), however they must meet minimum specifications. If bidding smaller gallon unit trailer must meet or exceed all current Minnesota and Federal Motor Carrier Safety Regulations.
Equipment Insurance Required

Example Specification 2:
SPECIFICATIONS for Decontamination Pressure Washer Units, Trailered or NON-Trailered
PRESSURE :3000psi
FLOW CAPACITY: 5.5+gpm

OUTLET TEMP: Adjustable thermostat up to 180°F (able to maintain 140°F for long periods to perform heat rise)
POWER/ENGINE: (High Elevation operation 10,000' with near freezing water supply) appropriate engine HP to produce temperature & pressure output, 25 amp charging system for burner and electric key start. (Optional enhancement is for pull start engine in addition to electric start)
ENGINE FUEL/CAP: Unleaded, 8 gal
CONTROLS/SWITCHES: Adjustable thermostat, lighted burner control switch, Hour Meter
PUMP: AR Pump or General Pump (Three Piston) warranty 5 years, bypass pump protection
POWER DRIVE: Belt Drive
PRESSURE CONTROL: Pressure regulating unloader
WATER SUPPLY: 5 gallon float reserve tank, with 3 way inlet valve (in from float tank, in from water tank or other source, out to pump)
PRESSURE HOSE: 3/8" x 100', 5000psi, swivel connection at trigger gun
GUN/WAND: Trigger gun with quick connect for attachments, 48" dual lance variable pressure with quick connect nozzles
NOZZLE: Size 5.5 (three at 40°)
BURNER COIL: ½" sch. 80 coil, 4 pancake, ceramic blanket insulation, emergency shut off, 5 year warranty.
BURNER/POWER: Beckett oil fired 12VDC, powerlight igniter, circuit breaker, auto ignition, inline water separator fuel filter
BURNER FUEL/CAP: Diesel, Kerosene, 8 gallons
FRAME CONSTRUCTION: Heavy gauge steel, powder coated frame, Stainless panels and coil wrap
WHEELS: required – pressure washer frame mounted on wheels – Non-Trailer
HANDLES: on frame to push the unit easily- Non Trailer
HOSE REEL: on frame to store the hose
DIMENSION: See attached diagram (48x42x21 max) - Non-Trailer
WEIGHT: not to exceed 500 lbs- Non Trailer
WATER SUPPLY: approximately 250+ gallon supply tank – Trailer
ATTACHMENTS: Trigger gun, diffuser, 48" dual lance variable pressure wand with (3) quick coupled nozzles

Trailer Specifications:
Aluminum storage box for equipment can be front, rear or side mounted, minimum size – 47"x12"x12"
3500# capacity, single axle with torsion or leaf spring suspension, fenders and 14" or 15" trailer wheels and radial tires
Bed size – 5' x 8' covered with either 1 ½ -inch planking or diamond tread plate steel deck, all metal surfaces painted
12" – 14" rail along outside of deck with back end open
2" ball hitch, tongue jack with caster, 14" or 15" spare tire with mount, hydraulic surge brake system
DOT approved wiring for hydraulic surge brake system to hitch & turn signals

Example Specification 3:
EFFECTIVE MOBILE WATERCRAFT DECONTAMINATION
System Requirements
AIS prevention programs are encouraged to employ only proven technologies for this critical application. The following provides a list of salient characteristics requirements that are vital to application satisfaction and for safe, effective and efficient decontamination performance.

Certifications & Approvals:

Equipment ETL Certification to UL1776 Standards
Manufacture conformance certification to ISO 9001

ENGINE, PUMP, GENERATOR CRITERIA:

Engine type, gasoline, minimum 18 horse power
Minimum eight (8) gallon onboard engine fuel capacity (C.A.R.B. compliant)
12-Volt electric engine starting and ignition system
Heavy duty spiral cell battery with engine driven 12-volt charging system
Engine driven 115 volt AC generator, load rated 1800 watts
Belt driven pump – lifetime warranty
Pump industrial triplex ceramic plunger design
Minimum backpressure of 3,000 pounds per square inch (psi)
Minimum flow of 5 gallons per minute (gpm)
Pump - high-pressure safety relief
Pump to have triple water source inlet feature
Pump to have winterization circulation system

ENCLOSURE: Engine, Pump, Generator, Battery, Controls

Base plate mounted enclosure
14-gauge housing with 18-gauge hinged lockable cover
Full lift cover with stay for maintenance access and safety
Panel mounted key switch and engine choke
Panel mounted digital gauge for discharge water temperature
Panel mounted burner toggle switch - on/off
Panel mounted toggle switch – PTM/Normal mode
Panel mounted pressure gauge
Panel mounted hour meter
Fresh air ducted ventilation
Centralized exhaust discharge with gas deflection
Enclosure mounted power receptacle - 115-volt AC

BURNER, COIL, HOUSING:

Horizontal fired, 12 volt diesel burner system, minimum of 400,000 BTU
Minimum 12 gallon onboard non-corrosive fuel oil tank
Forced air system, fuel solenoid controlled
On demand automatic burner ignition and On/Off switch
High temperature limit control
Burner Housing Full 16-gauge
Schedule 80 steel heating coil
Precision discharge water temperature control maximum +/- 2 degrees F.

Trailer & Frame System:

A-Frame 6-inch "C" Channel Steel, minimum 8.2-lbs/linear foot
Trailer Frame 4-inch, "C" Channel Steel, minimum 5.4-lbs/linear foot
Welds all full penetration at frame corners, fully gusseted
3,500-lb dual axles with extended leaf spring suspension
Electric brakes on both axles, DOT approved
Welded 7,000-lb wheeled jack
2-5/16 inch ball hitch, a-frame coupler
Trailer lighting DOT approved, 12 volt DC wiring system, with backup lights
15 inch trailer rated wheels/tires
Welded spare tire bracket and mounted 15 inch wheel/tire

Support Systems:

Complete trailer mounted system equipment mounted, wired and plumbed
2-Each, Twin, lockable, fully hinged, accessory storage boxes, min of 48"x18"x18"
Onboard potable water storage, round 225-gallon tank, recess frame mounted, energy dissipating
Onboard wastewater storage, round 225-gallon tank, recess frame mounted, energy dissipating
1-Each, high-pressure hose reel, lockable, for minimum 100' hose
100', 3/8" high-pressure, non marking hose
Wastewater Collection Hydromat

32-ounce UV resistant material
Dual use berm (fill air or water)
Folds to fit in storage cabinet
115-volt wastewater pump with 25' cord
25' hose, adapters, fitting for wastewater transfer to collection tank
Full port wastewater tank evacuation

Decontamination Wands, Triggers, & Attachments: Notes

Attachments must be constructed and fitted to withstand temperatures up to 200° F.
Attachments must include high temperature strain relief where applicable.
All fitting connections must be brass with stainless ear crimp hose clamps.
Variable pressure dual wand trigger assembly with safety SOQD upstream, 1/4" QD downstream
36" high-pressure, high temperature adapter hose - 1/4" QD up, 3/8" QD down
72" high-pressure, high temperature adapter hose - 1/4" QD up, 3/8" QD down
Purge flow diffuser assembly, low pressure with dispersion screen - 3/8" QD
Outdrive low pressure flush assembly, extended length, spring tensioned, dual flow cup - 3/8" QD
Thru hull low pressure, flush assembly with positioning extension - 3/8" QD
PWC high flow, low pressure purge fitting - 3/4" Female
PWC high flow, low pressure purge fitting - 3/4" Male
Gimbal purge fitting, brass, low pressure high flow device 45-degree
Gimbal purge fitting, brass, low pressure high flow device 90-degree
Undercarriage high-pressure steel turbo trigger wand with safety SOQD
SS Flood Adapter, steel, low pressure, 2" padded base - 3/8" QD
40-degree, flat fan spray, QD nozzle

APPENDIX C

Distributors and Manufacturers of Decontamination Units and Supplies

Western Regional Panel members have purchased many of these types of makes and models. The following list is not all-inclusive. *Note: Providing information in this document does not constitute an endorsement.*

Pressure Washer Distributors (alphabetical order):

Ben's Cleaner Sales, Inc.
2221 4th Avenue South,
Seattle, Washington 98134
877-922-4262
www.benscleaner.com

PSI (formerly Water Visions II Inc.)
7200 Garden Grove Blvd
Westminster, CA
800-766-1654
http://www.psiproducts.com/uploads/3/4/7/2/3472906/landa_mobile_wash_systems.pdf
http://www.psiproducts.com/index.html

Royce Industries
1355 West 8040 South, West Jordan, UT 84088
Phone: 702-633-6500 Cell: 702-591-8189
Boise / Cedar City / Denver / Las Vegas / Salt Lake City / Twin Falls
www.buyroyce.com calvinr@buyroyce.com

Pressure Washer Manufacturers:

Hotsy Cleaning Systems
240 Shearson Crescent, Unit 2,
Cambridge, Ontario, Canada N1T 1J6
Toll Free 1-800-265-7146
Direct 519-740-1331
www.hotsyontario.ca

Hydro Engineering, Inc.
865 W 2600 S
Salt Lake City, Utah 84119
1-800-247-8424
Direct 801-972-1181
www.hydroblaster.com

Hydro Tek Systems, Inc
2353 Almond Avenue
Redlands, CA 92374
(909) 583-9934
www.hydrotek.us

Landa
4275 NW Pacific Rim Blvd.
Camas, WA 98607
360-798-0525
www.Landa.com
www.youtube.com/user/Landa5000

Power Wash Industries

14717 Heritagecrest Way
Riverton, UT 84065
800-581-5750
http://powerwashindustries.com

Personal Watercraft Attachments:

Watercraft Superstore
866-957-9277
http://www.watercraftsuperstore.net
Flush Kits - http://www.watercraftsuperstore.net/PWC-Flush-Kits.html

Engine Flush Kit Adapters:

Perko.com 305-621-7525
http://www.perko.com/catalog/underwater_hardware/62/flush_pro/

Banding Supplies:

Christian Wenk, Customer Service
American Casting and Manufacturing Corporation
51 Commercial Street
Plainview, New York 11803
Toll Free 1-800-342-0333 x 117
Direct 516-349-7010
www.americancasting.com

APPENDIX D

Watercraft Seal Descriptions in Western States

Color	State	Entity	Description
Blue	Utah	State of Utah	Boat Passed a Successful Full Decontamination. Receipt Given. *NOTE: Seals are not given for inspection alone.
Blue	California and Nevada	Lake Tahoe	Boat Was Last in Tahoe OR Passed a Successful Inspection and/or Decontamination. No Receipt Given.
Blue	Colorado	City of Aurora	City of Aurora Annual Permit Holders Only. Intended for returning boaters only. Inspection Only. No Receipt Given.
Green	Colorado	All Agencies. State-wide cross-jurisdictional seal.	Boat Passed a Successful Inspection and/or Decontamination. Receipt Given.
Green	Nevada	State of Nevada	NV SFork Washed. Receipt Given. NV Washed. Throughout the state where a decontamination is performed. Receipt Given.
Clear	Colorado	City of Westminster	Standley Lake Annual Permit Holders Only. Positive For Eurasian watermilfoil. Intended for returning boaters only. No Receipt Given.
Red	Oregon	State of Oregon	Boat Passed a Successful Full Decontamination at Roadside Station. Boat is required to submit to quarantine after decontamination and red tagged boats have not yet completed the quarantine. Receipt Given.
Red	Nevada	State of Nevada	NV Mead Washed. Decontamination. Receipt Given.
Yellow	Nevada	State of Nevada	NV SFork Only. In and out only; no decontamination for locals. Receipt Given.
Yellow	Oregon	State of Oregon	Boat Passed a Successful Inspection at Roadside Station. Receipt Given.
Brown	Wyoming	State of Wyoming	Boat Passed a Successful Inspection and/or Decontamination. Receipt Given.
Orange	Idaho	State of Idaho	Boat Passed a Successful Inspection and/or Decontamination. Seals are only issued following decontamination or to ensure boater compliance with neighboring state seal requirements. In-state boats are recorded electronically and the boater receives a paper receipt (ID Passport).
White	Montana	State of Montana	Boat Passed a Successful Inspection and/or Decontamination. No Receipt Given.
N/A: No Seal	Washington	State of Washington	Receipt is given following inspection and/or decontamination.
Various colors based on waterbody	Nevada	State of Nevada	Lahontan, Rye Patch and Wildhorse waterbodies each have different color seals. Decontamination performed and Receipt Given.
Various colors based on waterbody and entity	California	Varies	Download the complete document

APPENDIX E

Sample Letter to Commercial Haulers

STATE OF IDAHO

DEPARTMENT OF AGRICULTURE

C.L. "BUTCH" OTTER
Governor
CELIA R. GOULD
Director

December 8, 2015

Premier Marine Inc.
E C Hallberg LSG
26612 Fallbrook Ave.
Wyoming, MN 55092

Dear Boat Hauler:

The Idaho Invasive Species Law establishes certain prohibited actions, including possession, transport and sale of invasive species in the state (see: http://www.legislature.idaho.gov/idstat/Title22/T22CH19.htm). As a boat hauler, be aware that certain invasive species – such as zebra and quagga mussel – may be attached to conveyances that you are transporting into and through the state.

The non-native quagga and zebra mussels were first detected in the Great Lakes in the late 1980s, resulting in hundreds of millions of dollars in damage to water delivery systems and the environment. They were first detected in the western United States in January 2007 and are now in Nevada, California, Colorado, Arizona, Texas and Utah. Although the mussels are not established in Idaho, the waters of the state are extremely vulnerable.

The mussels are primarily transported by watercraft. They attach to surfaces, colonizing on hulls, engines and steering components and can damage boat motors and restrict cooling. Water in engines, bilges, live wells and buckets can also carry mussel larvae (called veligers) to other water bodies.

Be advised that during the boating season, the State of Idaho has mandatory watercraft inspection stations throughout the state. As a boat hauler, please note that you are required to stop at these stations during operating hours. The inspectors will be looking for invasive species – including zebra and quagga mussels - that may be on or in your conveyance. For more information on inspections and proper decontamination of watercraft, visit http://www.100thmeridian.org/.

The State of Idaho is working to minimize the potential impacts of these species to the state. However, we need your assistance and support to address this threat statewide. Please feel free to contact me if you have any questions about the invasive species program in Idaho. I look forward to working with you on this important issue.

Sincerely,

Matthew Voile
Section Manager – Noxious Weeds/Invasive Species
(208) 332-8620