

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

(UMPS II)

An updated version of the original 2009 document



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Section 1

General Information

I. PREFACE:

The primary goal of all watercraft interception programs must be to prevent the transfer of quagga and zebra mussels (referred to here as Dreissenid mussels) and other aquatic invasive species (AIS) on trailered watercraft and equipment in order to safeguard natural resources, water supply, recreation and other important water dependent values. We also believe one objective of any long-term mussel interception program should be to keep public and private waters open to boating and seaplane use to the greatest extent possible. It may only take one infested watercraft, seaplane or piece of water-based equipment to establish a Dreissenid mussel population, but the vast majority of watercraft intercepted by these programs are not moving directly from contaminated waterways and therefore do not pose a high risk of carrying quagga or zebra mussels. By following common sense guidelines, a watercraft interception program can be established that readily identifies high risk watercraft so that more restrictive strategies can be focused where they are most critically needed to prevent any further range expansion of Dreissenid mussels.

We realize the inherent difficulty in implementing regionally consistent watercraft interception programs. The large number of programs already in place and the wide range of agency/organization capacity (funding, authority, access control and political will) to implement them make consistency across jurisdictional boundaries difficult to achieve. But, the fact remains, interjurisdictional coordination and cooperation will be the key to preventing the range expansion of Dreissenid mussels in the western United States.

Changes to regulations at the local, state, tribal and federal level may be necessary to implement a comprehensive multijurisdictional program in the West. We therefore encourage continued discussion, exchange and more cooperation, communication and coordination amongst agencies and organizations engaged in watercraft interception programs in the western US. Adopting uniform minimum protocols and standards for these programs is one step toward achieving that goal and increasing the overall effectiveness of these programs. With its large rivers that flow through numerous states, the West will be safer from the devastating impacts associated with Dreissenid mussels, when all of its numerous resource management jurisdictions undertake prevention efforts that include mutual support, consistency, and cooperation.

This Uniform Minimum Protocols and Standards Report (UMPS II) is a “living” document and will continually evolve as new information becomes available. This version includes many updates from the original document completed in 2009

(Zook and Phillips), but the basic principles and program elements remain substantially unchanged. We expect that the same process used for reconciliation and adoption of this version of the protocols and standards will be employed to complete other periodic updates to this document in the years to come as new information and better science becomes available.

II. BACKGROUND:

Following the discovery of quagga mussels in the western United States at Lake Mead in January 2007 and their subsequent detection in downstream Colorado River reservoirs and connected waterways of the Colorado River aqueduct systems in California and Arizona, many water and resource management agencies and organizations in the western U.S. initiated watercraft interception programs to prevent the further expansion of Dreissenid mussels. Nearly all of the agencies and organizations employing interception programs have relied on the Pacific States Marine Fisheries Commission's (PSMFC) Watercraft Inspection Training (WIT) program (certified by the 100th Meridian Initiative) for their training and for the initial development of policies, practices, protocols and standards used to establish those programs.

Many watercraft interception programs in the western United States have also adopted and implemented the protocols and standards recommended by the earlier version of this document (Zook and Phillips 2009). As a result, there are many similarities between watercraft interception programs currently being implemented in the western U.S. However, variations in programs still exist due to the widely varying capacity of individual agencies and organizations responsible for protecting local water resources.

The Western Regional Panel (WRP) of the national Aquatic Nuisance Species Task Force (ANSTF), their member agencies and most organizations currently involved in watercraft interception programs in the West 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 trailered watercraft, seaplanes and water-based equipment.

Recognizing the need to update the original UMPS document, in 2010 the PSMFC successfully applied for [Quagga-Zebra Mussel Action Plan \(QZAP\)](#) funding from the USFWS. The goal of the QZAP, developed by the WRP and adopted by the

ANSTF in 2010, is to summarize current strategies to address the invasion of zebra and quagga mussels in the West, and to identify and prioritize the specific actions that are 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 QZAP listed “Continue the Development of Effective Watercraft Inspection and Decontamination Protocols and Standards” as one of its *“Highest priority actions needed.”*

III: THE ECONOMICS OF PREVENTION:

Establishing and implementing a comprehensive Dreissenid mussel prevention program can be relatively expensive. State, federal, tribal and local agencies and organizations in the western US spend somewhere between an estimated \$50,000 and \$5.0 million dollars annually on Dreissenid mussel prevention programs, including investments for risk assessment, education and outreach, watercraft and equipment interception, early detection monitoring and response planning. Of these, watercraft interception is normally the highest cost item.

QZAP estimated the annual cost to implement mandatory inspection and decontamination of all watercraft at infested waterways in the western US to be \$20 million dollars (plus a one-time initial estimated set-up and equipment cost of \$25 million) and associated costs for research and development of protocols and standards and enforcement to be about \$12 million annually. In addition, QZAP estimated that \$31 million dollars would be required annually to fund the implementation of state plans that include state, local and regional watercraft and equipment inspection programs on uninfested waterways in 19 western states.

Since arriving in the Great Lakes in 1988, the economic impact of Dreissenid mussels has resulted in billions of dollars being spent on control measures for power producers, municipal water suppliers, and other water users. The economic impact of quagga mussels since the infestation in Lake Mead occurred in 2007 has also been significant. The Bureau of Reclamation at its Lower Colorado projects (Hoover, Parker, and Davis Dam) spends approximately \$1 million annually on quagga mussel control (Willett, Personal Communication). The Metropolitan Water District of Southern California has spent over \$30 million dollars in the past 5 years for quagga mussel prevention related operations and maintenance and capital costs in the Colorado River Aqueduct and associated facilities (De Leon, Personal Communication).

From these examples of Dreissenid impacts to the Great Lakes and Colorado River Basin, it is easy to see that the further expansion of Dreissenid populations in the

west will result in mitigation costs that far exceed the estimated cost required to implement the prevention efforts outlined in QZAP.

Additionally, an assessment by the Independent Economic Analysis Board (IEAB) (Independent Economic Analysis Board 2010) for the Northwest Power and Conservation Council reviewed prevention efforts in the Columbia Basin, Colorado, Minnesota, Lake Tahoe and other locations where studies and analysis have been completed. They concluded that existing prevention efforts in the Columbia Basin are under-funded and that an investment on the order of the QZAP estimates to prevent or delay mussel establishment “seem appropriate” given the high cost/benefit ratio (Independent Economic Analysis Board 2010).

The IEAB further concluded that even if Dreissenid mussels were to eventually become established, there is great value in delaying establishment because any delay would allow important scientific advances to occur which may help prevent an introduction, contain an introduction or eradicate a newly established population and because the annual cost saving for each year of delay would be substantial and far exceed the cost of implementing a comprehensive prevention program as envisioned by QZAP.

III. APPROACH:

The protocols and standards recommended here are the products of:

1. An extensive literature search and review
2. The results of decontamination protocol research funded by the United States Fish and Wildlife Service (USFWS) and conducted by the University of Nevada Las Vegas in 2010-2011
3. Countless personal interviews with program administrators, ANS/AIS specialists, private equipment manufacturers, alternative technology proponents, recreational boaters, seaplane pilots and commercial watercraft haulers
4. Results from a WRP survey of watercraft/equipment interception programs in the 20 western states completed in February 2009

5. A survey of commercial watercraft transport providers completed in 2010
6. A cooperative effort with the National Seaplane Pilots Association to develop inspection, cleaning and general operation guidelines for seaplanes completed in 2011
7. A November 2010 survey of watercraft interception program managers in the western United States to determine what changes were needed to the 2009 UMPS document
8. A review of individual agency/organization policies, procedures and standards; *and*
9. The experience and feedback gained from more than 65 watercraft inspection and decontamination trainings delivered to over 3,500 individuals representing 180 different agencies, organizations and water-dependent businesses in 17 western states from 2008-2011, and the extensive contact network and on-going interaction established through that (WIT) training program (<http://www.aquaticnuisance.org/wit>).

Protocols and standards have been identified for the following elements of a comprehensive Watercraft Interception Program:

1. Self-Inspection (Voluntary/Mandatory): A self-inspection program can be implemented alone or as an “off-hours” adjunct to a more direct and comprehensive interception program. This type of program involves requiring (mandatory) or requesting (voluntary) the cooperation of individual watercraft operators to complete an inspection of their watercraft and equipment prior to launching by following a set of instructions and completing a checklist provided at an entry station or kiosk.
2. Screening Interview: The screening interview involves asking the vessel operator a series of questions prior to launching or entry that are designed to determine the level of risk based on the recent history of use for the subject watercraft or piece of equipment. This should be an element of every interception program.
3. Watercraft/Equipment Inspection: A close visual and tactile inspection of all or selected watercraft focused on all exterior surfaces, areas of

standing/trapped water, trailer and equipment to determine the presence or likelihood of mussel contamination.

4. Decontamination: The process of killing and removing all visible mussels and, to the extent practical, killing all veligers and remaining mussels from every area of watercraft, trailer and equipment.
5. Quarantine/Drying Time: The amount of time out of the water required to assure that all mussels and veligers are killed through desiccation. This time requirement varies widely depending on temperature and humidity conditions.

NOTE ON BALLAST TANKS:

Areas that can maintain water or moisture for extended periods like ballast tanks and other hard to access and drain raw water storage areas do not dry sufficiently using the prescribed drying time standards referenced in this report. When ballast tanks or other inaccessible water storage areas are present, specific hot water treatment of these areas must be required for all high risk watercraft (See **page 45** for specific procedures to be followed).

6. Exclusion: Prohibiting watercraft or equipment from being launched. In extreme cases, exclusion can be applied to all watercraft, but in most cases, it is applied to only watercraft and equipment that are considered to be high risk or when they are not clean, drained and dry and when other options such as decontamination or quarantine are not available or rejected by the vessel operator.
7. Certification: A process whereby watercraft/equipment are determined to present minimal risk based on inspection, decontamination or quarantine/drying time and receive some form of certification of that fact (e.g., trailer tag, sticker, band, etc.). It is important to note that it is not possible to certify that watercraft are “free of mussels,” only that the most current and effective protocols and standards have been applied to kill and remove all clearly visible mussels and veligers.

DEFINITION:

Clean - Absent visible ANS or attached vegetation, dirt, debris or surface deposits including mussel shells or residue on the watercraft, trailer, outdrive or equipment that could mask the presence of attached mussels

Drained - 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 systems, cooler or other water storage area on the watercraft, trailer, engine or equipment

Dry - No visible sign of standing water, or in the case of equipment, wetness on or in the watercraft, trailer, engine or equipment

Only about half of the agencies and organizations currently implementing watercraft interception programs employ all of these elements. However, we believe all agencies/organizations should adhere to the uniform minimum protocols and standards recommended here for any element they do implement.

DEFINITION:

High Risk Watercraft/Equipment – Any vessel or piece of equipment that operates on or in the water that has been used in any waterbody known or suspected of having zebra or quagga mussels in the past 30 days or any watercraft or equipment that is not clean, and to the extent practical, drained and dry.

NOTE: Watercraft/equipment that have been moored or been in the water for several days or longer pose the highest level of risk for attached mussels, while all watercraft with on-board raw water systems present some elevated level of risk for veliger contamination regardless of the length of exposure. Generally speaking, the longer the period of exposure, the higher the risk of finding attached mussels.

There are at least 75 jurisdictions in 19 western states that currently employ some form of watercraft interception program on over 400 waterbodies. (See **Attachment 1** for a complete list of those agencies and organizations that currently implement at least one watercraft interception program).

Seventy-two of these agencies and organizations received an on-line survey designed to identify the key elements of each program and gauge support for developing uniform protocols and standards in January 2009. Of the 69 entities

completing this survey (96% return), nearly 90% favored the development and implementation of more consistent protocols and standards for watercraft interception programs that could be applied across jurisdictional boundaries.

DEFINITION:

Watercraft Interception Program (WIP) – Any program which seeks to prevent the spread of Dreissenid mussels and other aquatic nuisance species (ANS) on trailered watercraft and/or equipment by requiring that they be cleaned, and to the extent practical, drained and dried prior to launching.

To update the 2009 UMPS document, a brief e-mail survey was distributed to all 75 current WIP program managers in the western US in fall 2010. Only 13 of the 75 agencies or organizations surveyed responded (18%). One of those responses came from the Bay Area Consortium (California) representing 10 WIP program management entities, raising the response rate to 30%. (See **Attachment 2** for a copy of the results from this November, 2010 survey). We assume that the low response rate was due to the fact that no major changes were seen as being necessary to the UMPS document by agency/organization staff participating in the survey.

IMPORTANT REMINDER, EDUCATION:

While watercraft interception programs are an important public outreach and education vehicle in their own right, all agencies and organizations must also recognize the need to use other outreach strategies to make boaters more aware of the importance of preventing the spread of aquatic nuisance species such as zebra and quagga mussels and what role they can play in those prevention efforts. A watercraft interception 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 mussel prevention programs.

VII. WATERCRAFT TRACKING SYSTEMS:

Traditionally the level of risk posed by any watercraft or piece of water-based equipment has been determined by the screening interview. By asking the watercraft/equipment operator/hauler where the watercraft was last used, how long ago that was and what procedures were used to clean and dry it since its last use,

screeners are theoretically able to determine the level of risk and take the appropriate action to safeguard the receiving waterbody. The problem with screening interviews is that they rely on the memory and truthfulness of the person answering those questions and therefore can result in high risk watercraft getting through the safety net if erroneous information is used to make that initial determination.

Idaho Passport System: To address some of these issues at the state level, the State of Idaho developed an “Invasive Species Passport” in 2011. This system gives Idaho and Pacific Northwest Boaters an expedited “fast pass” when they repeatedly come through Idaho’s stations. Boaters are issued a uniquely numbered passport booklet at the beginning of the season. They show the assigned number to inspectors during subsequent inspections. Inspectors ask the boaters if they have left the Pacific Northwest in the last 30 days. If the answer is no, they receive an expedited inspection, the passport is stamped with the inspection station location and the boater’s information is logged with a handheld data unit. This dramatically reduces field data collection time and allows for tracking of repeat boaters. Several stations (such as I-90 eastbound) have a large volume of local boat traffic that travel between the Spokane (WA) area and the lakes of northern Idaho. This system allows inspectors to quickly screen boaters based on risk. This is especially critical during busy times when inspectors are able to give low risk boats an expedited inspection and can spend additional time scrutinizing high risk boats that have come into the region from elsewhere. It has been well received by the boating community (Ferriter, Personal Communication). Please refer to **Attachment 8** to see a copy of the passport.

Another potential method to track watercraft (and perhaps less obtrusive system for determining risk) is to implement a local, regional or national computerized watercraft tracking system. We will briefly discuss two such systems in this report. [Note: Several states are currently hesitant on implementing an electronic tracking system (because of privacy and funding concerns) and therefore a broader western wide tracking system is likely not feasible at this time]

The Quagga Inspection Data (QID) system allows watercraft to be tracked using the boat ID number. Every time a watercraft enters an inspection point, the boat ID number is entered into the computer by means of a hand-held smart phone or computer. The system then displays the tracking history of that watercraft and logs the current entry. In this way, the screener can instantly determine when and where the boat was last launched (waterbody must be in the system and assuming

all infested waterbodies are connected the same tracking system) and any actions taken on the watercraft (rejection, decontamination, quarantine).

The QID system is currently employed by a number of water and park districts in California.

NOTE ON WATERCRAFT TRACKING: *(See Attachment 7 for a further explanation of this system, the issues pertaining to sharing of private information and system costs)*

A watercraft tracking software program Quagga Inspection Data (QID) has been developed by the California based company Quagga Inspection Services (www.info@quaggainspections.com). This system is available by license agreement and allows watercraft to be tracked across time and space using boater registration ID numbers and computer or smart phone technology. It can be used to prevent watercraft that have been excluded for cause from being launched at one access point within the system from being launched anywhere else in the system or for a number of other related applications. *Note: Providing information in this document on the QID does not constitute an endorsement as we have no firsthand experience with this system.*

The Multi-Platform Solution is a tracking program developed by **Diversified Aquatic Solutions** a Utah company whose mission is to develop “technology for AIS (Aquatic Invasive Species) control” and works in a similar fashion to the QID system except that it uses an applied bar code or numbering system. This program has not been tested yet but may also prove to be an option for tracking watercraft and equipment. For further information go to <http://www.wix.com/stormin505/das1#!>

VIII. ALTERNATIVE DECONTAMINATION TECHNOLOGIES:

Because manually applied hot water spray decontamination is not always 100% effective in removing all mussels from hidden areas found on some types of watercraft and/or equipment. And, because a question remains as to the survivability of attached mussels in some areas of watercraft where visual confirmation of mortality is difficult (*UMPS have recommended that as an added safeguard all watercraft and equipment with attached mussels be subjected to a*

drying period sufficient to achieve complete desiccation after hot water spray decontamination), alternative methods to hot spray watercraft decontamination have been actively pursued and considered for a number of years. Alternative systems include drying time acceleration (Clean Lakes, Inc, Idaho), dry ice blasting (Power Wash Plus, Meridian, Idaho) and semi-automated wash systems (Prefix Corporation CLEAN boat wash system, Rochester Hills, Michigan).

Each of these systems has unique features that may be suitable for wider use in the future. We will **not** review the functionality of these systems in this document.

The following briefly describes some of the alternative decontamination technologies and adaptations of current technology that have been or are currently being developed by private parties:

Drying Time Acceleration:

Research conducted by Morse (2009) at the University of Texas Arlington (UTA) has shown that the rate of desiccation for Dreissenid mussels is a function of temperature, humidity and mussel size. Higher air temperatures and lower humidity decrease the time needed for desiccation, while larger mussels require more time to dry-out than smaller mussels. Quagga mussels are reported to have thinner shells (Zhulidov et al. 2006) and less tightly sealing shell valves than zebra mussels (Claxton et al. 1997) which may make them more susceptible to hot water sprays. However, this supposition requires experimental confirmation (Morse 2009).

As a result of the UTA research, a conversion table has been developed by the 100th Meridian Initiative for WIP program managers and others to determine the drying time required to kill all on-board mussels when exposed to air. Watercraft interception programs in the west have used this “Quarantine Time Calculator” to determine 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>.

The idea of finding a way to accelerate and control drying time using hot air has been considered for several years. Clean Lakes Inc., an Idaho company specializing in aquatic ecosystem restoration and maintenance, presented a proposal in 2009 to test a prototype enclosed forced hot air decontamination unit. The proposed system is composed of a portable enclosure and forced air heat generators that are capable of raising air temperatures inside the unit to in excess of

160 degrees Fahrenheit. While funding to study this prototype was not obtained and the technology has yet to be adequately tested, the concept of accelerated hot air drying may have merit, with further evaluation warranted. For further information contact Clean Lakes at 208-665-1475 (info@cleanlake.com).

Dry Ice Blasting:

The use of dry ice (CO₂) pellets for cleaning and removing attached Dreissenid mussels has been proposed as an alternative to hot water power wash equipment for decontaminating watercraft and equipment. An Idaho company (Power Wash Plus), with experience in using both power washing equipment for watercraft cleaning and dry ice blasting for other cleaning applications, has recently tested this technology to decontaminate watercraft.

This process consists of using specialized application equipment to project a controlled “spray” of dry ice pellets the size of rice grains onto the surface of watercraft and equipment to kill and vaporize attached mussels through thermal contact and crushing. This technology has been successfully used to clean a wide variety of objects under many different physical and environmental conditions. For further information go to: <http://www.idahopressurewashing.com/dry-ice-blasting-washing-services.php>

Prefix Semi-Automatic Wash System: (new application of current hot water technology)

The Prefix Corporation of Rochester Hills Michigan has developed, marketed and tested a semi-automatic decontamination unit based on current hot-water spray technology. The unit consists of a water heater, pump and multiple spray heads arranged strategically to apply hot water spray to all exterior surfaces of the hull, lower unit and trailer, and a containment structure for wastewater management. For further information go to <http://www.prefix.com/clean/>

IX. SEAPLANES:

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 proliferation 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 interdiction. As Dreissenid mussels and invasive aquatic plant 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.



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 US is not known. The SPA estimates that there are between 5,000 and 10,000 seaplanes currently in use in the United States.

NOTE ON SEAPLANES:

Guidelines for seaplane inspection and decontamination can be found on pages 54-55

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.

X. COMMERCIAL WATERCRAFT AND EQUIPMENT HAULERS:

The overland transfer of Dreissenid mussels and other aquatic invasive species on large watercraft and equipment transported by commercial haulers has undoubtedly contributed to their range expansion in North America. Watercraft and equipment that require the services of 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.

A survey and report on the Commercial Watercraft Hauling industry was completed in the fall of 2010 (Zook and Phillips 2010).

The same watercraft interception 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.



Decontamination of a Commercially Hauler Watercraft

XI. WATER-BASED EQUIPMENT:

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, as witnessed by the discovery of zebra mussels on a boat hoist moved from Lake of the Ozarks to Smithville Reservoir in Missouri in 2010, requiring emergency lake treatment.



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 this type of activity should adopt internal policies and procedures for equipment cleaning and decontamination, especially when working in waterways known or suspected of harboring Dreissenid mussels or other ANS.

The United States Bureau of Reclamation has developed an excellent 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. 2010) The Reclamation Equipment Inspection and Cleaning Manual (EICM) can be accessed at: <http://www.usbr.gov/mussels/prevention/docs/EquipmentInspectionandCleaningManual2010.pdf>.

[Note: An updated version of this document is expected to be released in 2012 and will be found at: <http://www.usbr.gov/mussels/prevention/>]

XII. DECONTAMINATION EFFICACY RESEARCH:

A) Morse: The first published study to look at the efficacy of hot-water sprays to mitigate Dreissenid fouling was conducted by Morse (2009). The Morse study showed 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 (Zhulidov et al. 2006) and less tightly sealing shell valves than zebra mussels (Claxton et al. 1997) which may make them more susceptible to hot water sprays. However, this supposition requires experimental confirmation.”

B) UNLV: The PSMFC with funding (USFWS) provided by Congress for implementation of the QZAP, contracted with the University of Nevada at Las Vegas (UNLV) to conduct research to test the efficacy of current UMPS decontamination protocols and standards. This research was completed by UNLV at Lake Mead Nevada in 2011 (Wong et al. 2011). The results of this research determined the following about current decontamination protocols and standards:



Dr. David Wong (UNLV) Testing Effect of Hot Water Spray on Live Quagga Mussels at Lake Mead

1. **Hull of Watercraft:** Applying hot-water spray at **140 °F** for 5 seconds or longer results in 100% quagga mussel mortality. **It is therefore recommended that the application of 140 °F hot water spray for 5 seconds duration or longer is required to kill 100% of quagga mussels on surfaces where direct contact is achieved. An application of time of 10 seconds at 140 °F is still recommended for zebra mussels.**
2. **Gimbal area:** In those areas where hot water flushing is required and where direct contact with flushed hot water of the entire surface or area is not always possible, the duration of hot water application is increased. **It is therefore recommended that the application of 140 °F hot water flush of 130 seconds or longer is required to achieve 100% mortality of both quagga and zebra mussels in those areas.** (For the gimbal area it is important to do both a top flush and a side flush {both sides} of 130 seconds to ensure 100% mortality).
3. **Live wells/bait wells:** We recommend hot water flushing of bait/live wells at **130 °F** for 70 seconds [note on temperature: some pumps are rated only at **120 °F**, please refer to your user manual to avoid damaging equipment] .

NOTE ON FLUSHING THE GIMBAL AREA:

Hot water flushing of the gimbal area requires that water be introduced from all directions to achieve total coverage and complete mussel mortality. Both a top and side flush are needed to ensure 100% mortality.

For complete results of Wong's (2011) research on the efficacy of hot water application to kill Dreissenid mussels on watercraft go to the following link and click on "reports": <http://www.aquaticnuisance.org/wit> . [Note: results from this study can also be found in (Comeau et al. 2011).]

C. UNLV – Kansas: In 2011 another study between UNLV and the Kansas Department of Wildlife, Parks and Tourism was initiated (using QZAP funding) using zebra mussels to test the efficacy of hot water sprays on watercraft hulls at Lake Wilson, Kansas. Initial results from this study indicate that applying hot water spray for 10 seconds at 130°F and 140 °F resulted in 100% zebra mussel mortality. (Wong, Personal Communication).

XIII. WATERCRAFT INTERCEPTION TRAINING:

The Pacific States Marine Fisheries Commission with funding from the USFWS and Bonneville Power Administration developed the Watercraft Inspection Training Program (WIT) in 2004. 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 in the course of their normal boater safety duties. Three of these trainings were delivered in Oregon, Idaho and the Lower Colorado River Basin in the fall of 2004 and spring of 2005 for about 150 officers from five western states.

When quagga mussels were discovered at Lake Mead in January of 2007 and soon afterward in a number of downstream waterways connected by the Colorado River and Central Arizona aqueduct systems in southern California and Arizona, the WIT program underwent major reconfiguration and change of direction. The program was expanded to 5-6 hours of training 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 as they struggled to come to grips with the looming invasion. The WIT program offered an immediate opportunity for agencies and organizations in the west to train their staff on the quagga/zebra mussel issue including prevention strategies and watercraft interception protocols and standards.



Level One Training

From the early spring of 2007 through the fall of 2008, 25 WIT training programs were delivered in nine western states to about 1,000 people. Since late 2008 an additional 39 trainings, of what is now referred to as Level One WIT Trainings, have been delivered to an additional 2,300 people and nine more western states. There have been 65 Level One trainings delivered since 2007 in 17 western states to more than 3,500 people representing over 180 different state, federal and local agencies, tribes, utilities and organizations.

In 2008, a Level Two Watercraft Inspection Training program was developed. Level Two WIT training is an intensive two-day training for 10-12 individuals held at Lake Mead, Nevada. This training is designed for those people who will be responsible for developing or managing watercraft interception programs for their agency, tribe or organization. Level Two graduates are certified as Level One trainers and as first responders. The training focuses on hands-on inspection and decontamination of watercraft and equipment actually infested with live quagga mussels. To date 19 Level Two trainings have been delivered producing over 200 certified personnel representing over 50 agencies and organizations from 14 western states



Level Two Training at Lake Mead

Level Two graduates have delivered an estimated 500 Level One trainings in addition to those identified earlier and several states, most notably Colorado, have established independent training programs based on the WIT training template.

We strongly recommend that all watercraft/equipment inspectors and those performing watercraft/equipment decontamination maintain proficiency through periodic re-certification and by taking advantage of continued education and training opportunities.

For a complete list of Level Two graduates who are certified Level One trainers go to the Watercraft Interception Training Program website at www.aquaticnuisance.org/WIT and click on "Training Resources."

Section 2

The Manual

**Uniform Minimum Protocols and Standards for
Watercraft/Equipment Interception Programs**

I. PROGRAM CONSISTENCY:

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

1. Increased effectiveness by ensuring that all programs utilize the best practical science and technology currently available.
2. Establishing a high level of confidence in the effectiveness of their own programs and trust in the programs employed by others.
3. Reducing the amount of staff time and funding required of all programs by avoiding unnecessary duplication of effort while increasing effectiveness and public acceptance.
4. Making it easier for the boating public to understand, anticipate and comply with watercraft interception and prevention programs.

Not every federal, state, tribal, and local agency or organization currently has the authority or resources to implement all of the minimum protocols and standards identified here. In those cases where capacity is lacking, we urge those entities to seek the regulatory authority and resources necessary to stop, inspect, decontaminate, quarantine or exclude high risk watercraft in order to insure protection of the natural resource, economic, public health and cultural assets that are threatened by this invasion.

In the past several years, many states including Washington, Oregon, Idaho, Montana, Utah, Wyoming, Arizona, Colorado and Nevada have approved new legislation granting broader authority to intercept watercraft and equipment in transit. In addition, federal agencies like the National Park Service (e.g. [Glacier National Park](#)) and local government agencies and organizations (e.g., [Tahoe Resource Conservation District](#)) have passed regulations establishing that authority within their respective jurisdictions.

While the protocols and standards recommended in this document are directed at preventing the inadvertent transfer of quagga/zebra mussels from areas where they are currently present to unaffected waters on trailered watercraft, seaplanes and water-based equipment, their application will help prevent the spread of other

Aquatic Invasive Species (AIS) as well. The screening, inspection, decontamination and quarantine/drying measures described here to reduce the risk of mussel transfer are also effective for reducing the risk of overland transport of invasive aquatic vegetation, fish, disease pathogens, plankton species and other AIS.

II. RECOMMENDED PROGRAM LEVELS:

Many agencies and organizations do not have the capacity to implement state-of-the-art watercraft/equipment interception programs. Funding limitations, lack of access control or authority, and/or the level of political understanding will all play a role in determining whether a water or resource management agency decides to become proactive enough to implement a watercraft interception program and how extensive that program will be. However, in those situations where the risk is high, the potential savings from preventing a mussel introduction always far exceed the cost of implementing even the most comprehensive interception program.

Because of funding/staffing or authority limitations, a number of western agencies and organizations employ only random, periodic or peak-time interception programs. These programs have obvious limitations so it is vitally important that agencies and organizations implementing this type of watercraft/equipment interception program also complete risk assessments on all major waterbodies and use that information to direct those limited resources to waters with the highest risk for mussel introduction.

It is also important that, to the extent practical, all programs should follow these uniform minimum protocols and standards for all elements of their interception programs and consider adopting more inclusive low cost programs like volunteer or mandatory self-inspection while seeking more public, political and financial support for expanded programs as the threat continues to increase with each new mussel discovery in the West.

It is the responsibility of water and resource managers to determine the level of acceptable risk and which type of watercraft interception program most closely reflects the mission, values and capacity of their agency or organization. However, consideration for the investments made by neighboring water and resource managers should not be overlooked when seeking support for interception programs. A common concern raised by 2009 survey recipients and current WIT training program attendees is that up-stream or neighboring managers aren't doing

enough to protect those systems, putting their own considerable investments and resources at risk. However, since 2009, as mentioned previously, a number of jurisdictions have implemented more comprehensive programs (though additional capacity is still needed).

DETERMINING INDIVIDUAL WATERBODY RISK LEVEL:

High Risk Waterbody – The determination of a “high risk waterbody” is the prerogative of the responsible management entity. Some of the factors that should be used to determine risk potential include:

Whether water quality parameters (e.g., calcium and pH level, food supply, summer water temperatures, etc.) will support the survival, growth and reproduction of Dreissenid mussels (these parameters may often vary seasonally and even by location within a large waterbody)

The amount and type of watercraft activity and where it’s coming from

Proximity to Dreissenid positive or suspect waters

When the water in question is a headwater, water or power supply system or supports species listed under the Endangered Species Act

We recommend employing one of the following three program levels for watercraft/equipment interception programs depending on the risk level and individual agency/organization capacity:

Level 1 (Self-Inspection): Relatively low cost program for low risk waters or on higher risk waters where organization or physical capacity prevents a more aggressive approach.

As an example, we recommend either a voluntary or mandatory self-inspection program similar to the one developed by the Utah Division of Wildlife Resources and in use at over 100 secondary risk waters in that state. 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 should be implemented.

This type of program involves the dissemination of an inspection form which can be made available at either an entry station, kiosk or message board with boldly

printed instructions for the watercraft/equipment operator to answer all the questions and inspect all designated areas of watercraft, trailers and equipment. The form is then placed in or on the transport vehicle where it can be easily seen. See **Attachment 3** for a sample of the form currently used by the Utah Division of Wildlife Resources. If the program is mandatory, spot checks by enforcement personnel can be used to reinforce compliance.

This type of program has limited effectiveness because it's unmanned and contaminated watercraft can still be launched unknowingly or otherwise by inexperienced or irresponsible boaters (though it does provide great benefits in terms of public outreach and education). A relatively low cost, a well signed self-inspection program essentially equates to having a full-time person (24/7/365) at each location educating boaters and raising their awareness about the consequences of a mussel invasion and the importance of cleaning, draining and drying watercraft between uses.

Another benefit from this type of program is that it provides a way to overcome political resistance to more “heavy-handed government” approaches by giving the boating public an opportunity to self-regulate and exercise personal responsibility. If the boating public fails to act responsibly, it is much easier then to convince water users and law makers that more formal efforts are required to protect water resources and local economies.

Self-inspection programs can be implemented for under \$1,000/year for individual water bodies. 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.

Level 2 (Screening out high risk watercraft and equipment): Moderate to high risk waterways where budget or other considerations prevent a more comprehensive (Level 3) program.

We recommend a program that includes a screening interview to identify high risk watercraft and/or equipment followed by a brief inspection to verify interview information. All watercraft that are not clean, drained and dry or those reporting coming from areas where Dreissenid mussels are known to exist within the last 30 days are then excluded from accessing that waterway.

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 easily 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 no decontamination or quarantine facilities are used, this is a relatively low cost protection option.

A Level 2 program is designed to exclude all high risk watercraft where the cost of implementing a more comprehensive program is prohibitive. It maintains boating access for low risk watercraft (the majority) but completely excludes others for lack of comprehensive inspection, decontamination and/or quarantine capability. Exclusion can have adverse economic, political and social consequences.

Programs like this typically cost between \$2,000 and \$5,000 a year to operate per water body if existing screening facilities and staff are available and are a relatively low cost option in those situations. However, if those assets are not already in place, the cost can be considerably higher.

NOTE ON LEVEL 1 AND LEVEL 2 PROGRAMS:

Level 1 and Level 2 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 reciprocity because they do not offer any assurance that watercraft and/or equipment subjected to either type of program are, to the extent practical, free of mussels or other ANS.

Level 3 (Comprehensive): High risk waters, large waterbodies and wherever possible.

We recommend this type of program for all high risk waters. A Level 3 program should include screening interviews at the point of entry; a comprehensive watercraft/equipment inspection of all high risk watercraft/equipment performed by trained inspectors; the decontamination and/or quarantine or exclusion of suspect watercraft and may include vessel certification.

This type of program may require construction or modification of entry facilities, purchase of a hot water powerwash and wastewater containment system, hiring and training inspectors and decontamination operators, providing a safe and secure quarantine facility, a good working relationship with law enforcement authorities, and the development of a set of policies and rules that allow all of the above actions.

We estimate that about 30 western state, federal, tribal and local agencies and organizations currently operate Level 3 watercraft intervention programs at the state, regional or local level on over 300 high risk waterbodies in the western United States. Programs like this can cost between \$50,000 and \$1 million dollars per waterbody per season to operate depending on the size of water involved, type of equipment and facilities used, hours of operation, and the number of access points available to boaters.

Some programs operate border inspection stations. For example the State of Idaho's program (http://www.idahoag.us/Categories/Environment/InvasiveSpeciesCouncil/Inspection_Stations_2011/Inspection_Stations_2011.php) has 15 mandatory inspections on all major roadways entering the state (seven days a week during the active boating season) at a cost of approximately \$850,000. Idaho also has 11 highway Port of Entries whose staff are trained to inspect for contaminated watercraft (particularly for commercially hauled watercraft).

Only Level 3 programs offer any opportunity for cross-jurisdictional reciprocity of watercraft decontaminations.

III. UNIFORM MINIMUM PROTOCOLS AND STANDARDS FOR WATERCRAFT INTERCEPTION PROGRAMS:

The term “**Uniform Minimum Protocols and Standards**” implies that all agencies/organizations should strongly consider adoption of these as integral components of their Watercraft Interception Program. **However, because each entity is unique; having different missions, authority, resources, facilities and governing bodies, it is understood that additional or stricter standards may be implemented and that cross-jurisdictional reciprocity should be left to the discretion of the implementing agency/organization.**

These protocols and standards reflect the best currently available science, technology and understanding. However, we recognize that watercraft interception

and decontamination is a rapidly evolving field and that new information may change the way we view these protocols and standards in the future. A recently completed research project specifically designed to test the efficacy of the 2009 version of this report's decontamination protocols can be found at the link provided on **page 22** of this report. And, we are aware of several additional efforts that are either underway or planned that will continue to look at alternative strategies for watercraft decontamination and may contribute to future updates.

There are few major changes from the 2009 to this 2012 version of the report regarding specific protocols or standards because the research and experience gained over the past three years has confirmed that these protocols and standards still represent the best currently available science and technology. There are, however, many clarifications, elaborations and updates to the earlier protocols and standards that reflect our growing knowledge base. We will continue to encourage and contribute to the quest to find more effective ways to achieve advancements in efficacy, cost, liability, and delivery of watercraft intervention programs in the future.

We recommend the following Uniform Minimum Protocols and Standards for watercraft interception programs in the Western United States:

a. Self-Inspection Programs (Mandatory or Voluntary)

Self-inspection programs, whether voluntary or mandatory, offer a limited level of protection because compliance and effectiveness are not guaranteed.

However, self-inspection programs are very effective boater education tools, 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, the type of program currently implemented by the Utah Division of Wildlife Resources on approximately 100 of their secondary risk waters should be considered as a **minimal** interception tool or “off-hours” adjunct to a more comprehensive program.

Protocols:

1. Provide a self-inspection form and clear directions on how to complete the inspection and the form at the point of entry, kiosk or dedicated check-in area.

2. Require (where a law/rule is in place) or request (when rules are not established) that the form be completed, signed, and posted in clear view on the dash of watercraft/equipment transport vehicle prior to launching.

Standards:

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

1. Watercraft, equipment, trailer have not been in any water known or suspected of having quagga/zebra mussels in the past 30 days (consider adding a checklist of those waterbodies of most concern in your area so boaters can indicated if they have been in any of those specific waters).
2. Watercraft, equipment, trailer are cleaned, and to the extent practical, drained and dried.
3. Watercraft, equipment, trailer have been visually inspected by the operator at the site prior to launching.

b. Screening Interviews

The screening interview (see **Attachment 4** for an example of a screening interview/boater use survey form used by the Los Angeles Department of Water and Power at Crowley Lake) involves collecting information from the vessel operator through a series of questions prior to launching or entry that are designed to determine the level of risk posed by that watercraft based on its recent history of use. This should be an element of every interception program.

In order to be most effective, the screening interview should not rely totally on the responses given, but the person conducting the interview should be attentive enough to make sure that the responses given match the physical evidence available and that they are credible, which may require a brief confirmation inspection.

Protocols:

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

- The home location of the owner/operator
 - The specific location (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
2. Verify the responses by checking the license plate or registration (boat ID) number and doing a brief visual inspection
 3. Clarify any inconsistencies between the responses given and the physical evidence before clearing the watercraft or equipment for launch.
 4. The screening interview provides all agencies and organizations implementing interception programs the opportunity to explain the importance of prevention and to educate the boating public on ways they can take personal responsibility for “clean” boating. Use it as an educational opportunity.



Screening Interview at Kansas Department of Wildlife, Parks and Tourism Check Station

Standards:

1. Watercraft that have been used in any Dreissenid mussel positive or suspect waterbody in the past 30 days or are not clean, drained and dry should be subjected to a comprehensive inspection by a trained professional before being allowed to launch, or excluded if inspection or decontamination resources are not available.
2. If there is reasonable suspicion of deception on the part of the owner/operator/transporter during the screening interview, the vessel should be subjected to a comprehensive inspection before being permitted to launch.

c. Watercraft/Equipment Inspection

Inspecting watercraft and equipment for the presence or likelihood of Dreissenid mussels is perhaps the most important and difficult element of a successful interception 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 and equipment; and the cooperation of the boat/equipment operator. In addition, watercraft and equipment inspection needs to be systematic and thorough. A checklist should always be used when conducting a watercraft or equipment inspection in order to assure that all areas where mussels and veligers can be found are inspected.

A basic watercraft inspection and decontamination course, like the Level One (WIT) course offered by the Pacific States Marine Fisheries Commission and certified by the 100th Meridian Initiative (<http://www.aquaticnuisance.org/wit>) is highly recommended for anyone who will be directly involved in watercraft inspection. An advanced training (Level Two) should be taken by at least one agency or organization representative, engaged in or planning to become engaged in watercraft interception. The 100th Meridian Initiative Level Two training provides the knowledge, tools and resources necessary to become an in-house Level One trainer or interception program manager.

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.

Protocols:

1. Use an inspection checklist and follow it. The inspection checklist should include (at a minimum) the following information (See **Attachment 5** for the inspection form used by Colorado State Parks as an example):

- The home state or area code where the watercraft or equipment is registered
- The vessel ID number
- The name and date of the last water visited
- A checklist of areas to be inspected, including 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) and foot-wells (PWCs)

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 Area:

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, PFD's, 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

Trailer:

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

2. Inspect all high risk watercraft (See definition on **page 65**).
3. Have a systematic and repeatable plan when conducting inspections to ensure complete coverage of every area of the watercraft.
4. If Dreissenid mussels are found anywhere on the watercraft or equipment, the inspection can cease and the entire watercraft, trailer and equipment will need to be decontaminated or quarantined (preferably both) before being allowed to launch.
5. Use the inspection process as an opportunity to educate the boat owner/operator on the importance of pre-launch self-inspection, proper cleaning and drying and the reasons why all watercraft and equipment operators need to clean, drain and dry watercraft and equipment when moving between waters. Demonstrate the proper way to conduct a watercraft, seaplane or equipment inspection.

Standards:

1. If attached mussels or standing/trapped water are found on a high risk vessel, it should not be allowed to launch without first being decontaminated or subjected to the prescribed quarantined/drying time standard or both.
2. If water is found on exposed areas only (rain or wash-water), on an otherwise low risk and clean watercraft, the watercraft should be thoroughly wiped dry first and allowed to launch.
3. If no mussels or 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 relevant temperature and humidity drying time standards, it should be allowed to launch, **except for watercraft that have ballast tanks or other difficult to access and completely drain 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 treated 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 and re-inspection.
5. Any watercraft with enough dirt, calcium or bio-fouling build-up so as to make inspection for small attached mussels or other AIS difficult, should be required to be cleaned and re-inspected before being allowed to launch.

NOTE ON LIVE BAIT FISH:

If the use of live bait fish is permitted in your jurisdiction and they are found during inspection, remove the bait, place in a bucket of clean water, drain and flush the live bait container with hot (130 degree 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 themselves, it is the best “minimum” standard for dealing with this situation currently available. (*Note: If your live or bait well uses a pump, make sure to check your owner’s manual for maximum temperature to avoid damaging equipment)

d. Watercraft/Equipment Decontamination

If, following inspection, a watercraft or piece of equipment transported from one waterbody to another is confirmed or believed to have mussels on board, three options are available: 1) decontamination, 2) quarantine/drying or 3) exclusion. Hot water spray decontamination is the only option that kills and removes mussels. Since we cannot be sure that all areas of the watercraft and/or equipment have been adequately treated, we recommend that a period of drying (using the 100th Meridian Initiative Quarantine Time Calculator or the table on *Page 50* of this report) be used in conjunction with decontamination for all watercraft confirmed or suspected of having mussels on board.

The best current technology available for watercraft/equipment decontamination is hot water pressure washing. We recommend the exclusive use of hot water (**140**

°F or greater *at the point of contact*) and pressure washing equipment with various attachments to kill and remove all visible mussels (live and dead) and kill all veligers from every area of the watercraft, engine, trailer, and equipment.

NOTE ON DECONTAMINATION TECHNOLOGY:

Recent research (Wong 2011) and current assessment (this report) strongly indicate that hot water pressure washing using the protocols and standards identified here remain the most effective currently available decontamination methodology. We do not believe that relying solely on aerial exposure and desiccation as the primary means of decontamination is sufficient since dead mussels remaining on watercraft/equipment can be moved to other locations where their discovery can cause expensive and unnecessary response. However, we do encourage and support the combination of hot water decontamination and drying time as 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 and REMOVE, to the extent practical, all visible mussels. Killing prevents establishment of new populations resulting from watercraft/equipment transfer, but removing dead mussels is also important because a false positive finding may result from the presence of mussel shells or DNA in samples collected for genetic analysis (polymerase chain reaction {PCR}). This can result in unnecessary concern and expensive action if unexplained shells drop or are scrapped-off the hull and are subsequently discovered at a boat ramp or the lake bottom, or if the watercraft is intercepted in transit. Furthermore, there are no standard protocols in place to easily confirm the viability of attached mussels within the context of a watercraft inspection or decontamination. Therefore, mussels on watercraft or equipment that appear to be dead do not necessarily indicate that those mussels or others not clearly visible settled elsewhere are in fact dead.

DECONTAMINATION SAFETY ADVISORY:

Extreme caution should always be used when working in and around watercraft and equipment. This is particularly true when working with the high pressure equipment and the high water temperatures recommended here.

Protocols:

1. Before commencing a decontamination procedure, get the permission of the vessel owner after explaining the options and decontamination process in detail.
2. Consider requesting a liability waiver signature from the vessel owner as a condition of decontamination. Most owners would agree to sign a liability waiver when the option is quarantine or exclusion. Agencies should consult as necessary with their legal staffs on liability issues.
3. Find a location for the decontamination that is away from the water where the run-off and solids from the cleaning process can be contained and will not re-enter any waterbody.
4. If possible, wastewater and solids should be totally contained (low-cost containment systems now exist for this purpose) and directed to an appropriate waste treatment or disposal facility. New guidelines are currently being developed by the EPA for watercraft/equipment decontamination. [Note: For further information go to <http://water.epa.gov/lawsregs/lawsguidance/cwa/vessel/CBA/about.cfm>]
5. If possible, incorporate some cross training on the care and maintenance of all types of watercraft in preparing staff that will be extensively involved in watercraft decontamination. Consider asking a local marine mechanic to provide some instruction in the basics relating to cooling system and ballast tank flushing and other mechanical elements of commonly encountered watercraft that will help staff better understand the watercraft they will be entrusted to work with, project a more confident approach and maintain better public relations.

NOTE ON KILLING VELIGERS:

On-going research (Sykes, Personal Communication) has indicated that killing veligers in water is much more difficult than previously thought and that veligers are resistant to some chemicals currently recommended for that purpose. The research also indicates that veligers that may appear dead immediately following chemical treatment may revive after several hours of recovery time. Research by Craft and Myrick (2011) showed that quagga mussel veliger predicted survival times (in static water baths) ranged from less than a day at 35°C to at least 24 days at 10°C.



Portable Decontamination Unit Including Wastewater Containment Pad

Standards:

1. Use **140 °F** or hotter water (at the point of contact) to kill mussels and veligers. Water loses approximately 10-15 degrees F 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. Monitor water temperature at the nozzle and at the point of contact to be sure that equipment is operating as required before initiating a decontamination.
2. Use a plastic scraper, brushes and gloves to remove attached mussels before applying hot water spray to significantly reduce the time required to complete a watercraft decontamination.
3. When using a hot water pressure washer and/or flushing attachment to kill and remove attached mussels from the surface of watercraft/equipment, allow **at least 5 seconds for quagga mussels** and **10 seconds for zebra mussels** 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. [Note: If you are unsure whether you have quagga or zebra mussels, use 10 seconds to be safe.]

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 eight inches out from the head to avoid any paint damage and allow a wider spray area of greater lethal contact time. We also recommend a 40-deg flat fan spray nozzle (anything less than 40° nozzle can cause damage to the surface) and a 12” standoff to get the maximum coverage and to prevent damage to the vessel.



Removing Attached Mussels with Plastic Scraper Prior to Pressure Washing

NOTE: REMOVING ATTACHED MUSSELS

When attached mussels are allowed to dry for several days and desiccate their byssal threads begin to decompose. Removing mussels through scraping or by power washing after a period of drying requires considerably less effort and can be accomplished with lower nozzle velocities than those required for live mussels (3,000 psi).

4. Use a power wash unit capable of spraying at least **5 gallons/minute** with a nozzle pressure of 3,000 psi or greater (not to exceed 3,500 psi) to remove

attached visible mussels from all exposed surfaces of the watercraft, piece of equipment, trailer and engine.

NOTE ON “HIDDEN” MUSSELS:

It may not be possible to remove all attached mussels from every area of the watercraft/equipment. The standard is to remove all “visible” mussels. A day or two following a very thorough decontamination, it is not unusual for mussels to appear as byssal threads begin to decompose and mussels slide out of hidden areas to become visible. In addition there are some areas of almost any watercraft or piece of equipment that cannot be easily accessed to remove dead mussels. If properly treated, these mussels are dead and in the process of decay. Brushes may be used in conjunction with flushing in some of these areas when doing the initial decontamination to reduce (not eliminate) this from occurring.

5. 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.



Using a Brush to Remove and Flushing Attachment to Kill Mussels in the Gimbal Area

6. When flushing hard to reach and sensitive areas, maintain a contact time of **70 seconds** to assure that mussels receiving only indirect contact are killed since it may not be possible to remove them from these areas.



Flushing Live Well

WARNING ON ENGINE COOLING SYSTEMS:

Marine engine cooling system pumps and engines are not designed to operate at less than seven gallons per minute (gpm) over an extended period, and most current power wash units are not designed to deliver more than five gpm. Therefore, when using a power wash unit for this purpose, it is important to limit run-time to **130 seconds** to avoid any possible engine/pump/impeller damage. No such limitation exists if an outboard is “tank run” in hot water without the use of a power wash unit.

There must be enough volume to properly supply an engine’s cooling system in order to keep them from overheating. Five gpm will suffice as long as the engine is idling. In all cases, the operator must watch the temperature gauge during the flushing process. The person who is doing the decontamination should monitor the water being discharged from the engine with a handheld temperature gauge or thermometer to make sure that the discharge temperature is at least **140°F**.

7. First drain and then use a flushing attachment and **130 degree water** to maintain contact time of **70 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 130 degree water and held for 30 seconds, and then drained. If the fill method is used, care must be taken in the bilge area to not flood the engine.]
8. Use appropriate attachment connected to the powerwash unit or other hot water source, start the engine and run for **130 seconds** to kill mussels in the engine cooling system.

(The table below shows lethal water temperatures, exposure time and mortality rates for quagga mussels as tested at Lake Mead by Dr. David Wong)

Table 1. Quagga mussel mortality (%) under different treatments at day 10.

Temperatures		Times in seconds							
°C	°F	1 s	2 s	5 s	10 s	20 s	40 s	80 s	160 s
20	68	4	4	6	0	0	2	2	0
40	104	2	2	8	12	94	100	100	100
50	122	10	22	36	82	100	100	100	100
54	129	54	72	98	100	100	100	100	100
60	140	72	92	100	100	100	100	100	100
70	158	88	98	100	100	100	100	100	100
80	176	86	98	100	100	100	100	100	100

Control mortality (n = 4) was 3%. Bold values emphasize the quagga mortality rate of 100%

Red values emphasize the estimated VHS and spiny flea mortality rate of 100%

9. Some ballast system manufactures have indicated that their pumps and/or other electrical system components are designed for temperatures of no more than 120 degrees. For that reason, we recommend using a 3-4 foot hose extension from the end of the flushing attachment to introduce hot water from the source to the ballast or raw water storage tank. The extension allows the water temperature to cool by an additional 15 to 20 degrees in order to reduce effective water temperatures in the bladder or tank to below

120 degrees. To maintain lethal temperatures long enough to achieve 100% mortality it is important to pump water into the area until the exiting water reaches a temperature of **120 °F**. The exiting water temperature can be monitored with a handheld temperature gauge or thermometer. Leaving the water in that area for a minimum of **130 seconds**, will assure 100% mortality. [Note: ballast tank decontamination can be time consuming, it is recommended that tank decontamination be undertaken first at the beginning of the decontamination process]

10. Use the flushing attachment to treat PFD's, anchor and lines, paddles and oars, water toys, boat fenders and other equipment that has been in the water by flushing (or spraying if it will not damage the equipment) with **140 °F water** to kill any veligers or mussel present (remember that equipment fouled with settled mussels will require more time to decontaminate, see "3" above).
11. Watercraft and Equipment Trailers: All accessible surfaces should be sprayed with 140 degree or hotter water. Since trailers are normally out of the water, juvenile and adult mussel are not normally attached to any surfaces however, mussels can become scraped-off 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, flush for at least 70 seconds with 140 degree 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.
12. Always use a thermometer or temperature logger to verify and maintain proper water temperatures at the point of contact.



Using Hose Extension to Lower Hot Water Flush Temperature to 120 °F to Treat Ballast Tank

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 ear muffs or “fake-a lake” attachment is properly and securely sealed, and in the ballast tank flush (where it is critical that water temperature be reduced to 120 °F or less to avoid damage to the electrical components. If these and other protocols are strictly applied, there is little prospect of damage resulting from the application of these protocols and standards.



NOTE ON CHEMICAL TREATMENTS TO KILL DREISSENID MUSSELS:

A number of agencies and organizations in the western U.S. currently recommend and use various chemical compounds for decontamination including Potassium Chloride (KCL), Formalin, Vinegar and other substances. The latest and on-going research by Catherine Sykes of the US Fish and Wildlife Service being conducted at Willow Beach National Fish Hatchery on the Colorado River indicates that at the recommended concentrations, KCL and Formalin are not effective decontamination agents. Vinegar has not yet been tested, but until similar research confirms that it is effective, we have chosen not to recommend any chemical treatments. For the latest information on chemical compounds and their effect on adult and juvenile Dreissenid mussels please contact Catherine Sykes at Catherine_Sykes@fws.gov

e. Quarantine or Drying Time

If watercraft and/or equipment suspected of carrying zebra or quagga mussels cannot be decontaminated for any reason, then they must be held out of water for a period of time necessary to desiccate and kill all mussels and veligers on-board through desiccation. 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, Personal Communication).

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 biggest concern with quarantine/drying 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, triggering alarm and resulting in expensive and unnecessary action. For that reason, we recommend that all visible mussels be removed from quarantined/dried watercraft before they are allowed to launch.

NOTE ON TREATING BALLAST TANKS:

Remember, drying time does not apply in the same way to watercraft with ballast tanks or other water storage areas that are not easily accessed for inspection and 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 here.

The 100th Meridian Initiative has developed a Quarantine Time Calculator based on research conducted by Dr. Robert McMahon and others at the University of Texas, Arlington. That calculator is available on the organization's website <http://www.100thmeridian.org/emersion.asp>. When practical, we recommend using this standard for determining 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). When this level of precision is not practical for field operation, a second, more easily calculated and remembered standard, is also recommended below.

Protocols:

1. Requiring quarantine, drying time or a waiting period should be applied to all watercraft and equipment that meet the definition of high risk; either in lieu of decontamination or in addition to decontamination as an “insurance policy.”

2. Implementation of this option can take several forms.

- Physically quarantining 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 on-board. 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’s 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 banding (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 into any freshwater area until the date indicated on the “band” or an accompanying paper certificate.
- The final option is simply to require that all high risk watercraft serve a pre-determined drying/waiting period prior to launch (duration determined by risk level and current temperature and humidity conditions). Under this scenario, all high risk watercraft are prohibited from launching until the required drying time has passed, as determined by the screening interview.

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

Standards:

1. Where practical, the 100th Meridian Initiative Quarantine Time “Calculator” should be used to determine the length of quarantine/drying time required (provides the greatest precision but limited availability and predictability for boaters).
2. When the use of the “calculator” is not practical, the standards below should be applied to determine the length of the quarantine/drying time required (Note: information provided in the following table was developed in cooperation with Dr. Robert McMahon, University of Texas Arlington)

<u>Maximum daily temperature</u> Degrees Fahrenheit	<u>Minimum days out of water</u>
< 30	3
30- 40	28 (4 Weeks)
40-60	21 (3 Weeks)
60-80	14 (2 Weeks)
80-100	7 (1 Week)
>100	3

NOTE: Add 7 days for temperatures ranging from 32-95 degrees F if relative humidity exceeds 50%

- Watercraft with ballast or other internal water storage tanks that cannot be completely drained should be treated differently with regard to drying time. (See *Pages 45, 48*).

f. Watercraft/Equipment Exclusion (or sometimes referred to as quarantine):

High risk watercraft which are not decontaminated and/or quarantined should be excluded and not allowed to launch; whether the result of vessel owner refusal, or lack of available equipment, trained applicators or facilities. Exclusion should not be used as a long-term substitute for development of a more user-friendly and proactive interception program that recognizes the value of recreational boating and seaplane operation to the economy and the legitimate interests and enjoyment of the boating and flying public.

Since Dreissenid mussels were first found in the western U.S. in 2007, some agencies and organizations responsible for water and recreation management have continued to resort to the use of exclusion to protect those resources from the Dreissenid mussel threat, however, that number has declined over the past three years. The case for using exclusion as a prevention strategy has diminished as agencies and organizations have had time 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. High risk watercraft and equipment that have not been or cannot be decontaminated or meet the quarantined/drying time standard should be 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 known zebra/quagga mussel areas within the past 30 days and have not been decontaminated and/or been out of the water for the required time (based on temperature and humidity conditions as determined by either the quarantine time calculator or alternative method recommended here) should be decontaminated if approved facilities are available; placed in self or on-site quarantine for the required time frame; or excluded.
2. Watercraft that are not clean (having 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 (been out of the water long enough for attached mussels to desiccate) should be decontaminated and/or quarantined or excluded.

g. Watercraft Certification/Banding

A growing number of boating and water management agencies and organizations currently offer some form of certification for watercraft or equipment that have passed inspection, been decontaminated or have remained out of the water long enough to satisfy quarantine/drying time requirements. Certification of this type helps the operator avoid repeated time delays upon reentry and makes it easier for the management agency/organization implementing watercraft/equipment

interception programs by reducing work load, processing time and by allowing them to concentrate limited resources on higher risk watercraft.

Some entities currently offer a sticker or paper certificate, however, since there is no way to determine where that watercraft or equipment has been between interceptions, this form of certification offers limited benefit except as an indicator that appropriate fees to support the program have been paid. Many agencies and organizations have addressed this short-coming by applying “bands” that connect the watercraft/equipment to the trailer so that it cannot be used between interceptions without detection. In some cases, a written certificate is also issued with banding.

If agencies and organizations choose to offer certification, we recommend that the watercraft/equipment be banded in such a manner that it cannot be launched between interceptions without detection. If banding is coordinated between jurisdictions, further action can be expedited (at the discretion of the implementing agency/organization) at the next launch site anywhere in the western US so long as the band remains intact. Such a system would reduce the amount of staff and equipment time required at interception facilities region-wide, thereby increasing resource protection, saving money, reducing waiting time and crowding and lowering the frustration level of staff and the boating public alike.



Protocols:

In order to implement a region-wide program that may be acceptable to most agencies and organizations in the western U.S., three conditions must be met:

1. The agency/organization placing the band must implement all Uniform Minimum Protocols and Standards to insure that the best practical science and technology has been employed in certifying the watercraft or equipment.
2. Only those programs that comply with Level 3 inspection and decontamination protocols and standards offer reciprocity opportunity (between jurisdictions).
3. All agencies and organizations participating in the certification program should use a banding 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 band has been tampered with, severed or removed.
4. While a variety of different “band” styles and materials may continue to be used, all bands should have the following features: **This information can either be incorporated into the band or provided on an accompanying paper receipt or certificate.**
 - The name and contact telephone number of the agency/organization applying the tag.
 - Some way to indicate the basis for certification as one of the following three categories; inspection, decontamination or quarantine (several options are available including color coding or pre-printed number or letter coding).
 - In the absence of an automated tracking system, the banding date should be indicated on the tag or providing a dated “paper” certificate.

Standards:

1. Only watercraft or equipment that have passed inspection or have been decontaminated or quarantined by trained and certified personnel in

accordance with all of the Uniform Minimum Protocols and Standards as adopted, should receive certification banding.

2. Certification banding should only be applied by a trained inspector.
3. Watercraft and equipment that have been certified and banded by an agency or organization utilizing these Uniform Minimum Protocols and Standards may receive expedited processing at the discretion of the receiving agency/organization in other jurisdictions.

h. Seaplane Guidelines:

1. All seaplane pilots should view the seaplane inspection and cleaning video on the 100th Meridian Initiative website (http://www.youtube.com/v/luDZptFsQDk?fs=1&hl=en_US) and complete the training course and carry a certificate available on-line at <http://www.100thmeridian.org/certificate.asp>
2. 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 (household bleach {one part household bleach to 5 parts water mixed in a spray bottle} or **140 °F** water) all water from floats, wheel wells and any other compartments or areas of the aircraft that can contain or maintain raw water.
3. 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 as dry internally as possible during takeoff.
4. 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.
5. 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.

Section 3

References, Terms and Attachments

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2. Dr. David Britton. USFWS, Arlington, Texas.
3. Dr. Robert McMahon. University of Texas, Arlington.
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9. Tom McMahon and Kevin Bergersen, Arizona Game and Fish Department, Phoenix, Arizona.
10. Marshall Pike and Sean Senti, Quagga Inspection Services

11. Stephen Wickstrum, General Manager, Casitas Municipal Water District, Oak View, CA.
12. Scott Smith, United States Geological Service, Seattle, Washington.
13. Paul Heimowitz, United States Fish and Wildlife Service, Portland, Oregon.
14. Ken Kreif, Lake Kahola Zebra Mussel Committee, Kansas.
15. Chuck Dearman, Powerwash Plus, Boise, Idaho
16. Tom McNabb and Leif Elgethun, Clean Lakes Inc. Coeur d' Alene, Idaho
17. Kurt Zeile, Prefix Corporation, Rochester Hills, Michigan
18. Brian Rappoli, EPA, Washington DC
19. Susan Mangin, ANS Task Force, Arlington,VA
20. Catherine Sykes, USFWS Dexter National Fish Hatchery and Technology Center, New Mexico
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GLOSSARY OF TERMS:

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, band, paper certificate, etc.). It is important to note that it is not possible to certify watercraft are “free of mussels”, only that the most currently available and effective protocols and standards have been applied to kill and remove all visible mussels.

Clean - Absent visible ANS, attached vegetation, dirt, debris or surface deposits including mussel shells, byssal threads or residue on the watercraft, trailer, outdrive or equipment that could mask the presence of attached mussels.

DAS – A watercraft/equipment tracking tool developed by Diversified Aquatic Solutions, Inc. that uses applied bar or number codes and computer technology.

Drained - To the extent practical, all water drained from any live-well, bait-well, storage compartment, bilge area, engine compartment, floor, ballast tank, water storage and delivery system, cooler or other watered area of the watercraft, trailer, engine or equipment.

Dry - No visible sign of water on or in the watercraft, trailer, engine or equipment. Out of the water long enough to be totally dry.

Decontamination - The process of killing and removing all visible attached mussels, and to the extent practical, killing all veligers and concealed mussels from every area of watercraft, trailer and equipment.

Exclusion - Not allowing watercraft or equipment to be launched. In extreme cases, exclusion can be applied to all watercraft, but in most cases, is applied to only watercraft and equipment that are considered to be high risk, when other options are not available.

High Risk Waterbody - The determination of “high risk waterbody” is the prerogative of the responsible management entity. Some of the factors used to determine risk potential include:

Whether water quality parameters will support the survival, growth and reproduction of Dreissenid mussels

The amount and type of boater use

Proximity to Dreissenid positive or suspect waters

Whether the water in question is a headwater, water or power supply system or supports listed species

High Risk Watercraft/Equipment - Any vessel or piece of equipment that has operated on or in any waterbody known or suspected of having zebra or quagga mussels in the past 30 days or any watercraft or equipment that is not clean, and to the extent practical, drained and dry.

Screening Interview - Asking the vessel operator a series of questions prior to launching or entry that are designed to determine the level of risk based on the recent history of use. This should be an element of every intervention program.

Quarantine/Drying Time - The amount of time out of the water required to assure that all mussels and veligers are killed through desiccation. This time requirement varies widely depending on temperature and humidity conditions.

QID – A computer based proprietary tool developed by Quagga Inspection Services, LLC that allows for real time tracking of watercraft and equipment using vessel ID numbers and smart phone or computer technology.

Self-Inspection (Voluntary/Mandatory) - A self-inspection program can be implemented alone or as an “off-hours” adjunct to a more direct and comprehensive inspection program. This type of program involves requiring (mandatory) or requesting (voluntary) the cooperation of individual watercraft operators to complete an inspection of their vessel prior to launching by following a set of instructions and completing a checklist provided at an entry station or kiosk.

Reciprocity – The acceptance of watercraft/equipment inspection and/or decontamination by several or all jurisdictions when similar protocols and standards are employed by similarly trained and motivated professionals.

Watercraft/Equipment Inspection - Where all or selected watercraft are subjected to a thorough visual and tactile inspection of all exterior and interior surfaces, areas of standing/trapped water, trailer and equipment to determine the presence or likelihood of mussel contamination.

Watercraft Interception Program (WIP)- Any program which seeks to prevent the spread of Dreissenid mussels and other Aquatic Nuisance Species (ANS) on trailered watercraft or equipment by requiring that they be cleaned, and to the extent practical, drained and dried prior to launching.

Attachment 1: List of Agencies and Organizations Implementing Watercraft Interception Programs in the Western United States (January 2012)).

See separate file @ <http://www.aquaticnuisance.org/wit/reports>

Attachment 2: Results from November 2010 survey of WIP program managers regarding changes recommended for the UMPS Update

The questions and answers from this survey are presented below:

- 1. Have you used the current UMPS to develop, supplement or implement your individual agency/organization policies, protocols or standards for watercraft/equipment interception?**

Yes: 8 N/A: 5

- 2. Please list and explain any problems you have experienced in applying the current UMPS's in your interception program. Please be specific and identify what alternative(s) you have put into practice to improve either the effectiveness or efficiency of your program.**

None: 6 Issues: 7

- *Definitive description of Ballast Tank Decontamination*
- *Manpower shortage limits program*
- *Address access management options*
- *Lack of funding*
- *No Decon Equipment*
- *Better explanation of how to remove mussels from difficult areas*
- *Lack of authority*

- 3. Are you aware of any new technology(s) that have been or should be evaluated for inclusion either as replacement or adjunct to the current protocols and standards recommended by the UMPS? Please provide as much information as possible about the technology, test results, supporting research or sources of information.**

None: 11 New technology: 2

- *Quagga Inspection Database (QID)*
- *Electrochemical and Ozone*

4. ***Are you aware of any equipment or supply providers that should be added to the list of vendors found at the back of the current UMPS report? Please provide the vendors name, type of equipment/supplies available and the contact information for any new vendors provided.***

None: 12 New supplier: 1

- Royce Industries – Decon equipment provider*

5. ***Does your agency/organization use a system of identifying watercraft that have passed inspection or been decontaminated? Would you characterize that system as one of the following?***

Banding w/paper certificate _____ Banding only _____ Sticker w/ paper certificate _____ Sticker only _____ Paper certificate only _____ Other _____ (please explain)

*Banding/Cert: 1 Banding Only: 5 Sticker: 1 Banding/QID: 1
Other: 5*

6. ***Can you think of anything not covered by your comments on the UMPS document or by your answers here that we should consider in the revision and updating of the Uniform Minimum Protocols and Standards for Watercraft Interception Programs in the Western United States? Please detail.***

None: 10 Other Issue: 3

- Add bait reminder*
- Add FAQ*
- Optimum method of mussel removal*

Attachment 3: Utah Division of Wildlife Resources Self Inspection (and Certification) Form.

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, Red Fleet Reservoir, 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).

Stop the mussels!



Invasive mussels will destroy fisheries, ruin your boat and cost millions of dollars to control. Help us keep them out of Utah's lakes and reservoirs.

Before boating

Before you launch your boat, it must be mussel-free. It's the law!

After you complete the decontamination steps below, fill out and sign the back of this form. Or, to save time in the future, take the online Mussel-Aware Boater course at Wildlife.Utah.Gov/SelfCertification to receive a certification form that is valid for the rest of the year.

* Mandatory boat inspections at Lake Powell are routine.

Self-decontamination steps

Check the box as you complete each step

- Step 1:** Clean all plants, fish, mussels and mud off your boat.
- Step 2:** Drain all water, even from your ballast tanks, bilge, livewells and motor.
- Step 3:** Dry your boat and equipment for at least 7 days in summer, 18 days in spring/fall and 30 days in winter. Or, you can freeze winterized equipment for 3 days.

Professional decontamination

Professional decontamination is another option. Certified personnel use **high-pressure, scalding (140° F) water** to wash your trailer and boat inside and out, flushing your ballast tanks, bilge, livewells and motor.

To locate a professional decontamination unit, call 801-648-6315 in northern Utah, 435-790-8938 in northeastern Utah, 435-503-4066 in central Utah, 435-691-2427 in southern Utah or 435-630-3132 in southeastern Utah.

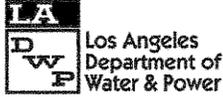
After boating

After you finish boating, remember to always decontaminate!

Visit StopTheMussels.org for more information.

Invasive mussel hotline: **1-800-662-3337**

**Attachment 4: Example of a boater screening interview form,
Crowley Lake Fish Camp - Los Angeles Department of Water & Power.**



Crowley Lake - Boat Use Survey

Date: _____ CF#: _____

1. What is your home state? _____ and zip code? _____

2. When was the boat last used (approximately)? _____

3. Where was the boat last used:

A. Name of last water body: _____

State: _____ County: _____

Number of days in water: _____

B. Name of the second to last water body: _____

State: _____ County: _____

Number of days in water: _____

Approximately how long ago was the boat in this water body? _____

4. Have you removed vegetation and drained any water from the boat since last use?

Yes No

The above is true and accurate, under penalty of perjury. I voluntarily give permission for any agent of the Los Angeles Department of Water and Power or Crowley Lake Fish Camp to thoroughly inspect the vessel referenced above for invasive species. I understand failure to comply will result in denial of ability to launch the above referenced vessel into Crowley Lake.

Name: _____ Signature: _____

Official Use Only		Inspected by:	
Description:	make and model	Inspection Result:	
Boat			
Vehicle			
Reason Denied	(circle all that apply)	WATER	DEBRIS MUSSELS

Attachment 5: Colorado Division of Wildlife and Colorado Division of Parks Watercraft Inspection Form.

State of Colorado

Inspection/Sample #: - -
Water Code Date (month, day, year) CL#

HIGH RISK (ANS) INSPECTION FORM

For use on High Risk Trailered Watercraft

Inspection Location: _____		Date/Time: _____		Water Code: _____	
Vessel Registration# (CL#): _____		Vehicle Tag #: _____		Trailer Tag. #: _____	
REASON FOR HIGH RISK INSPECTION (check all that apply)					
<input type="checkbox"/> Out of state registered or used out of state within last 30 days.					
<input type="checkbox"/> Been in infested waters within last 30 days: _____ (Name/State of water). Days since in infested: _____					
<input type="checkbox"/> Leaving infested waters after more than 24 hours at an infested reservoir					
<input type="checkbox"/> Big/Complex boat <input type="checkbox"/> Standing water present <input type="checkbox"/> Vol Request <input type="checkbox"/> Dirty/Crusty/Slimy below waterline					
<input type="checkbox"/> Entering/Leaving marina <input type="checkbox"/> Other: _____					
VESSEL INSPECTION (inspect very methodically and carefully)					
Overall look and feel of the hull (check box):					
<input type="checkbox"/> Clean/Smooth <input type="checkbox"/> Bumpy/Sandpaper feel <input type="checkbox"/> Other: _____					
<small>(if bumpy/sandpaper feel, then look at bumps with magnifying glass to see if mussels)</small>					
<input type="checkbox"/> Vessel Exterior Checked					
<input type="checkbox"/> Entire hull		<input type="checkbox"/> Trim tabs (top and bot.)		<input type="checkbox"/> Through hull fittings	
<input type="checkbox"/> Transom		<input type="checkbox"/> Transducers		<input type="checkbox"/> Pitot tubes	
<input type="checkbox"/> Anchors and ropes		<input type="checkbox"/> Depth sounders		<input type="checkbox"/> Water intakes/Outlets	
<input type="checkbox"/> Water holding pockets		<input type="checkbox"/> Recessed bolts		<input type="checkbox"/> PWC—foot recesses	
<input type="checkbox"/> Motor well		<input type="checkbox"/> Cavitations plate(s)		<input type="checkbox"/> Lights	
Sailboats:					
<input type="checkbox"/> Centerboard box					
<input type="checkbox"/> Rudder and transom					
<input type="checkbox"/> Keel					
<input type="checkbox"/> Fittings					
<input type="checkbox"/> Motor Checked					
<input type="checkbox"/> Exterior housings		<input type="checkbox"/> Propeller and assembly		<input type="checkbox"/> Propeller shaft	
<input type="checkbox"/> Rudders		<input type="checkbox"/> Propulsion system		<input type="checkbox"/> Lower unit	
				<input type="checkbox"/> Prop., shaft supports	
				<input type="checkbox"/> Gimbel area	
				<input type="checkbox"/> Propeller guards	
				<input type="checkbox"/> Water intake/Outlets	
<input type="checkbox"/> Trailer Checked					
<input type="checkbox"/> Rollers, bunks, pads		<input type="checkbox"/> License plate		<input type="checkbox"/> Trailer lights	
<input type="checkbox"/> Trailer springs		<input type="checkbox"/> Fenders		<input type="checkbox"/> Pockets and hollows	
				<input type="checkbox"/> Trailer wiring	
				<input type="checkbox"/> Trailer axles	
				<input type="checkbox"/> Wheels and tires	
				<input type="checkbox"/> Hangers	
<input type="checkbox"/> Interior/Equipment Checked					
<input type="checkbox"/> Bait and live wells		<input type="checkbox"/> Internal ballast tanks		<input type="checkbox"/> PFD's	
<input type="checkbox"/> Anchors		<input type="checkbox"/> Waterfowl decoys		<input type="checkbox"/> Nets	
				<input type="checkbox"/> Float cushions/belts	
				<input type="checkbox"/> Rope and equipment lockers	
				<input type="checkbox"/> Other equipment	
<input type="checkbox"/> Vessel Thoroughly Drained					
<input type="checkbox"/> Bilge plug or pump		<input type="checkbox"/> Bait and live wells		<input type="checkbox"/> Ballast tanks	
<input type="checkbox"/> Drain inboard motors fully by pulling plugs.				<input type="checkbox"/> Drain lower unit on outboard	
<input type="checkbox"/> Large boats, ask driver to activate bilge pump.				<input type="checkbox"/> Drain water cooled generators, swamp coolers with plugs	
<input type="checkbox"/> If entering a reservoir with any standing water and from infested or out-of-state waters in last 30 days, send to decontamination!					
<input type="checkbox"/> If entering a reservoir with standing water, require draining. If vessel cannot be drained and has more than 5 gallons, send to decontamination. For lesser volumes of water, assess risk to determine whether to decontaminate.					
<input type="checkbox"/> If leaving, drain and educate about Clean/Drain/Dry.					
<input type="checkbox"/> Closeout (if nothing is found)					
<input type="checkbox"/> Ask owner to replace bilge or other plugs		<input type="checkbox"/> Yell "stand clear"		<input type="checkbox"/> Thank them for cleaning/draining/drying	
VESSEL INSPECTION FINDINGS (check all that apply)					
<input type="checkbox"/> Did not find any identified or suspected ANS species					
<input type="checkbox"/> Found: <input type="checkbox"/> Large volume of water <input type="checkbox"/> Suspected ANS in water <input type="checkbox"/> Mussels <input type="checkbox"/> Vegetation					
<input type="checkbox"/> Other: _____ <input type="checkbox"/> Location(s): _____					
INSPECTION COMPLETED IN ACCORDANCE WITH STATE PROCEDURES:					
Inspected by (print # and name): _____					
Inspected by (signature): _____					

Attachment 6: Partial List of Decontamination Suppliers.

Power Wash Units and Attachments:

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

Greenfield Industries
P.O. Box 158
Monarch, Montana 59463
406-236-5549
www.greenfield-insustries.com

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

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

Hydro Tek Systems, Inc
2353 Almond Avenue
Redlands, CA 92374
(909) 583-9934
(909) 478-3724 fax
www.hydrotek.us

Best Marine Services
(For Power Wash Attachments Only)
12098 W 50th Pl
Wheat Ridge, CO 80033-2038
(303) 423-3311
www.bestmarineservice.com

Royce Industries
1380 E. Commercial Ave.
Meridian, ID 83642
(208) 377-8292
www.buyroyce.com

Prefix
1300 West Hamlin Road
Rochester Hills, MI 48309
(248) 650-1330
<http://www.prefix.com/clean/>

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

Watercraft Tracking Systems (QID):

Quagga Mussel Inspections
2150 Main Street, Suite 5
Red Bluff, California 96080
530-529-1512
mp@calparksco.com

Attachment 7: Description of Quagga Inspection Database (QID)

QID

Quagga Inspection Services, LLC has developed the Quagga Inspections Database, or



QID. This proprietary tool allows for the real time tracking of CF numbered vessels, out of state vessels, and other non-registered float craft as they access inspected lakes. The advantage of QID is that inspections and failures are recorded and transmitted in real time to all other inspection facilities in the district or consortium of regional lakes, making it possible to track vessels by type, location, or status on a quarantine list.

Lake administrators will also be able to review statistical data for the usage of their facilities including the number and times of launches, the types of vessels, and the zip code from which users originate.

This system can be accessed through any web enabled phone, PDA or laptop with an internet or cellular connection.

General Information

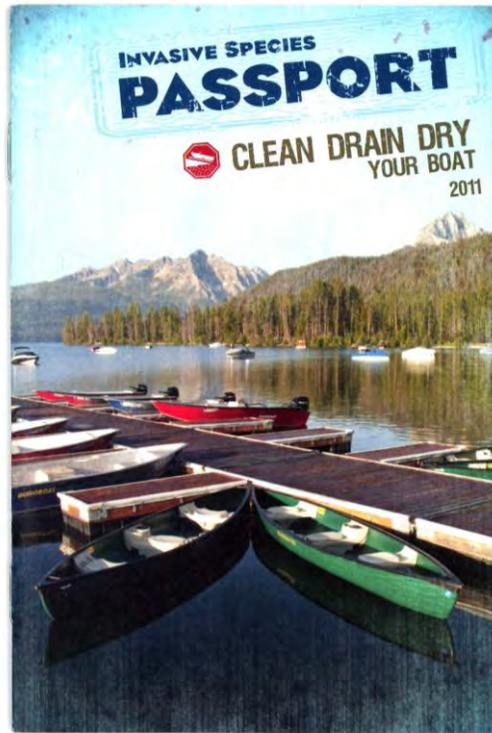
The California Parks Companies
2150 Main St.
Red Bluff, CA 96080

Phone: (530) 529-1512

Fax: (530) 529-4511

info@QuaggaInspections.com

Attachment 8: “Invasive Species Passport.” This system gives Idaho and Pacific Northwest Boaters an expedited “fast pass” when they repeatedly come through Idaho’s stations.



INSPECTED APR 02 2011 BRUNEAU	INSPECTED MAY 15 2011 OLD TOWN	
INSPECTED MAY 15 2011 SAMUELS	INSPECTED MAY 27 2011 BEAR LAKE	
INSPECTED MAY 27 2011 HENRY'S LAKE #1	INSPECTED MAY 27 2011 HENRY'S LAKE #2	
INSPECTED JUL 01 2011 RED FISH		