ADVANCING A REGIONAL DEFENSE AGAINST DREISSENIDS IN THE PACIFIC NORTHWEST

The Pacific Northwest is the largest region of the United States and Canada that does not have established populations of dreissenids.

The cost of an introduction to the Pacific Northwest:

$500,000,000+ annually

A conveyance fouled with dreissenids – invasive quagga mussels.
Photo credit: ISDA Invasives Program.

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A Report Prepared by the Pacific Northwest Economic Region and Pacific States Marine Fisheries Commission

Pacific NorthWest Economic Region

Advancing a Regional Defense against Dreissenids in the Pacific Northwest

A REPORT PREPARED BY THE PACIFIC NORTHWEST ECONOMIC REGION AND PACIFIC STATES MARINE FISHERIES COMMISSION

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Executive Summary

The Pacific Northwest is the only region of the United States and Canada that does not have established populations of quagga or zebra mussels (*Dreissenid* spp.). The Pacific Northwest (PNW) region, for the purposes of this defense strategy, includes the four U.S. states of Washington, Oregon, Idaho, and Montana as well as the western Canadian provinces of British Columbia, Alberta, and Saskatchewan.

The estimated costs associated with failing to prevent an invasion of dreissenids in the Pacific Northwest states and western Canadian provinces exceeds $500,000,000 million annually. Pacific Northwest states and western provinces, as well as a few key states that are source states for dreissenids, are spending more than $13.2 million annually on prevention efforts.

The region can be most effective in preventing an introduction by cooperating on a defense strategy that includes interdiction of contaminated boats entering the region at its perimeter.

An effective and implementable regional defense strategy includes prevention; surveillance and monitoring; rapid response and management capabilities; an aware, informed, an educated public; enhanced detection and response tools and technologies; and improved communication and information about key vectors and pathways. Prerequisites for an effective perimeter defense include awareness and support at the policy level and cooperation at the community level, regional and bilateral coordination to harmonize methods and procedures for preventing further spread, and capacity and allocation of adequate resources that provide for rapid response, and research that informs understanding of dreissenid biology and effective methods for control.

To successfully implement an aquatic invasive species regional defense effort for the Pacific Northwest would require an additional $20 million in funding to achieve five key priorities as well as implement an additional set of recommendations:

Five Key Priorities:

1. Contain dreissenids at the source.

2. Develop and foster long-term, sustainable funding solutions for dreissenid and other aquatic invasive species prevention efforts, including industry participation. Engage the greatest benefactors of dreissenid prevention efforts in funding those efforts.

3. Build and fund the institutional capacity and decision-making structures for collaboration in the region to monitor, assess, and renew regional AIS strategies, including enhancing the effectiveness of a regional perimeter defense and achieving consistency in public education and awareness.

4. Establish and implement a real-time rapid response notification database that incorporates commercial haulers into the system.

5. Annually coordinate watercraft inspection and decontamination stations in the Pacific Northwest and with neighboring states and provinces using an online database.

Additional Recommendations:

- Fully fund state and provincial Aquatic Nuisance Species Management Plans.
- Facilitate, through PNWER, consistent and comprehensive cross-border training for United States/Canada border patrol officers, equipping them with the necessary information, materials, and training to effectively prevent infested conveyances from crossing international borders.
- Develop boater movement models to predict the most likely locations for an introduction of dreissenids in the Pacific Northwest, and evaluate other risk screening models (e.g., cattle diseases) to identify primary points of introduction and potential partners.
- Request and document the status of vulnerability assessments for all hydropower facilities in the PNW annually as part of annual facility inspections.
- Ensure all chemical options for dreissenid treatment are registered for use in each state and province and that coordination among states and provinces continues through the established Rapid Response Working Group.
- Develop and support mechanisms to share resources across jurisdictions, such as the Interstate Pest Control Compact.
- Develop an AIS coordinator position in the US Army Corps of Engineers in Washington, DC as well as in Canada.
- Strengthen alliances with organizations (e.g., Tahoe Regional Planning Agency) and the western states and provinces through timely and consistent communication and collaboration, including sharing watercraft inspection and decontamination station information, and fouled conveyance interceptions via real-time online databases.
- Begin to develop a more comprehensive program that addresses mussels as a component of a Pacific Northwest Biosecurity program.

I. BACKGROUND

A comprehensive biosecurity approach that emphasizes minimizing invasive species introductions through risk management strategies focused on interdiction of vectors is the most successful approach to preventing new introductions of invasive species. This report highlights a set of strategies focused on preventing a dreissenid mussel introduction to the Pacific Northwest. The recommendations in this report could be used to inform the development of a comprehensive biosecurity plan for the Pacific Northwest that addresses numerous vectors and pathways affecting all industries and activities.

The Pacific Northwest (PNW) region, for the purposes of this defense strategy, includes the four U.S. states of Washington, Oregon, Idaho, and Montana as well as the western Canadian provinces of British Columbia, Alberta, and Saskatchewan. The PNW constitutes the only region in the United States and Canada (with the exception of the Nunavut and Maritime provinces in Canada and the far southeastern United States) that does not have established populations of dreissenids (Figure 1). Within this region, the Columbia River Basin is a major and shared water source that holds significant environmental and economic risks associated with dreissenid introduction.

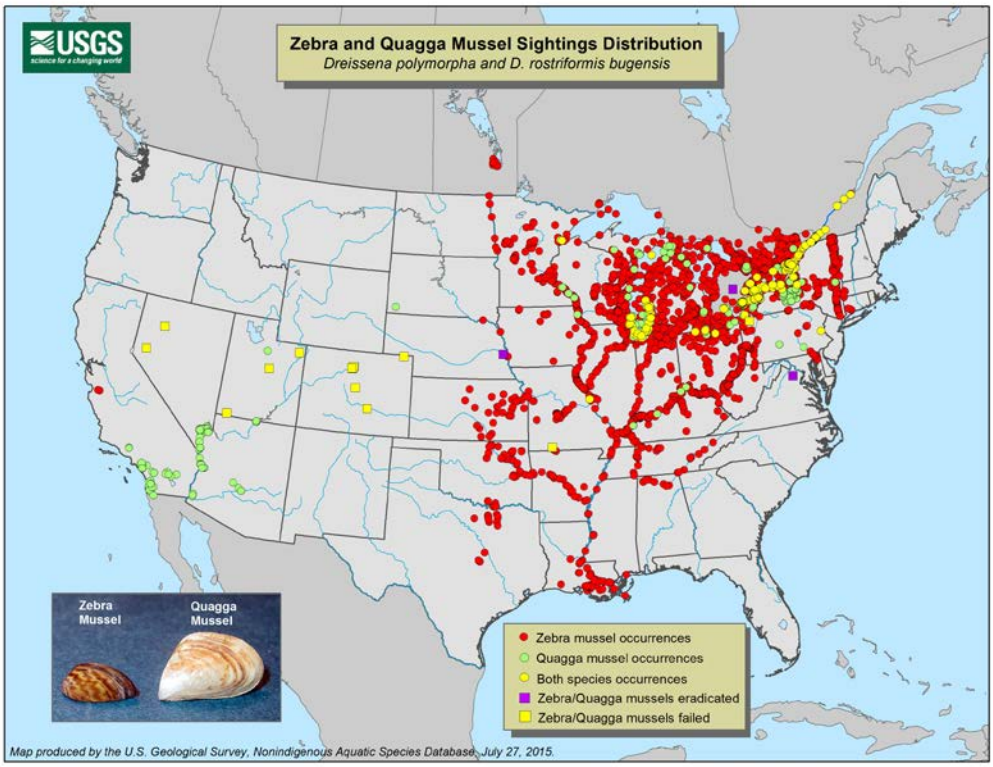

FIGURE 1. DISTRIBUTION OF ZEBRA MUSSELS AND QUAGGA MUSSELS IN NORTH AMERICA. SOURCE: USGS NAS (UPDATED JULY 27, 2015).

The Pacific Northwest Economic Region, a partnership of five PNW states (the four states mentioned above as well as Alaska) and five Canadian entities (the three Canadian provinces mentioned above as well as the Yukon and Northwest Territories), was tasked with developing a regional defense strategy using a prevention and containment framework for preventing the introduction of dreissenids into the PNW region.

The priorities for this project were to:

- Define and describe an effective, efficient, and practical regional defense (framework)—structure, cost, and policy needs.
- Work with stakeholders to assess possible sources of long-term sustainable funding for regional defense.
- Provide a high-level estimate of the avoided costs saved by focusing on prevention.
- Produce and distribute the framework to member states/provinces, Congressional delegation, stakeholders, and others.

In addition, a PNWER Invasive Species Working Group meeting was held in Seattle, Washington, in November 2014 to give representatives from the PNW region an opportunity to provide recommendations in nine areas: contingency planning, coordinated inspection and decontamination, containment, a coordinated approach across the Pacific Northwest, outreach and education, consistent messaging, assessment and monitoring, research and biocontrol and funding. Recommendations from this workshop were considered and included in this report.

II. REGIONAL DEFENSE DEFINITION

The Pacific States Marine Fisheries Commission (PSMFC) initially proposed a well-accepted definition for regional defense, which was modified by adding the word "collaborative" to emphasize the importance of partnerships to realize success:

Definition: Using resources in a cost-effective, interjurisdictional, coordinated, ***and collaborative*** response to prevent mussels from entering uninfested areas and to contain aquatic invasive species at their source.

III. KEY ENTITIES INVOLVED IN PNW DREISSENID PREVENTION EFFORTS

US federal and state governments and the Canadian federal government, provinces and territories are integral to implementation of dreissenid prevention efforts. In addition, the following organizations (Figure 3) play a key coordination/collaboration role: The Western Region Panel on Aquatic Nuisance Species, a non-governmental body to the Aquatic Nuisance Species Task Force (ANSTF) that serves as a forum for coordinating activities on ANS management in the West, identified a total of 42 different entities working on aquatic invasive species issues in 2013. A subset of these groups, which include both United States and Canadian representatives, are featured in this report because they represent some of the most active and effective organizations conducting activities associated with dreissenid prevention efforts:

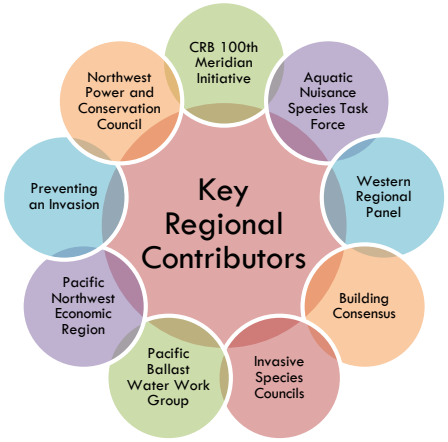

FIGURE 2. KEY REGIONAL CONTRIBUTORS TO AQUATIC INVASIVE SPECIES PREVENTION EFFORTS IN THE PACIFIC NORTHWEST.

- **Columbia River Basin Team - 100th Meridian Initiative (CRB)**—A cooperative effort between local, state, provincial, regional and federal agencies, and tribal sovereign nations, in the Columbia River Basin, the team is administered by the Pacific States Marine Fisheries Commission, with support from the USFWS, to prevent the westward spread of dreissenids and other aquatic nuisance species in North America. The group meets twice annually, serves as a coordination forum for dreissenid response, rapid response planning, and information sharing.
  - CRB Team Meeting Minutes – http://www.100thmeridian.org/Columbia_RBT.asp
  - AIS News - http://www.westernais.org/
  - Q/Z Monitoring – http://crbais.psmfc.org/monitoring/monitoring-for-aquatic-animals
  - Rapid Response Plan and Exercises – http://www.100thmeridian.org/Columbia_RBT.asp for exercise documents and plans.

- **Aquatic Nuisance Species Task Force (ANSTF)**—An interagency task force, co-chaired by the USFWS and NOAA, and established in 1991, that meets twice annually, consists of 13 federal members and 13 ex-officio members, and has six regional panels (19 western states and Guam comprise the Western Regional Panel). The ANSTF supports regional panels, approves state and interstate aquatic nuisance species management plans, implements a national aquatic nuisance species program and the 100th Meridian Initiative, promoted the development of Hazard Analysis and Critical Control Point (HACCP) plans, developed the Quagga-Zebra Mussel Action Plan for western US waters, approved the Quagga/Zebra Mussel Action Plan (submitted by the Western Regional Panel), and developed best management practices associated with aquatic nuisance species.
  - ANSTF Web Page: http://www.anstaskforce.gov/default.php
  - HACCP Web Page: http://www.haccp-nrm.org/

- **Western Regional Panel (WRP)**—A non-governmental advisory body to the ANSTF that assists in coordinating activities on aquatic nuisance species in the West. Its mission is to protect western aquatic resources by preventing the introduction and spread of non-native invasive or nuisance species into western marine, estuarine, and freshwater systems through the coordinated management and research activities of state, tribal, federal, commercial, environmental, research entities, industries, and other regional panels. The WRP leads the Building Consensus in the West committee, conducted a gap analysis of model law and regulations, is working with the marine industry to inform boat and motor design to reduce transport of aquatic invasives, contributes to updating watercraft inspection and decontamination training manuals, conducts inreach and outreach, and is advancing sampling lab standards and quality control for detection of aquatic invasives.
  - Western Regional Panel on ANS: http://www.fws.gov/answest/
  - Building Consensus in the West: http://seagrant.oregonstate.edu/invasive-species/invasive-mussels-west
  - Model Law & Gap Analysis: http://nsglc.olemiss.edu/projects/model-legal-framework/index.html
  - The Magic Website (WID Training): http://www.westernais.org/
  - ANS Task Force: http://www.anstaskforce.gov/default.php

- Quagga/Zebra Mussel Action Plan: http://www.westernais.org/media/witresources/qzap_final_feb2010.pdf
- **Building Consensus**—A working committee of the Western Regional Panel to protect uninfested waters of the West. The committee has produced:
  - An Action Plan to Implement Legal and Regulatory Efforts to Minimize Expansion of Invasive Mussels through Watercraft Movements in the Western United States;
  - Model Legislative Provisions for State Watercraft Inspection and Decontamination Programs;
  - From Theory to Practice: A Comparison of State Watercraft Inspection and Decontamination Programs to Model Legislative Provisions; and
  - Uniform Minimum Protocols and Standards for Watercraft Interception Programs for Dreissenid Mussels in the Western States.

- **Invasive Species Councils**—The Oregon Invasive Species Council, Washington Invasive Species Council, Idaho Invasive Species Council, Montana Invasive Species Advisory Council, Invasive Species Council of British Columbia, Alberta Invasive Species Council, and Saskatchewan Invasive Species Council work together on common messaging and signing to advance invasive species prevention efforts. Examples of joint campaigns include, *Buy It Where You Burn It* (firewood), *Squeal on Pigs* (feral swine), and *Clean, Drain, Dry* (aquatic invasives).

- **Pacific Ballast Water Group (PBWG)** —An ad hoc group, administered by the Pacific States Marine Fisheries Commission, formed in 1998 to foster coordination and formulate consensus solutions for safe, economical, and environmentally protective management strategies of common concern to regulators, managers, scientists and the commercial shipping industry on the West Coast. State and federal agencies, research institutions, and maritime industry representatives advance discussions associated with ballast water transfer, mid-ocean ballast water exchange, vessel inspection, compliance verification, enforcement, and pursuit of robust, safe, and practicable prevention methods.

- **Pacific Northwest Economic Region (PNWER)**—A public/private nonprofit created in 1991, and includes state, provincial, and territorial legislators (Alaska, Idaho, Oregon, Montana, Washington, British Columbia, Alberta, Saskatchewan, Northwest Territories, and the Yukon) committed to working across borders. The PNWER established An Invasive Species Working Group.

- **Preventing an Invasion**—A regional workshop held in May 2013 hosted by PNWER, Pacific States Marine Fisheries Commission (PSMFC), Portland State University, and the Northwest Power and Conservation Council (NWPCC) to coordinate and implement an action plan to advance Pacific Northwest dreissenid prevention efforts through regulations, policy, outreach, funding, research, and coordination. Outcomes of the workshop included signatories to a Declaration of Cooperation, workshops to advance regulatory review for dreissenid control, support the creation and updating of state rapid response plans, and create two working groups—a Rapid Response Working Group and a Vulnerability Assessment Team.

- **Northwest Power and Conservation Council (NWPCC)**—An interstate (ID, MT, OR, WA) compact established in 1980, under the Northwest Power Act, to prepare a 20-year power plan for the Pacific Northwest. The NWPCC is involved in regional fish, wildlife and power planning, with independent scientific review of fish and wildlife projects. Elements of its 2014 Columbia River Basin Fish and Wildlife Program focus on reducing threats from invasive species through preventing the establishment of dreissenids, monitoring and managing introduction pathways, developing regional coordination strategies and outreach tools. The Fish and Wildlife Program is implemented by four federal action agencies (e.g., Bonneville Power Administration, US Army Corps of Engineers, Bureau of Reclamation, and the Federal Energy Regulatory Commission).
  - For more information about the Council, see: www.nwcouncil.org
  - For more information about the F&WL Program, see: www.nwcouncil.org/fw/program/2014-12/Program.

IV. BASELINE INFORMATION ON PNW STATE AND PROVINCIAL DREISSENID PROGRAMS

Washington—Baseline information for the Washington State Aquatic Invasive Species Prevention and Enforcement Program was obtained from their 2011-2013 biennial report to the Washington Legislature. The Aquatic Invasive Species (AIS) program is a collaboration between the Washington Department of Fish and Wildlife's (WDFW) biological and enforcement divisions and the Washington State Patrol at their Port of Entry Weight Stations. AIS program management accomplishments during that two-year period include:

FIGURE 3. A MAP OF THE UNITED STATES AND CANADA, SHOWING THE GEOGRAPHIC RELATIONSHIP OF THE STATES AND PROVINCES.

- Adopted new state invasive species statutes (chapter 77.135RCW);
- Inspected 27,373 watercraft, of which 83 were found to be carrying invasive species and 19 were carrying dreissenids;
- Collected 1,425 dreissenid early detection samples at 174 sites in 73 different water bodies;
- Provided training to state law enforcement and U.S.-Canada Border Patrol officers;
- Implemented a new voluntary Watercraft Passport System (Figure 5); and
- Conducted outreach and education at numerous conferences and public sporting events.

Data from watercraft inspections illustrate that Washington's AIS program efforts are effective – 90% of boaters state they apply *Clean, Drain, Dry* practices between uses (from a low of 59% in 2009). WDFW is implementing a new authority that requires anyone entering Washington by road and transporting an aquatic conveyance that has been used outside the state to have documentation stating the conveyance is free from aquatic invasive species. Washington completed a dreissenid mussel rapid response plan in 2014.

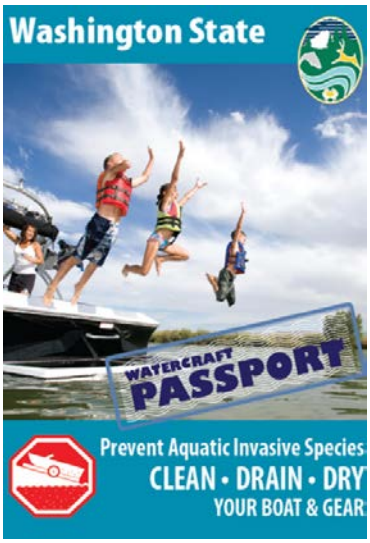

FIGURE 4. WASHINGTON STATE WATERCRAFT PASSPORT.

Oregon—Oregon's Aquatic Invasive Species Prevention Program produces a comprehensive annual report – the most recent report is the 2014 report. During 2014, the Oregon Department of Fish and Wildlife (ODFW) stationed five Watercraft Inspection Teams in Ashland, Brookings, Lakeview, Midland, and Ontario. ODFW conducted 11,280 watercraft inspections and 210 watercraft decontaminations; 17 for quagga or zebra mussels. Overall boater inspection compliance rate was 69%, a decrease of 3% from 2013. ODFW and the Oregon State Marine Board participated in 13 public events and sponsored 38 trainings or presentations for fishing groups, agency staff, concerned citizens and school groups. Since 2009, 1,028 Oregonians have attended watercraft inspection training classes. In 2014, revenue generated from AIS Prevention Permit totaled $670,235, which supported three full-time positions and 13 seasonal or part-time funded positions, and law enforcement activities, such as watercraft-inspection compliance and boater possession of an AIS Prevention Permit. State, county, and local law enforcement agents issued 957 warnings and 662 citations related to AIS permit violations. Additionally, law enforcement supported ODFW watercraft inspectors with boater compliance resulting in 55 citations and 36 warnings issued for failure to stop at a watercraft inspection station. Oregon updated its dreissenid rapid response plan in 2014. The Center for Lakes and Reservoirs conducts early detection monitoring in Oregon, which includes the citizen science-based Oregon Lake Watch Program.

Idaho—The Idaho Invasive Species Program began watercraft inspection in 2009. Inspections focus on highways, primarily near the state's borders, to maximize contact with boats that are travelling from mussel impacted areas (Figure 6). Inspections look for AIS and help educate the public on the "Clean Drain Dry" message. Vessels that are determined to be "high risk" are hotwashed to ensure any hidden AIS are destroyed. If viable mussels are found, the vessel can be impounded and held for 30 days to ensure that it is clean and free of live mussels. Since 2009, over 260,000 inspections have been conducted in Idaho and over 130 mussel-fouled boats have been intercepted in the state. In addition to watercraft inspection, the Idaho Invasive species program also conducts statewide invasive species survey and promotes invasive species awareness and education.

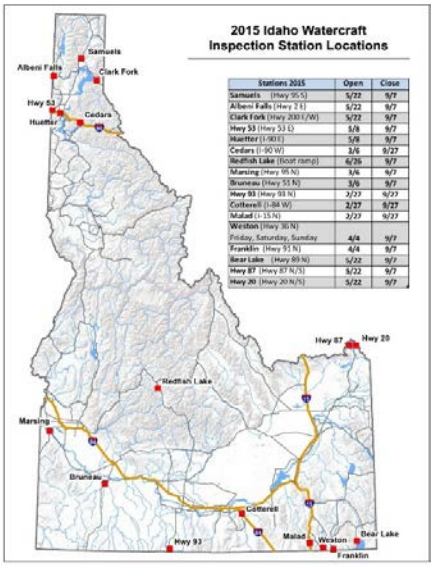

FIGURE 5. 2015 IDAHO WATERCRAFT INSPECTION STATION LOCATIONS.

Montana—Montana adopted an AIS Management Plan in 2002, and has been coordinating statewide efforts since 2004, including the operation of watercraft inspection and decontamination stations. The Aquatic Invasive Species Act of 2009 provided for cooperative agreements for detection and control, rulemaking authority, invasive species "management areas," and penalties, as well as the establishment of an invasive species account and possession and transfer prohibitions. The AIS Act was revised in 2013 to establish a statewide management area with mandatory watercraft inspections at key entry points to the state, as well as language clarifying search and seizure and quarantine. The updated Act also provides for General Fund appropriation and includes the Department of Transportation. 2015 legislation grants authority to outside entities to operate watercraft inspection stations with Department of Fish, Wildlife and Parks oversight and allow peace officers to enforce FWP AIS laws. Montana's 2014 Watercraft Inspection Report and Monitoring Report provide the latest information on inspection stations (Figure 7) and monitoring.

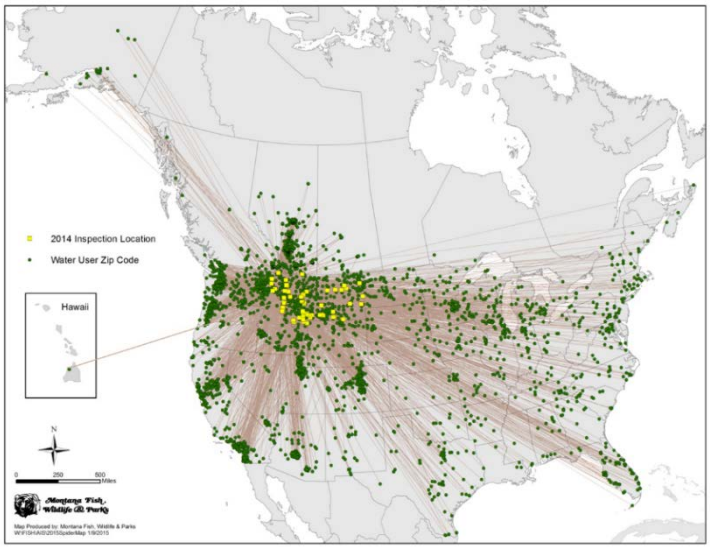

FIGURE 6. 2014 MONTANA WATERCRAFT INSPECTION STATION LOCATIONS (YELLOW) AND ORIGIN OF CONVEYANCES (GREEN).

British Columbia—Following BC's legislation change in 2012, making it illegal to transport or introduce dreissenid mussels, British Columbia recently produced three new invasive species strategic planning documents, the Invasive Species Strategic Plan (2014), the Invasive Species Early Detection and Rapid Response Plan for British Columbia (2014), and the Zebra and Quagga Mussel Early Detection and Rapid Response Plan for British Columbia, which provided the foundation for a new Mussel Defense Program initiated by the province in 2015. The program operates six roving highway inspection crews, with mobile decontamination units, located along the southern and eastern border of BC. The crews are manned by Auxiliary Conservation Officers with the powers to stop and inspect vehicles, and issue decontamination orders. The province also erected *Clean, Drain, Dry* signage at 24 locations near the BC/US and BC/Alberta border crossings (note: The signs state transport of aquatic invasive species is illegal). The program is cofounded by the government of BC, BC Hydro, and the Columbia River Basin Trust. Monitoring is ongoing in many lakes throughout the province, many in collaboration with stewardship groups. BC is also launching a "Don't Let it Loose" public outreach campaign.

Alberta—Alberta's AIS Program includes response, inspections, monitoring, education, and policy. Alberta monitors more than 60 waterbodies annually for dreissenid mussels and spiny waterflea and continues to promote the *Clean, Drain, Dry* message through many mediums, including billboards, boat launch signs, television, social media, and promotional products. In 2015, they ramped up efforts to inspect watercraft, with 12 inspection stations province-wide, all with hot wash capabilities. One station at the US border inspects traffic both ways in collaboration with Montana so that they may focus inspections on other more high risk areas. Alberta partnered with Montana to conduct a canine mussel detection pilot, using working dogs to inspect and detect dreissenids on boats; this has been expanded

to become a permanent part of the program with three mussel-sniffing dog crews. The provincial Fisheries (Alberta) Act was amended in 2015, which created a list of 52 prohibited species, made watercraft inspections mandatory, enhanced authorities relative to other AIS vectors and conveyances, provided for further regulation-making authority, and instituted quarantine provisions in the event of a detection of AIS in a waterbody. Alberta is currently finalizing a rapid response plan for dreissenids and launching the *Don't Let it Loose* campaign that will target non-watercraft AIS vectors such as the aquarium and pet industry, horticulture, live food fish markets, spiritual groups that practice ceremonial releases, and illegal fish stocking by anglers.

Saskatchewan—Dreissenids were discovered in Lake Winnipeg in 2013, and effort is being expended to contain them at the source. The Manitoba-Saskatchewan border is a priority for the province, along with high-risk water bodies that host organized fishing and wakeboard events. Select Saskatchewan Ministry of Environment received training from Minnesota DNR staff in watercraft inspection and decontamination at the end of June 2015 to support a pilot season of watercraft inspections with a focus in the southeastern part of the province near the Manitoba and North Dakota borders as well as other high profile waters. The inspections will take a roving approach, and will likely occur at boat launches of select high risk / high use waters to allow time for staff to gain experience and identify other safe locations (e.g. commercial weigh stations etc.).

The Ministry is also working with Saskatchewan Parks to have maintenance staff conduct inspections of boat docks, swimming area buoys and boat accessories, such as anchors, at the end of the season from waters in provincial parks. Veliger sampling will also occur on select waters that have been identified as high risk and/or high use.

Saskatchewan promotes an Adult Invasive Mussel Monitoring (AIMM) Protocol, designed for voluntary use by the province's Watershed Stewards. The program is coordinated by the Saskatchewan Ministry of Environment Fisheries Unit, and is a partnership project with non-government organizations and other agencies to detect invasive mussels through monitoring for adult dreissenids (e.g., shoreline surveys and substrate samplers).

A 30-second *Clean, Drain, Dry* public service announcement started airing on four CTV channels in May. Also, installation of boat launch signs and printed materials continues with assistance from watershed associations and other non-governmental organizations.

V. ELEMENTS OF AN EFFECTIVE PERIMETER STRATEGY

The goals of an effective dreissenid regional framework/strategy are to:

- Prevent the introduction of dreissenids (and other AIS) to the PNW region through containment at the source.
- Prevent the spread of dreissenids to the PNW region by intercepting contaminated conveyances through staffing watercraft inspection and decontamination stations at high-risk gateways that remain open during the times of year when infested conveyances are most likely to be transported.
- Improve surveillance and monitoring of dreissenids.
- Improve rapid response and management capabilities.
- Create an aware, informed, and educated public.
- Develop and enhance detection and response tools and technologies.
- Improve communication and information about key vectors and pathways.
- Ensure northwest states and western provinces collaborate and cooperate on a regular basis throughout the year.
- Establishment of a regional rapid response funding mechanism, such as the Interstate Pest Control Compact.

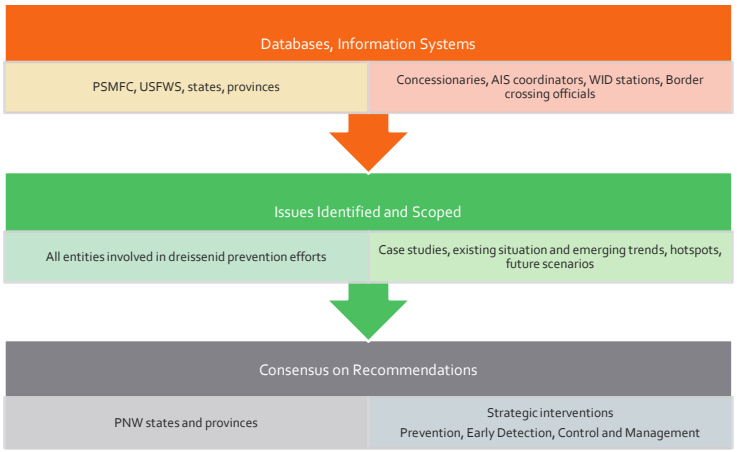

FIGURE 7. KEY ELEMENTS OF A DREISSENID REGIONAL FRAMEWORK.

The key elements of an effective framework include databases and information systems, identified and scoped issues, and consensus on recommendations (Figure 5). The prerequisites for such a framework include:

- Awareness and support at the policy level and cooperation at the community level.
- Regional and bilateral coordination that harmonizes methods and procedures for preventing further spread.
- Capacity and allocation of resources.
- Research to inform understanding of dreissenid biology and effective methods for control.
- Online tools to collaborate and share information (see "An Online Watercraft Inspection Station Tool below).

FIGURE 8. MAP ILLUSTRATING THE PNW REGION AND ITS PERIMETER FOR DREISSENID DEFENSE, WHICH INCLUDES EASTERN SASKATCHEWAN, NORTHERN AND EASTERN MONTANA, EASTERN AND SOUTHERN WYOMING, SOUTHERN IDAHO, AND SOUTHERN OREGON.

VI. REGIONAL MAPPING TOOLS

Online Watercraft Inspection Maps

During the spring of 2015, as part of the PNWER regional framework effort, the Pacific States Marine Fisheries Commission created a Watercraft Inspection and Decontamination (WID) Station Planning Application, an online tool to support the regional compilation and review of proposed WID station locations and hours of operation. Each state/province now has access to a password-protected web mapping application for its jurisdiction (Figure 10). The tool allows AIS coordinators (PNW region aquatic invasive species state and province program coordination leads) to confirm and modify information collected on the different types of WID stations (e.g., roving, rampside, and highway) that are currently operating or planned using current funding. Each coordinator can also add new locations or propose extended hours/calendar days for existing sites should additional funding exist.

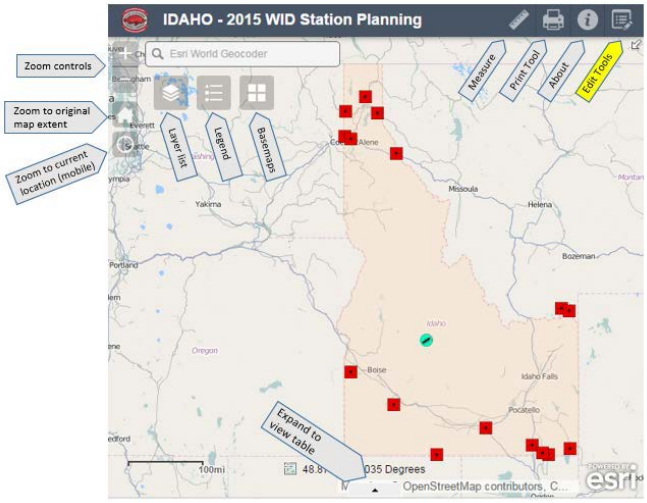

FIGURE 9. SCREENSHOT OF IDAHO 2015 WATERCRAFT INSPECTION STATION LOCATIONS.

General comments about a site and information on prior years' interceptions or hourly operating costs can also be recorded and accessed.

Layers of information can be turned on and off to reveal different attributes of the database. For example, layers include PNW region watercraft inspection stations, locations of fouled boat interceptions, currently planned inspection efforts, priority stations if additional funding were to be received, boundaries of the PNW region states and provinces, and the geographic boundary of the Columbia River Basin.

In addition, when an AIS coordinator makes a change to the database, that information is uploaded real-time, and can be viewed, not only in the jurisdiction's database viewer, but in a password-protected region-wide viewer. This allows AIS coordinators to view attributes of all existing and proposed WID stations throughout the region, enhancing coordination and collaboration.

Application users can export screen shots as pdf files for reports and other uses. Figures 11 and 12 illustrate the different types of existing inspection stations. These mapping tools allow the AIS coordinators to assess WID station effort location compared to actual past interception location and identify key gaps. Other layers shown in this illustration are the PNW region boundary and the Columbia River Basin.

Table 1 depicts the number of conveyances inspected in the PNW region (and neighboring states and provinces) in 2014, and includes information on the source of the conveyances as well as their destination. Figure 13 emphasizes the states with the most interceptions of infested conveyances from

2012-2013, and Figure 14 identifies the Lower Colorado Region, the Great Lakes, Lake Mead, Lake Pleasant, Lake Powell, and Lake Havasu as key sources for contaminated conveyances for boats headed to the Pacific Northwest.

It is important to understand that no one station is the key to prevention efforts. There are examples of fouled conveyances passing through stations, or avoiding stations on certain roadways. As a result, a network of perimeter and interior stations, including permanent and roving stations, is integral to preventing a dreissenid introduction.

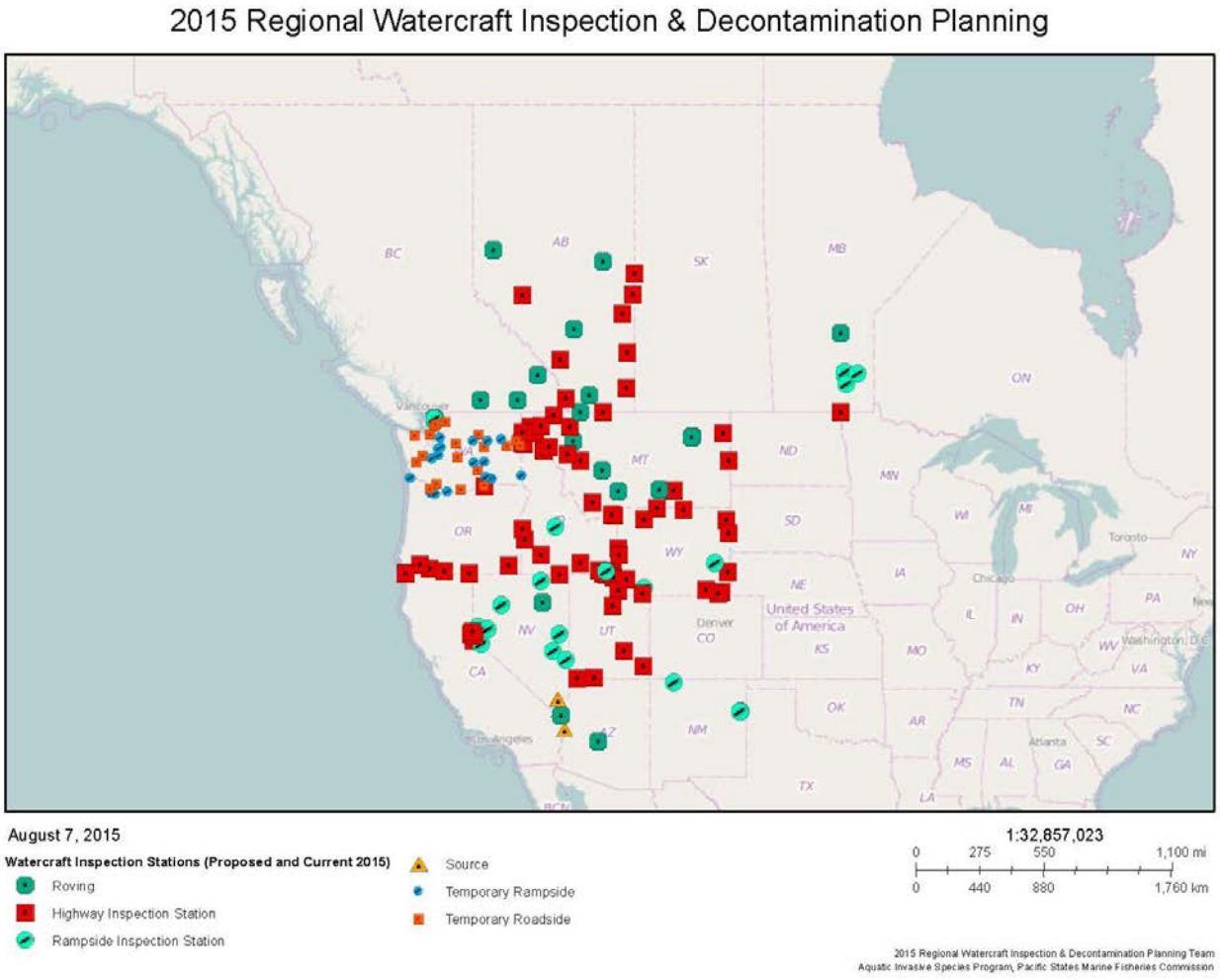

FIGURE 10. SCREENSHOT OF 2015 REGIONAL WATERCRAFT INSPECTION AND DECONTAMINATION LOCATIONS IN THE PNW REGION. SOURCE: PACIFIC STATES MARINE FISHERIES COMMISSION.

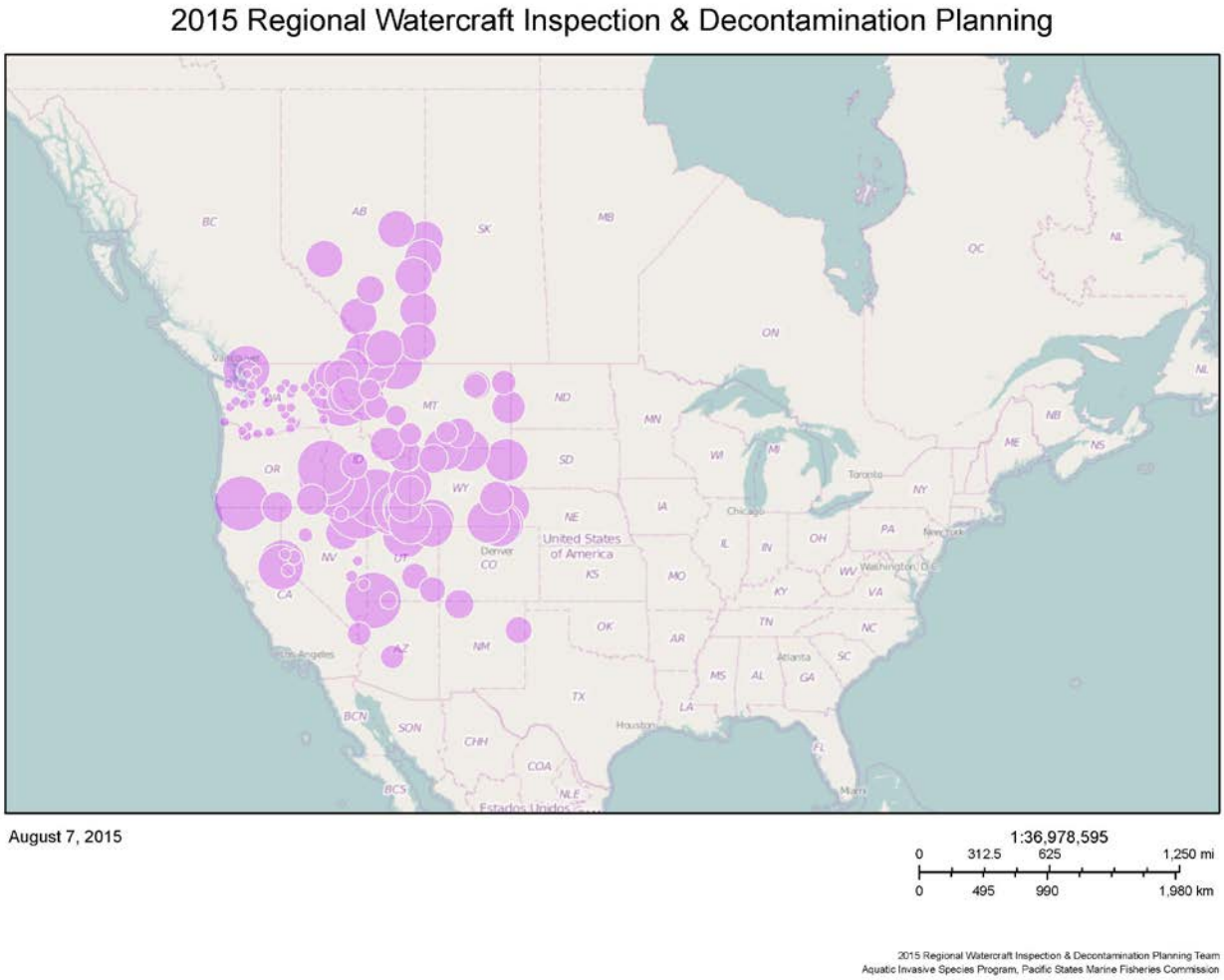

FIGURE 11. PLANNED 2015 WATERCRAFT INSPECTION AND DECONTAMINATION STATIONS. THE SIZE OF THE CIRCLE INDICATES THE AMOUNT OF EFFORT (I.E., THE LARGER THE CIRCLE, THE MORE HOURS AND DAYS THE STATION IS OPEN).

Table 1. 2014 Watercraft inspection/interception program data by select states and provinces. Source: Pacific States Marine Fisheries Commission.

STATES/ PROVINCES	# BOATS INSPECTED	FOULED DREISSENID BOATS INTERCEPTED	ORIGIN	DESTINATION
MONTANA (Montana Fish, Wildlife and Parks)	34,121	3	**Indiana** - Lake Michigan (1) **Ohio** - Lake Erie (1) **Ontario** - Oakville (1)	**Montana** – Missoula (1), Lima (1) **Washington** - Bothell (1)
OREGON (Oregon Department of Fish and Wildlife)	11,490	11	**Illinois** - Lake Michigan (1)[1] **Lake Powell** (1) **Great Lakes** (1) **Michigan** - Lake Michigan (1) **Minnesota** - Lake Minnetonka (1) **Nevada** - Lake Mead (1) **Ohio** - Lake Erie (1) **Texas** - Lake Lewisville (1) **Wisconsin** - Lake Superior (1), Lake Michigan (2)	**Washington** – Seattle (1), Puget Sound (1), Other (4) **Oregon** – Salem (2) **Columbia River** (1) **Willamette River** (1) **Brownlee Reservoir** (1)
WASHINGTON[2] (WDFW) Lake Whatcom, Lake Samish – Bellingham	15,040 7,859	3[3] 1	**Nevada** – Lake Mead (1) **Arizona** – Lake Mead (2) **Arizona** - Lake Havasu (1)	Washington – Lake Roosevelt (2), Undetermined (1) **Washington** - Lake Whatcom (1)
IDAHO[4] (Idaho Department of Agriculture)	49,380	15	**Minnesota** (2) **Ohio** - Lake Erie (2) **Michigan** - Lake Huron (1) **Iowa** - (1) **Lake Pleasant** (2) **Lake Powell** (1) **Great Lakes** (1) **Nevada - Lake Mead** (5)	**Idaho** - Lake Lowell (2), Pend Oreille (1), Lake CDA (1), Marsing (1), **Washington** - Seattle (2), Newman Lake (1), Rochester (1) **Montana** - Dillon (3) **British Columbia** - Sooke (1), Vancouver (1) **Alberta** - Chestermere (1)
WYOMING[5] (Wyoming Game and Fish Department)	40,587	10	**Illinois** - Fox Lake (1) **Iowa** - Mississippi River (1), Other (1) **Minnesota** - Lake Minnetonka (2) **Wisconsin** - Sturgeon Bay (1) **Arizona** - Lake Pleasant (2), Lake **Havasu** (1) **Texas** - Lake Texoma (1)	**Idaho** (1) **Washington** – Seattle (1), Other (1) **Oregon** – Pacific Ocean (1), Other (1) **Colorado** – Horsetooth Reservoir (1) **California** – San Francisco Bay (1) **Wyoming** – Boysen Reservoir (1) **Flaming Gorge Reservoir** (1) **North Dakota** – (1)
UTAH (Utah Department of Wildlife Resources)	106,000	5	Nevada – Lake Mead (5)	Utah – Utah Lake (3), Jordanelle Reservoir (1), Salt Lake City (1)

STATES/ PROVINCES	# BOATS INSPECTED	FOULED DREISSENID BOATS INSPECTED	ORIGIN	DESTINATION
COLORADO (Colorado Parks and Wildlife)	428,457	11	**Unknown** (4) **Wisconsin** (2) **Nevada** – Lake Mead (1) **Lake Powell** (1) **Arizona** – Lake Pleasant (1), Lake Havasu (2)	**Colorado** – Pueblo State Park (2), Horsetooth Reservoir (1), Chatfield State Park (2), Curecanti National Recreation Area (1), SW Colorado (3), Spinney Mountain Reservoir (1), Lake Granby (1)
CALIFORNIA[6] (California Department of Food and Agriculture)	110,053	112	**Lower Colorado River** (66) **Lake Mead** (16) **Lake Havasu** (14) **Lake Mohave** (3) **Great Lakes** (10) **Michigan** – Gull Lake (1), Other (1) Tennessee (1)	**California** (105) **Nevada** – Incline Village (1), Henderson (1) **Oregon** – Portland (1) **Arizona –** Bullhead City (2), Lake Havasu City (1) **Alaska** – Ketchikan (1)
LAKE TAHOE (Tahoe Regional Planning Agency)	8,000	11	**Unknown** (3) **Lake Michigan** (1) **Lake Mead** (3) **Lake Havasu** (2) **Mississippi River** (1) **Lake Mohave** (1)	**Lake Tahoe** (11)
Arizona[7] (Arizona Game and Fish Department)	96	4	**Arizona** – Lake Pleasant (3), Lake Havasu (1)	**Arizona** – Lake Powell (2), Bartlett Lake (1) **Washington** – Chinook (1)
New Mexico (New Mexico Fish and Game)	7,899	0	0	0
NEVADA[8] (Nevada Department of Wildlife)	1,331	0	0	0
ALBERTA (Alberta Ministry of Environment and Sustainable Resource Development)	3,747	3	**New York** – Lake Saratoga (1) **Lake Ontario** (1) **Michigan** (1)	**Alberta** – Lethbridge and St. Mary Reservoir (1), Grand Prairie (1) **Alaska** (1)
BRITISH COLUMBIA (Ministry of Environment)	132	1	**Arizona** – Lake Pleasant (1)	**Unknown** (1)
TOTALS	**759,772**	**187**		

* Note: The data provided here is primarily from state- or provincial-managed programs. Additional inspections also occur at the local level and are not quantified here (California has a number of local inspection programs, see Watercraft Inspection Programs in California Contact Information (PDF)). Intercepted fouled boats in one state are often passed to another state for decontamination. To avoid double counting to

the best extent practicable, fouled boats are attributed to the state where they are first encountered. The data is for fouled boats only and does NOT include high risk boats that came from an infested waterbody that may have veliger contaminated raw water (e.g. ballast, bilge, bait well).

[1] Note: Lake Michigan is listed twice because both Illinois and Michigan each reported origins of infested boats from each of these two states.

[2] Note: WDFW decontaminates conveyances intercepted in other states.

[3] Note: Two mussel-fouled watercraft self-reported that had not been stopped at other state inspection stations and were decontaminated. Thirteen infested watercraft passed through from other states and were re-inspected; one required additional decontamination.

[4] Note: Two watercraft with false dark mussels (*Mytilopsis leucophaeata*) were intercepted.

[5] Note: One watercraft with false dark mussels was intercepted.

[6] Note: Six watercraft with false dark mussels were intercepted.

[7] Note: 13 boats were decontaminated from Lake Havasu; these boats did not have visible mussels.

[8] Note: NDOW performed 246 decontaminations at Lake Mead NRA in 2014 (through October 31).

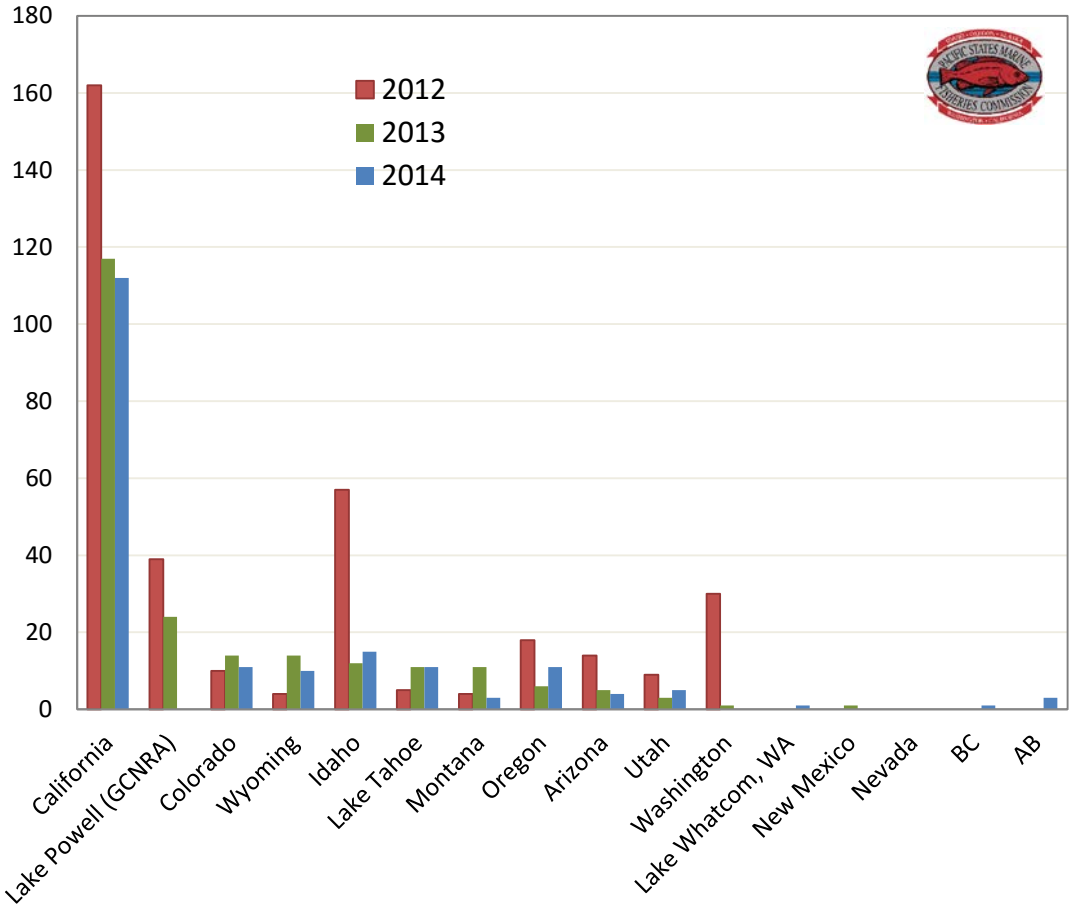

FIGURE 12. CONTAMINATED DREISSENID WATERCRAFT INTERCEPTED BY STATES/PROVINCES FROM 2012-2014. SOURCE: PACIFIC STATES MARINE FISHERIES COMMISSION.

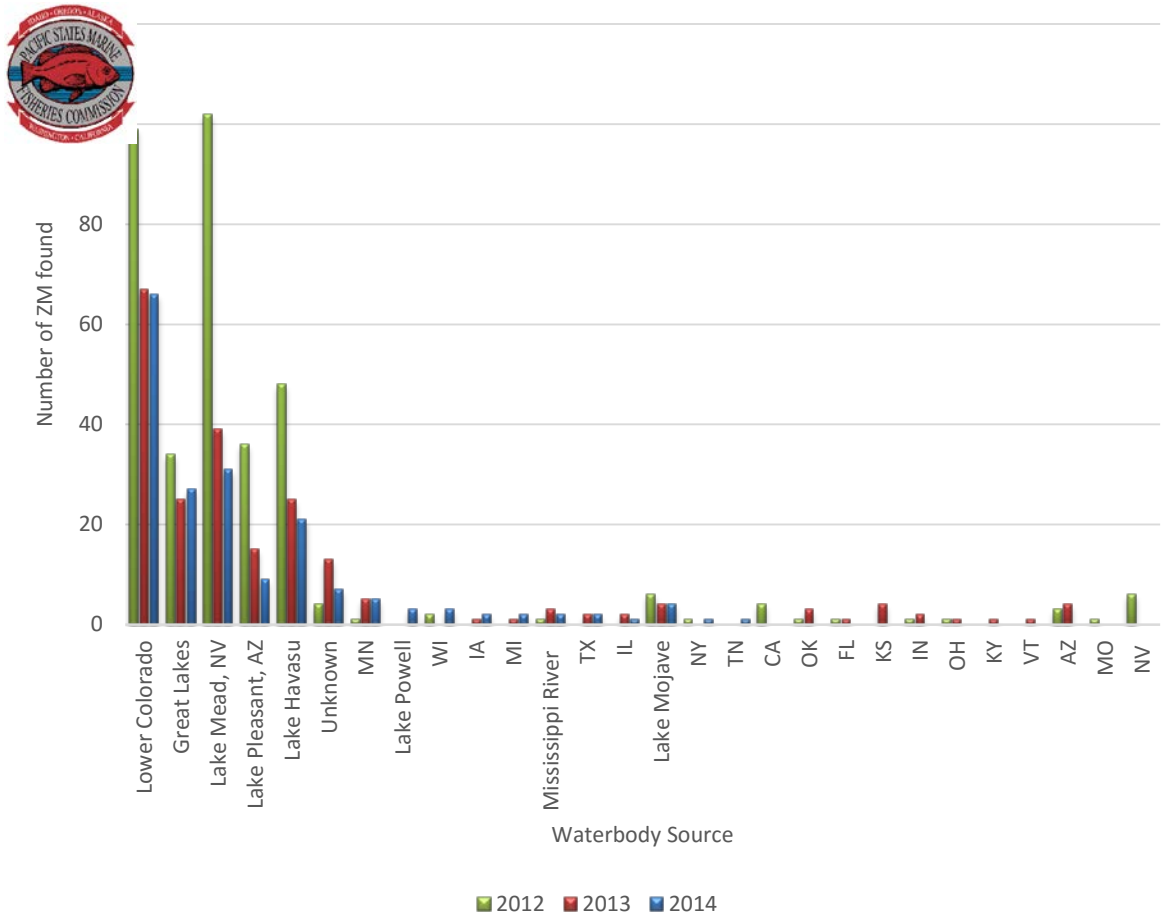

FIGURE 13. SOURCE OF INTERCEPTED WATERCRAFT WITH ADULT DREISSENID MUSSELS 2012-2014. SOURCE: PACIFIC STATES MARINE FISHERIES COMMISSION.

Early Detection Mapping

Portland State University developed a set of monitoring protocols to detect dreissenids in Oregon; these protocols are being replicated in many PNW states and provinces (Figure 12), and include sampling in water bodies with high to medium risk of dreissenid mussel introduction and/or establishment as well as water bodies with large amounts of boater recreational use and/or exhibited dissolved calcium concentrations and pH values conducive for mussel survival and growth. Sampling targets both veligers and adult life stages, occurs throughout each water body, is focused during the period of expected peak mussel spawning, incorporates practices to minimize cross-contamination and unintentional transfer of organisms among water bodies, and uses trained personnel to collect quality veliger samples.

Developing volunteer programs to enhance detection of dreissenids in the Pacific Northwest is integral to success. Programs, such as Saskatchewan's Adult Invasive Mussel Monitoring (AIMM) Protocol, or Portland State University's Oregon Lake Watch Program, are examples that can be replicated throughout the region.

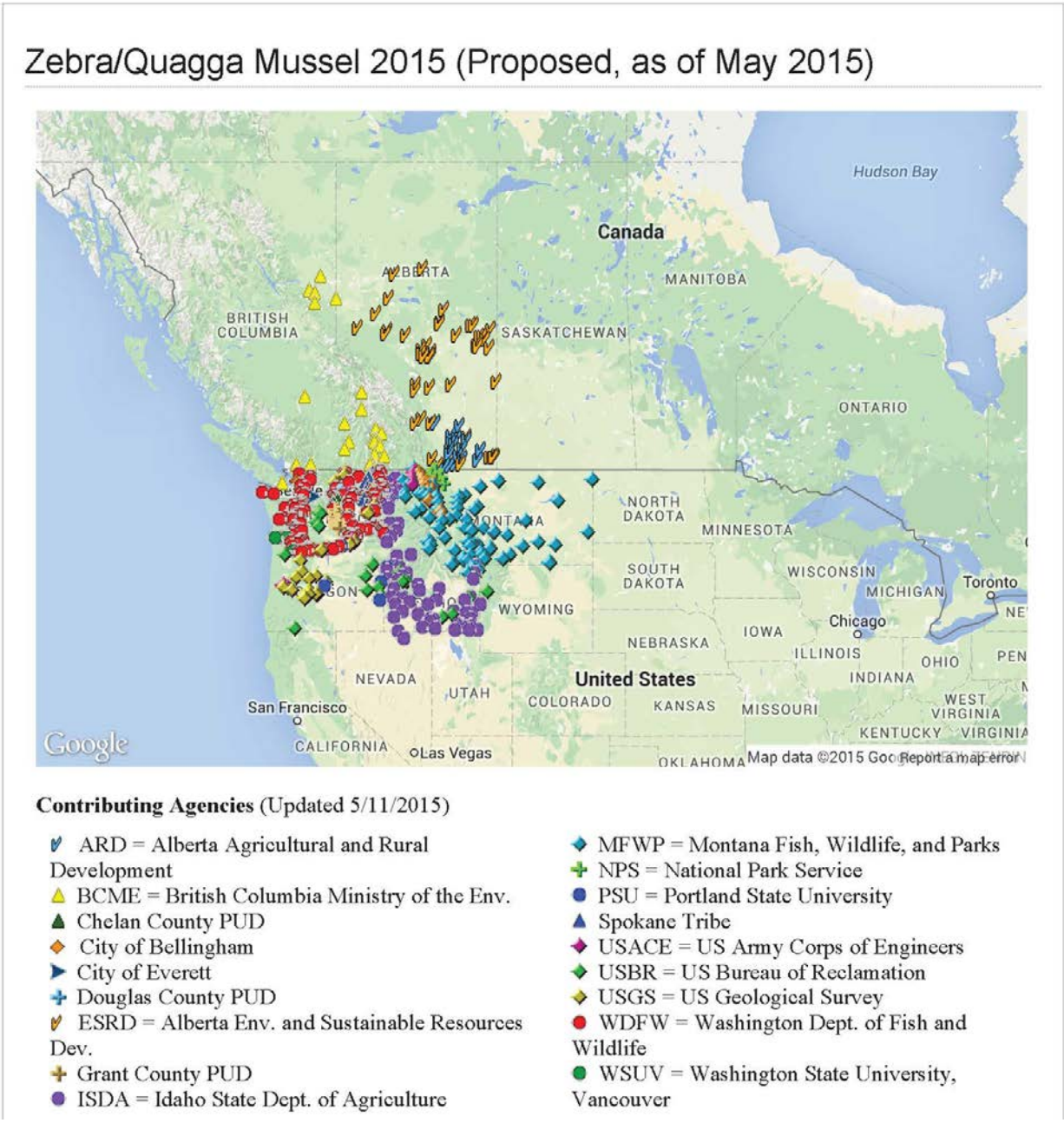

FIGURE 14. COLUMBIA RIVER BASIN AQUATIC INVASIVE SPECIES DATABASE ILLUSTRATING ZEBRA/QUAGGA MUSSEL MONITORING LOCATIONS IN 2014. SOURCE: HTTP://WWW.CRBAIS.PSMFC.ORG.

VII. THE ESTIMATED COSTS OF A DREISSENID INTRODUCTION TO THE PNW

The estimated costs associated with failing to prevent an invasion of dreissenids in the Pacific Northwest exceed $500,000,000 million annually.

The estimated cost associated with failing to prevent an invasion of dreissenids in the PNW region is a compilation of several sources that have conducted economic assessments to evaluate key (not comprehensive) costs associated with dreissenid establishment, including:

Alberta—$75,540,773 (CAD) (Neupane, A. 2013. An estimate of annual economic cost of invasive dreissenid mussels to Alberta. ESRD.)

British Columbia—$42,962,102 (CAD) (Robinson, D. C. E., D. Knowler, D. Kyobe and P. de la Cueva Bueno. 2013. Preliminary damage estimates for selected invasive fauna in B.C. Report prepared for Ecosystems Branch, BC Ministry of Environment, Victoria, BC by ESSA Technologies Ltd., Vancouver, BC. 63pp.)

Idaho—$94,474,000 (Idaho Aquatic Nuisance Species Taskforce. 2009. Estimated potential economic impact of zebra and quagga mussel introduction into Idaho. Prepared for the Idaho Invasive Species Council.)

NW Power and Conservation Council's Independent Economic Advisory Board - Tens of hundreds of millions (Independent Economic Analysis Board. 2013. Economic Risk of Zebra and Quagga Mussels in the Columbia River Basin, Document IEAB 2013-2). This document was an update of their 2010 document, Economic Risk Associated with the Potential Establishment of Zebra and Quagga Mussels in the Columbia River Basin.

Other studies associated with the economic effects of dreissenids can be found here.

Based on existing analyses, the following industries and programs that are at greatest risk of dreissenid establishment include those that rely on water as a key element of their function:

- Power generation/hydropower/dams
- Drinking water systems
- Water management and irrigation structures
- Water diversion intakes
- Boating facilities and boater maintenance
- Fish hatcheries and aquaculture
- Recreational fishing, golf courses

Every industry and citizen within each PNW jurisdiction would benefit from an effective prevention strategy. In regions where dreissenids exist, the cost to manage these invasives has been borne by water users, from those that irrigate to those that consume drinking water.

VIII. THE CURRENT EXPENDITURES TO PREVENT A PNW INTRODUCTION

Four Pacific Northwest states and three western provinces, as well as a few key states that are source states for dreissenids, provided information on annual costs of preventing the spread and introduction of dreissenids. The costs total $13.2 million spent annually (based on 2014–2016 data) (Table 2), and are used to support key elements of dreissenid and aquatic invasive species programs (Figure 13). It is important to recognize that efforts outside the region, particularly those associated with containment at the source, are essential to supplement prevention efforts within the region.

Table 1. Average annual state and provincial dreissenid prevention effort costs, including watercraft inspection and decontamination, outreach, and monitoring.

Pacific Northwest States and Provinces	Amount	Source
Alberta	**$1,500,000**	K. Wilson, Environment and Parks
British Columbia	***$814,834**	M. Herborg, BC Ministry of Environment
Saskatchewan	****$274,149**	C. Doherty, Saskatchewan Ministry of Environment
Idaho	**$1,250,000**	T. Woolf, Idaho Department of Agriculture
Montana	**$1,140,000**	T. Boos, Montana Fish, Wildlife and Parks
Oregon	**$542,340**	R. Boatner, Oregon Department of Fish and Wildlife
Washington	**$420,000**	A. Pleus, Washington Department of Fish and Wildlife
	$5,941,323	**TOTAL**
States and Provinces Adjacent to the PNW	**Amount**	**Source**
Wyoming	**$800,000**	B. Bear, Wyoming Game and Fish Department
California/Nevada – Lake Tahoe	**$1,500,000**	D. Zabaglo, Tahoe Regional Planning Agency
California	*****$2,931,207**	D. Norton, California Department of Fish and Wildlife
Nevada	**$700,000**	K. Vargas, Nevada Department of Wildlife
Utah	**$1,350,000**	J. Nielson, Utah Department of Wildlife Resources
	$7,281,207	**TOTAL**
	$13,222,530	**GRAND TOTAL**

*Expressed in US dollars.
**This is an estimate of the amount that will be expended in 2015-16 for equipment and salaries. It does not include that portion of the program carried out by the Communications Branch and Compliance and Field Services Branch. These funds are expressed in US dollars.
***In California, watercraft inspection programs at individual waterbodies are implemented and conducted by the local water manager. These programs and fees vary by waterbody and are not tracked by the state. For information on boating restrictions and inspections please contact the waterbody manager directly. Note: Colorado invests $4,000,000 annually in watercraft inspection programs. They do not implement roadside inspections.

IX. FUNDING NEEDED TO PREVENT AN INTRODUCTION OF DREISSENIDS

Four PNW states and three western provinces are currently investing almost $6 million annually, and in combination with neighboring western states, over $13.2 million is being spent annually to prevent the spread of dreissenids and to prevent introductions to uninfested water bodies. These figures are very conservative, as they are focused primarily on watercraft inspection and decontamination efforts, and do not include costs expended by federal agencies, utilities, academia, and others to implement monitoring, research, vulnerability assessments, etc.

Prevention efforts are saving PNWER region states and provinces more than $500,000,000 annually.

It is estimated that an additional $20 million is needed to more adequately protect the Pacific Northwest from an introduction of dreissenids and create institutionalized programs that will ultimately protect the region from many other types of aquatic invasive species, as well. This funding is needed to:

- Implement state aquatic invasive species management plans;
- Enhance watercraft inspection and decontamination station hours of operation and numbers of days open;
- Provide adequate training to volunteers, staff, and border patrol agents; and
- Implement consistent outreach and messaging associated with the movement of aquatic invasive species.

An influx of an additional $20 million in funding[1] would support two tiers of priorities – a $4 million expansion of watercraft inspection and decontamination efforts, including an infusion of funding to support containment at the source:

Highest Priority - $4 million to support expansion of watercraft inspection and decontamination stations and supporting prevention activities:

- About $4 million in funding is needed to further support watercraft inspection and decontamination stations, build institutional capacity, produce outreach materials, training, signage, monitoring, research, and containment at the source.
    - **Watercraft inspection and decontamination stations:** Increased WID efforts in the following locations ($1,977,969) - State officials would be willing to incrementally increase their WID station efforts with additional support (see Table 3):
        - Oregon-$410,000
        - Montana-$83,000
        - Washington-$694,000
        - Wyoming-$718,000

[1] Note: The source of funding the region is currently exploring is US federal funding and would likely have to be spent in the United States, but could likely be spent at Canada-US border stations, as well. Because funds would likely have to be disbursed to US entities, neither Canadian provinces nor their programs are listed in this section (other than border programs).

- **Build and fund the institutional capacity for collaboration in the region to monitor, assess, and renew regional AIS strategies, including enhancing the effectiveness of perimeter defense, on an annual basis** - $647,030

- **Produce *Clean, Drain, Dry* pamphlets and support training** for United States/Canada border patrol (a modification of Alberta's pamphlet (Figure 14)) - $25,000

- **Produce highway signs** at the borders of the United States and Canada - $100,000

- **Increase monitoring** to ensure early detection of dreissenids in the region - $200,000

- **Conduct research** - Development of boater movement models to predict the most likely locations for an introduction of dreissenids in the Pacific Northwest - $50,000

- **Containment at the source** (outside of the PNW and CRB) - directed at supporting outreach in places were contaminated sources of water bodies pose the greatest risk to the PNW - $1,000,000

$16 million to support Aquatic Nuisance Species (ANS) Management Plans:

- **ANS Management Plans** – Many of the state ANS management plans (Figure 16) were adopted in the early 2000s, and none of them have been funded at the recommended level. In fact, the majority receive less than $25,000 annually to implement. Fully funding state ANS plans will bolster dreissenid prevention efforts, and aquatic invasive species prevention efforts, in the region. As an example, in 2001, Oregon estimated it would cost at least $3 million to adequately fund aquatic invasive species efforts in the state. A new influx of $4 million in 2015 dollars, combined with existing programs and budgets, would fully support state aquatic invasive species efforts.

The 2014 Water Resources Reform and Development Act (WRRDA) has the potential to provide the needed $20 million in funding long term. However, in the interim, the potential exists for $4 million of that $20 million to be allocated specifically to advance dreissenid prevention efforts in the PNW region.

An initial $4 million influx of WRRDA funding would supplement the existing state and provincial commitment of almost $6 million. If WRRDA funds were appropriated to the recommended $20,000,000 levels, the additional $16,000,000 should be dedicated to fully supporting the PNW state ANS management plans, which would bolster efforts to protect the Columbia River Basin and other waterways from the economic, environmental, and social effects of aquatic invasive species introductions.

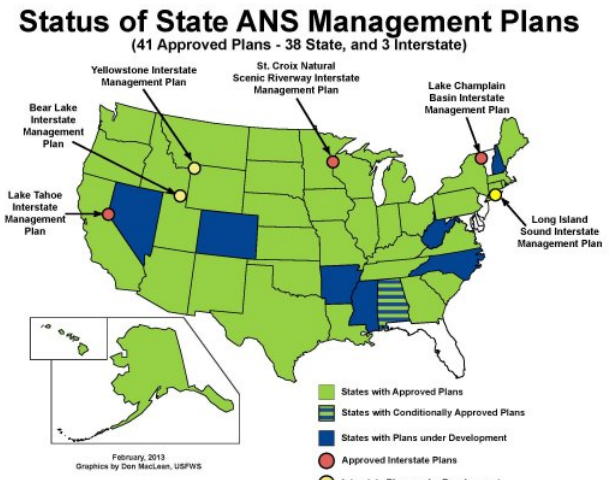

FIGURE 15. STATUS OF ANS MANAGEMENT PLANS. SOURCE: ANS TASK FORCE.

Table 2. Estimated initial costs to incrementally increase the capacity of watercraft inspection and decontamination stations in the lower 48. Source: State AIS Coordinators.

State	Location	Route	Current opening date	Current closing date	Current hours of operation	Proposed opening date	Proposed closing date	Proposed hours of operation	Cost per hour to run station	$ needed to increase capacity
OR	Brooking POE	Hwy 101	May	Oct	10am-6pm	Mar	Oct	7am-7pm	$77	$104,000
OR	Grants Pass	Hwy 199	n/a	n/a	n/a	May	Sep	10am-5pm	$77	$65,000
OR	Ashland POE	I-5	Mar	Oct	9am-7pm	Feb	Oct	7am-7pm	$77	$39,000
OR	Klamath Falls	Hwy 97	May	Sept	10am-6pm	Apr	Oct	7am-7pm	$77	$58,500
OR	Lakeview - OR/CA border	Hwy 395	May	Sept	10am-6pm	May	Sept	7am-7pm	$77	$32,500
OR	Basque	Hwy 95	May	Sept	10am-6pm	May	Sept	10am-5pm	$77	$32,500
OR	Umatilla	I-82	n/a	n/a	n/a				$77	
OR	Ontario - OR/ID border	I-84	Mar	Sept	9am-7pm	Feb	Oct	7am-7pm	$77	$78,000
										$409,500
ID	Marsing	Hwy 95	6-Mar	7-Sep	7am to 7pm	6-Mar	7-Sep	7am to 7pm	< $50	$0
ID	Jackpot	Hwy 93	27-Feb	27-Sep	7am to 7pm	27-Feb	27-Sep	7am to 7pm	< $50	$0
ID	Cotterell	I-84	27-Feb	27-Sep	7am to 7pm	27-Feb	27-Sep	7am to 7pm	< $50	$0
ID	Bruneau	Hwy 51	6-Mar	27-Sep	7am to 7pm	6-Mar	27-Sep	7am to 7pm	< $50	$0
ID	Samuels	Hwy 95	22-May	7-Sep	7am to 7pm	22-May	7-Sep	7am to 7pm	< $50	$0
ID	Albeni Falls	Hwy 2	22-May	7-Sep	7am to 7pm	22-May	7-Sep	7am to 7pm	< $50	$0
ID	Clark Fork	Hwy 200	22-May	7-Sep	7am to 7pm	22-May	7-Sep	7am to 7pm	< $50	$0
ID	Hwy 53	Hwy 53	8-May	7-Sep	7am to 7pm	8-May	7-Sep	7am to 7pm	< $50	$0
ID	Huetter	I-90	8-May	7-Sep	7am to 7pm	8-May	7-Sep	7am to 7pm	< $50	$0
ID	Cedars	I-90	6-Mar	27-Sep	7am to 7pm	6-Mar	27-Sep	7am to 7pm	< $50	$0
ID	Redfish Lake	Boat ramp	26-Jun	7-Sep	7am to 7pm	26-Jun	7-Sep	7am to 7pm	< $40	$0
ID	Weston	Hwy 36	4-Apr	7-Sep	7am to 7pm	4-Apr	7-Sep	7am to 7pm	< $50	$0

State	Location	Route	Current opening date	Current closing date	Current hours of operation	Proposed opening date	Proposed closing date	Proposed hours of operation	Cost per hour to run station	$ needed to increase capacity
ID	Franklin	Hwy 91	4-Apr	7-Sep	7am to 7pm	4-Apr	7-Sep	7am to 7pm	< $50	$0
ID	Bear Lake	Hwy 89	22-May	7-Sep	7am to 7pm	22-May	7-Sep	7am to 7pm	< $50	$0
ID	Hwy 87	Hwy 87	22-May	7-Sep	7am to 7pm	22-May	7-Sep	7am to 7pm	< $50	$0
ID	Hwy 20	Hwy 20	22-May	7-Sep	7am to 7pm	22-May	7-Sep	7am to 7pm	< $50	$0
ID	Malad	I-15	27-Feb	27-Sep	7am to 7pm	27-Feb	27-Sep	7am to 7pm	< $50	$0
										$0
WY	Evanston	I-80	25-Apr	20-Sep	M-W: 7:30a-7:30p; Th-Su: 6:30a-7:30p	1-Apr	15-Oct	M-Su: 5am-9pm	$139	$89,294
WY	Cheyenne 25	I-25	25-Apr	20-Sep	M-W: 7:30a-6:30p; Th-Su: 6:30a-7:30p	1-Apr	15-Oct	M-Su: 5am-9pm	$139	$103,287
WY	Cheyenne 80	I-80	25-Apr	20-Sep	M-W: 7:30a-6:30p; Th-Su: 6:30a-7:30p	1-Apr	15-Oct	M-Su: 5am-9pm	$92	$73,522
WY	Torrington	Hwy 26	25-Apr	20-Sep	M-W: 6:30a-3:30p; Th-Su: 6:30a-5:30p	1-Apr	15-Oct	M-Su: 7am-7pm	$77	$68,265
WY	Sundace	I-90	25-Apr	20-Sep	M-W: 7:30a-6:30p; Th-Su: 6:30a-7:30p	1-Apr	15-Oct	M-Su: 5am-9pm	$139	$131,272
WY	Laramie	Hwy 287	25-Apr	20-Sep	M-W: 7:30a-4:30p; Th-Su: 7:30a-6:30p	1-Apr	15-Oct	M-Su: 5am-9pm	$92	$73,522
WY	Thayne	Hwy 89	25-Apr	20-Sep	Th-Su: 9:00a-6:00p	1-Apr	15-Oct	M-Su: 7am-7pm	$77	$82,257
WY	Newcastle	Hwy 16	n/a	n/a	n/a	1-Apr	15-Oct	M-Su: 7am-7pm	$77	$96,250
										$717,669
MT	Wibaux	I-94	28-May	30-Aug	8am-6pm	10-Apr	14-Sep	8am-6pm	$19*	$16,250
MT	Culburston	Hwy 2	28-May	30-Aug	10am-5pm	10-Apr	14-Sep	10am-5pm	$19*	$17,500
MT	Broadus	Hwy 212 and 59	n/a	n/a	n/a	28-May	30-Aug	10am-5pm	$19*	$48,750
	*Does not include supervisor/management time									**$82,500**
State	Location	Route	Current opening date	Current closing date	Current hours of operation	Proposed opening date	Proposed closing date	Proposed hours of operation	Cost per hour to	$ needed to increase capacity

									run station	
WA	Spokane	I-90	n/a	n/a	n/a	1-May	1-Oct	12	$125	$229,500
WA	Vancouver	I-5	n/a	n/a	n/a	1-May	1-Oct	12	$125	$229,500
WA	Richland	Hwy 395 -I-82	n/a	n/a	n/a	1-May	1-Oct	12	$125	$229,500
WA	Train Canada border inspectors		n/a	n/a	n/a					$5,000
WA	Additional monitoring									$74,800
										$768,300
Utah	I-15 POE	I-15	10-Mar	31-Oct	7am - 7pm					$0
Utah	Garden City	US-89	30-May	30-Sep	Daylight					$0
Utah	Laketown	US-30	30-May	30-Sep	Daylight					$0
Utah	Hanksville	US-95	1-May	30-Sep	Weekends/Daylight					$0
Utah	Blanding	US-95/US-191	1-May	30-Sep	Weekends/Daylight					$0
Utah	Kanab	US-89	TBD	TBD	None					$0
										$0
									GRAND TOTAL	**$1,977,969**

X. POLICY AND LEGISLATION

Each PNW region state and province has made significant advancements relative to the laws associated with aquatic invasive species and prevention programs. In April of 2014, the National Sea Grant Law Center and the Association of Fish and Wildlife Agencies released, "Preventing the Spread of Aquatic Invasive Species by Recreational Boats: Model Legislative Provisions and Guidance to Promote Reciprocity among State Watercraft Inspection and Decontamination Programs." The model state legislative provisions were created to offer guidance to states with existing WID programs and to outline an effective legal framework for those states seeking authorization for new WID programs. Upon completing the model law document, National Sea Grant Law Center then undertook a review of each state's WID laws and regulations to assess how each state's program compared to the authorities in the model law. The 2014 document, "From Theory to Practice: A Comparison of State Watercraft Inspection and Decontamination Programs to Model Legislative Provisions," revealed the following relative to PNW states (it did not review provincial laws):

In 2015, PNWER worked with the PNW jurisdictions to highlight the highest priority legislation to support regional dreissenid and aquatic invasive species efforts. These included:

Support appropriation of 2014 Water Resources Reform and Development Act funds to Columbia River Basin dreissenid activities.

The Act, signed in June of 2014, contains Section 5007, which authorizes the Secretary (of the Army) to establish a program to prevent and manage aquatic invasive species in the Columbia River Basin in the states of Idaho, Montana, Oregon, and Washington. The Act directs the Secretary to establish watercraft inspection stations in the Columbia River Basin (CRB) at locations having the highest likelihood of preventing the spread of such species into reservoirs operated and maintained by the Secretary. The Act authorizes the Secretary to conduct monitoring and contingency planning that includes conducting risk assessment of each major public and private water resources facility in the CRB, establishing an AIS monitoring program in the CRB, establishing a CRB watershed-wide plan for expedited response to an AIS infestation, and monitoring water quality at facilities owned or managed by the Secretary in the CRB. Although $20 million was authorized under WRRDA for this program, it was not appropriated in 2015. Therefore, in the interim, the PNW states are supporting Congressional efforts to appropriate $4 million in 2016 through lobbying and other efforts.

Support mandatory decontamination of fouled watercraft at federally managed waterbodies.

Containment at the source is the most cost-effective method of preventing the movement and spread of aquatic invasive species. The nation needs a federally binding decontamination policy for federal waters (excluding the Great Lakes, where source decontamination is unrealistic). The PNW states support federal legislation that provides for the mandatory decontamination of any watercraft/conveyance leaving a federally managed water body.

Table 18. A comparison of state watercraft inspection and decontamination programs to model legislative provisions. A check mark means full consistency and an "X" means no consistency with the model legislation recommendations. Source: National Sea Grant Law Center. Note: The analysis conducted by National Sea Grant Law Center did not include Alaska or the Canadian provinces.

	IDAHO	OREGON	MONTANA	WASHINGTON
% of core authorities suggested in Model Law	**70**	**75**	**55**	**75**
LEGISLATIVE FINDINGS	√	X	√	√
DEFINITIONS	No definitions for decontamination or inspection	No explicit definition for inspection	Inspection, decontamination, and waters not defined	Inspection not defined
POWERS AND DUTIES	√	√	√	√
PROHIBITIONS	√	√	No launching prohibitions	No prohibition on launching out-of-compliance conveyances
OWNER RESPONSIBILITIES	No general obligation to Clean, Drain, Dry	X	No cleaning and drying obligations	√
INSPECTION	√	√	No provisions to authorize law enforcement stops	No express authority for law enforcement stops
DECONTAMINATION	√	No express authority to impound conveyances or impose costs	No express authority to impound conveyances or impose costs	√
CERTIFICATION	Authorizes issuance of receipts/seals only for decontamination	√	X	No provisions for seals or reciprocity
PENALTIES	√	√	√	√

Support reauthorization of the National Invasive Species Act.

The Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990 identified and implemented ways to prevent the unintentional introduction and spread of invasive species into waters of the United States, worked toward minimizing economic and ecological impacts of established invasive species, and established a program to assist states in the management and removal of invasive species. NANPCA was reauthorized and amended in 1996 and renamed the National Invasive Species Act (NISA). However, Congressional appropriations have never met the amounts authorized in NISA (group of bipartisan legislators wrote the leaders of their respective Appropriations Committees in 2002) and other aspects of the legislation need updating to address numerous invasive species issues that have emerged since 1996. Therefore, the PNW states support reauthorization of NISA, along with the necessary appropriations, to prevent the introduction and spread of invasive species and minimize the impacts of established invasive species.

Support adding quagga mussels as "Injurious species" under the Lacey Act.

The Lacey Act, enacted in 1900, is administered by the US Fish and Wildlife Service and prohibits the interstate transport of wildlife killed or taken in violation of state law. The Act was amended in 1981 and 2008 to extend protections to plans as well as increase penalties for violations. Title 16 prohibits wildlife trafficking and the submission of false records. Title 18 prohibits the importation and interstate transportation of listed injurious species. Live zebra mussels are listed as injurious species, but quagga mussels are not. The Lacey Act needs to be amended to include quagga mussels as injurious, and thus make it illegal to transport quagga mussels across state lines. Therefore the PNW states support listing quagga mussels as injurious under the Lacey Act.

Support the implementation of federal aquatic invasive species legislation in Canada.

New federal regulations, passed in June of 2015, created a comprehensive national AIS regulatory framework, replacing the existing patchwork of inconsistent regulations and policies to address risks posed by aquatic invasive species and filling much-needed regulatory gaps. The regulations expand prevention effort tools as well as response and management mechanisms by prohibiting the importation, possession and transportation of Dreissenid mussels and four species of Asian carp into Canada (with the exception of Quebec and Ontario, that are already mussel-positive). The regulations also provide delegated authority to the environment Minister in each province to authorize the control of non-indigenous species that previously required federal approval. PNWER has been working with the border agencies in both the US and Canada to encourage the immediate implementation of these measures, as well as consistency on both sides.

Support the Western Governors Association (WGA) resolution on dreissenid prevention efforts.

In mid-2015, the WGA will consider a resolution as follows:

- We call on federal agencies that manage water bodies with infestations of dreissenids to expedite mandatory decontamination of fouled watercraft to contain dreissenids at their source.

- Request that Congress expedite appropriation of Water Resources Reform and Development Act funds to significantly enhance monitoring and prevention efforts and to implement the intent of the Act.
- The Governors request that Congress fully fund and implement state and interstate aquatic nuisance species management plans to provide the capacity and resources to address aquatic invasive species threats.
- The Governors request that Congress reauthorize the National Invasive Species Act (NISA) to prevent the introduction and spread of invasive species and minimize the impacts of established invasive species. Further, the Governors request that Congress support appropriations authorized in NISA.
- The Governors call on the US Fish and Wildlife Service to list quagga mussels as "injurious" under the Lacey Act to make it illegal to transport quagga mussels across state lines.

XI. BEST MANAGEMENT PRACTICES

Standards and Protocols - Implement *Recommended Uniform Minimum Protocols and Standards for Watercraft Inspection Programs for Dreissenid Mussels in the Western United States* for self-inspection, screening, inspection, decontamination, quarantine and drying time, exclusion, and certification/banding.

Research – Best management practices for early detection and monitoring (cross-polarized light microscopy and PCR assay of a sample is the recommended standard for official confirmation of the presence of dreissenids.

Water Managers – Best management practices for water managers to prevent and minimize veliger movements and settlements within water delivery systems and other water infrastructure.

Notification/communication databases – Principle contact for communication of newly infested water bodies and an online mapping tool to identify watercraft inspection and decontamination stations.

Messaging – Consistent outreach (*Clean, Drain, Dry*) across PNW states and provinces. This message may need to be "freshened" occasionally to incorporate new vectors and pathways and increase awareness with new audiences.

Monitoring – Portland State University developed a set of monitoring protocols to detect dreissenids in Oregon; these protocols are being replicated in many PNW states and provinces, and include sampling in water bodies with high to medium risk of dreissenid mussel introduction and/or establishment as well as water bodies with large amounts of boater recreational use and/or exhibited dissolved calcium concentrations and pH values conducive for mussel survival and growth.

Boaters – *Clean, Drain, Dry* outreach message:

- Clean-Remove all plants, animals, and mud and thoroughly wash the boat and trailer. A quick trip to the car wash to use high-pressure spray nozzles can help clean crevices and

hidden areas. **Boats that have been in a body of water with zebra or quagga mussels should be professionally decontaminated before launching anywhere.**

- Drain-Pull the plug! Drain all water before leaving the area, including livewells, bladders, bilges, ballast, and engine cooling water.
- Dry-Allow time for your boat to dry completely before launching in other waters. Use this calculator to help determine recommended drying time for your climate and season.

Fishing Tournaments - Draining boat livewells, bilges, bait containers, etc. should become a regular routine for all boaters. Washing boats exteriors and interior areas and or flushing interior pumps and water lines is recommended. For tournament series, where multiple contests are scheduled over a season, avoid scheduling infested-water contests before contests on non-infested waters. Instead, schedule contests on the non-infested waters first and schedule infested waters to be the last contest(s) in the series. In contests held on infested waters, sponsors will supply portable washing equipment and require participants to clean their boats before transporting boats and trailers away from contest waters. High pressure hosing of exteriors and hosing of interior water lines and pumps has been shown to be more effective than low pressure in removing small organisms. Organizers will encourage participants to have their boats washed both before entering contests waters and following completion of the contest. Assign a 'landing monitor" to check boats coming in and out. Create an AIS Contest Rule that - if not adhered to - could result in DQ and/or forfeiture of winnings (including practice days if applicable). Provide power-washing equipment on-site or locations of wash stations, such as gas stations, etc. Set up boat inspection area that ensures that water and plant materials are properly disposed. Similarly, for contests involving multiple waters, schedule the non-infested waters before moving to the infested waters.

Best Management Practices for Hydropower Facilities and Dams – Renata Claudi produced a chapter called, "Impact of Dreissenid Mussels on the Infrastructure of Dams and Hydroelectric Power Plants," in Nalepa, T.F., and D.W. Schloesser, eds., *Quagga and Zebra Mussels: Biology, impacts, and control,* CRC Press, Boca Raton, FL, USA, pp 243-257.

Local boat inspection programs – Lake Whatcom in Whatcom County, Washington, implements a robust watercraft inspection and decontamination program, including online training. You may access their program here.

XII. PRIORITIZED RECOMMENDATIONS FOR AN EFFECTIVE PNW PERIMETER DEFENSE STRATEGY

Five Key Priorities:

1. **Contain dreissenids at the source.** It has been demonstrated that the most effective way to prevent the spread and new introductions of aquatic invasive species is to contain them at the source. A significant amount of resources are being invested by states and provinces in the Pacific Northwest to prevent an introduction and establishment of dreissenids. Additional resources that become available, despite the source or intent, should focus on investing in containment at the source. Areas at high risk for introduction should support prevention, notification, and outreach and education efforts.

    a. **Address moored vessels at contaminated source waters.** High-risk conveyances have been identified as those in contaminated source waters for the

length of time needed for fouling. A strategic approach to identifying those conveyances, and implementing a comprehensive and thorough program to ensure those conveyances are decontaminated prior to leaving the source water body, is imperative to prevent the spread and new introductions of dreissenids.

i. **Implement mandatory inspection and decontamination for any conveyance that has been moored in a contaminated water body.** Conveyance owners choose the water bodies in which they launch and participate in boating and other activities. If a conveyance owner chooses to recreate or launch his/her conveyance in a contaminated source water, it should be mandatory that the owner pay for decontamination of his/her conveyance.

2. **Develop and foster long-term, sustainable funding solutions for dreissenid and other aquatic invasive species prevention efforts, including industry participation. Engage the greatest benefactors of dreissenid prevention efforts in funding those efforts.**
   a. Appropriations under 2014 WRRDA authorization would help fund prevention efforts focused on the Columbia River Basin; if fully appropriated, federal appropriations could help fund containment at the source, which would ultimately protect the Columbia River Basin.
      i. Implement the recommended budget items for $4 million and $20 million WRRDA appropriations.
   b. Many state agencies now sell permits that generate revenue for WID and outreach programs – state investment in prevention efforts should continue, at a minimum, at current levels.
   c. Water-related Industries, such as boat manufacturers, hydropower producers, and irrigated agriculture, are key benefactors of aquatic invasive species prevention efforts, but with the exception of the boat manufacturing industry considering design alterations to lessen the spread of invasives, industry has not been a financial supporter of dreissenid prevention efforts. Continued efforts are needed to engage all water-related industries in contributing funding that addresses aquatic invasive species prevention efforts.

3. **Build and fund the institutional capacity and decision-making structures for collaboration in the region to monitor, assess, and renew regional AIS strategies, including enhancing the effectiveness of a regional perimeter defense and achieving consistency in public education and awareness.**

4. **Establish and implement a real-time rapid response notification database that incorporates commercial haulers into the system.** The 2010 Quagga-Zebra Mussel Action Plan for Western US Waters called for the "finalization" of the "rapid response notification database." Five years later, this database is not yet functional. Its completion and implementation is integral to notification and communication efforts across jurisdictions, including between the United States and Canada. A regional entity should be designated as the lead for the development and implementation of the rapid response notification database. Explore regulations and outreach at the state/provincial/federal levels.

5. **Annually coordinate watercraft inspection and decontamination stations in the Pacific Northwest and with neighboring states and provinces using an online database.** In 2015, PNWER and the Pacific States Marine Fisheries Commission facilitated the creation of an online database for AIS coordinators in western Canada and the United States to enter and share their watercraft inspection and decontamination station locations, hours, and other details. This system is a visual tool that allows AIS coordinators to better collaborate on the locations and timings of stations. It should be used prior to the start of each "season" to collaborate on the locations of WID stations and make the most efficient use of existing resources.

Additional Recommendations:

- **Fully fund state and provincial Aquatic Nuisance Species Management Plans.** These plans form the foundation of all aquatic invasive species prevention efforts on a state-by-state basis, however, they have not been funded adequately, since their creation.

- **Facilitate, through PNWER, consistent and comprehensive cross-border training for United States/Canada border patrol officers, equipping them with the necessary information, materials, and training to effectively prevent infested conveyances from crossing international borders.** It is imperative that border control agents have the information, materials, and training to intercept infested boats crossing the border.

- **Develop boater movement models to predict the most likely locations for an introduction of dreissenids in the Pacific Northwest, and evaluate other risk screening models (e.g., cattle diseases) to identify primary points of introduction and potential partners.** Build on the work of individuals, such as the Mark Lewis Mathematical Biology Lab at the University of Alberta, to incorporate existing boater movement data to predict, with greater accuracy, the most likely locations for an introduction of dreissenids by high risk pathways—recreational boaters from infested waters, and commercial haulers hauling conveyances from infested waters.

- **Request and document the status of vulnerability assessments for all hydropower facilities in the PNW annually as part of annual facility inspections.** Ensuring vulnerability assessments are scheduled and completed for all hydropower facilities will help ensure that hydropower managers understand the risks of introduction, prevention efforts, and treatment options.

- **Ensure all chemical options for dreissenid treatment are registered for use in each state and province and that coordination among states and provinces continues through the established Rapid Response Working Group.** Approved chemicals must be readily available to ensure rapid response occurs after detection of dreissenids in a water body.

- **Develop and support mechanisms to share resources across jurisdictions, such as the Interstate Pest Control Compact.** State and provincial jurisdictions encounter challenges when attempting to direct resources outside their jurisdiction, even if containment at the source is a proven, cost-effective method of preventing the spread and new introduction of dreissenids. A regional mechanism is needed to share resources and direct those resources to the most cost-effective locations and strategies and is

integral to long-term success. The Interstate Pest Control Compact (Oregon Revised Statutes 570.650) could serve as a model for dreissenids, in that it establishes a Pest Control Insurance Fund to finance, through state, donation and grant contributions, pest control operations sanctioned by the states involved in the compact.

- **Develop AIS coordinator positions in the US Army Corps of Engineers in Washington, DC as well as in Canada.** Coordination of aquatic invasive species efforts within the US Army Corps of Engineers and in Canada is integral to communication, coordination, and administration of dreissenid efforts at the regional and national levels.

- **Strengthen alliances with organizations (e.g., Tahoe Regional Planning Agency) and the western states and provinces through timely and consistent communication and collaboration, including sharing watercraft inspection and decontamination station information, and fouled conveyance interceptions via real-time online databases.** Early notification of movement of fouled conveyances is imperative to prevention efforts as notification allows for states to prepare for decontamination and prevents fouled conveyances from launching in uninfested waters.

- **Begin to develop a more comprehensive program that addresses mussels as a component of a Pacific Northwest Biosecurity program.** Mussels are just one of many injurious species that could be introduced into the region. All new species introductions share a common characteristic – they are carried into the state via a vector of some type. A focus on vectors of introduction of organisms into the region could benefit mussel prevention and response through experience with other harmful organisms, such as bovine spongiform encephalopathy (mad cow disease) and a more holistic approach to biosecurity could enhance the region's defense against a variety of harmful species introductions.